

“LEGIONNAIRES’ DISEASE”

HEARINGS
BEFORE THE
SUBCOMMITTEE ON CONSUMER PROTECTION
AND FINANCE
OF THE
COMMITTEE ON
INTERSTATE AND FOREIGN COMMERCE
HOUSE OF REPRESENTATIVES
NINETY-FOURTH CONGRESS

SECOND SESSION

FOR THE PURPOSE OF DISCUSSING THE CAUSATIVE
FACTORS OF THE “LEGIONNAIRES’ DISEASE”

NOVEMBER 23 AND 24, 1976

Serial No. 94-159

Printed for the use of the
Committee on Interstate and Foreign Commerce



U.S. GOVERNMENT PRINTING OFFICE

WASHINGTON : 1977

84-064

37
H501-521

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 - Hoak, Edward T., Pennsylvania State adjutant.
- Armed Forces Institute of Pathology, Capt. Elgin C. Cowart, Jr., MC, U.S. Navy, Director.
- Bellevue Stratford Hotel, Philadelphia, Pa., William G. Chadwick, vice president and managing director.
- Connecticut, State of, Randall C. Baselt, Ph. D., chief toxicologist, Office of the Medical Examiner.
- Cook Associates, Hockessin, Del., Lorne Cook, owner-manager.
- Health, Education, and Welfare Department:
 - Boutwell, Joseph, M.D., Deputy Director, Bureau of Laboratories, Center for Disease Control.
 - Fraser, David, M.D., Chief, Special Pathogens Branch, Bureau of Epidemiology, Center for Disease Control.
 - Sencer, David J., M.D., Director, Center for Disease Control.
- Pennsylvania, Commonwealth of:
 - Bachman, Leonard, M.D., secretary, Department of Health.
 - Ingenito, Estelle F., Ph. D., medical research scientist.
 - Parkin, William, M.D., chief epidemiologist, Department of Health.
 - Wecht, Cyril H., M.D., Coroner, Allegheny County.
- Philadelphia, city of:
 - Polk, Lewis D., M.D., acting health commissioner, Department of Public Health.
 - Soricelli, David A., D.D.S., acting deputy health commissioner for Community Health Services.
- Veterans of Foreign Wars, Joseph Buckley, Commander, District I, Department of Pennsylvania.

"LEGIONNAIRES' DISEASE"

TUESDAY, NOVEMBER 23, 1976

**U.S. HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON CONSUMER PROTECTION AND FINANCE,
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
*Philadelphia, Pa.***

The subcommittee met at 10 a.m., pursuant to notice, in room 3306-10, 600 Arch Street, William Green Federal Building, Philadelphia, Pa. Hon. John M. Murphy, chairman, presiding.

Mr. MURPHY. The subcommittee will come to order. It is a great pleasure for me to be in Philadelphia this morning personally, where I can visit with my long-time friend and colleague Bob Nix and also with the former member of the House who moved up to the other body, Senator Dick Schweiker, with whom we have had many, many long years of fruitful legislation together. Congressman Matt Rinaldo of New Jersey, who is a ranking Republican member of this subcommittee, is with us.

Unfortunately, Senator-elect John Heinz, member of the full committee, regrets he could not attend this morning. He has been following these hearings with great interest.

Bob, I might say at the outset, I have many long and pleasant memories of Philadelphia. My first three children were born here, in fact, as long ago as 24 years, so we are familiar with the medical institutions of Philadelphia.

The Consumer Protection and Finance Subcommittee of the House Interstate and Foreign Commerce Committee meets here this morning to look into what has been called, for lack of a more definite name, Legionnaires' disease.

The subcommittee has a long history of interest in efforts to protect the public from toxic substances. On October 11, 1976, the President signed into law the Toxic Substances Control Act, which was written by this subcommittee. The law is designed to protect our health and the environment from toxic chemicals. It requires testing of potentially dangerous chemicals, and it authorizes the imposition of restrictions on the manufacture and use of hazardous chemicals.

The Congress was in the process of considering this legislation when the so-called Legionnaires' disease outbreak occurred. Because of the possibility that a toxic substance was the causative factor, the subcommittee took an immediate interest in the investigation of the outbreak.

Had the Toxic Substances Control Act been in existence at the time, invaluable data could have been available to those involved in the search for the cause of the epidemic. For example, the Toxic Sub-

stances Control Act calls for the establishment of a thorough system for the collection and dissemination of data on toxic substances. Such a system would include toxicological and other scientific data detailing the effects of a substance on human health. Researchers would have had at their fingertips data which set forth what kinds of substances could have caused the symptoms which were observed in the victims of the Legionnaires' disease. This kind of information could have helped the Center for Disease Control immediately to focus its attention on those toxic substances most likely to have been involved in the Philadelphia outbreak.

In addition, under the Toxic Substances Control Act, the Environmental Protection Agency will be able to collect extensive information on the manufacture, distribution, and use of chemical substances throughout our environment. From such information, it will be possible to identify quickly and, if necessary, contact manufacturers, distributors, and users of substances which could have been involved in the outbreak.

Finally, the Toxic Substances Control Act directs the EPA to develop better monitoring techniques and instruments for use in the detection of toxic substances. The need for such instruments is obvious.

Although we hope that we will never have another outbreak such as occurred among the Legionnaires, the Toxic Substances Control Act will provide invaluable tools for dealing with and limiting any future tragedies if they should occur.

Theories, speculation, conjecture, supposition, and suspicions have been offered by a full spectrum of recognized medical experts, ordinary citizens, ad hoc panels of misguided theorists, and an occasional irrational interjection. We are faced with reasonable possibilities for the cause of the deaths, as well as unreasonable impossibilities postulated by hundreds of letters and phone calls.

This has been called the epidemic of the century, and one veteran reporter stated it is the only outbreak of its kind to spawn a congressional investigation. We have been witness to one of the most intensive and extensive epidemiological investigations in modern medical history, involving Federal, State, and local authorities to a degree unprecedented in this country.

Yet we have not found the answer.

We do not know the cause of the disease—if it was a disease. We do not know what affected those Legionnaires, nor how it got there. But worse—if it happens again, apparently we have no formal, coherent contingency plan at the Federal level to do anything about it. The lack of coordination among the various agencies and officials involved has been an embarrassment, and the prospects for any self-motivated improvement seem slim.

These hearings will be directed along two general paths. First, the administrative breakdown that left us where we are today; and second, the disease itself and the investigative search for its origins.

Let us first touch on the disease. There have been endless studies, examinations of tissues, and data. There have been a large number of possibilities eliminated—we know many things the Legionnaires' disease is not. But one thing it definitely is, is the killer of 29 people, the infector of 150 more, the initiator of a multimillion-dollar loss and

demise of a historic hotel, and perhaps the saboteur of the credibility of a number of Federal, State, and local agencies.

Testimony at these hearings will include a number of noted medical authorities who will give us the benefit of their reasoned inquiries into the pathology related to the events. While we will hear a number of theories proposed, many of them entirely plausible, none is offered as the definitive cause of the deaths of 29 persons. On the contrary, we shall ask the witnesses to refrain from offering a step-by-step account of possible methods of killing large numbers of people.

On November 4, 1976, I directed my legislative staff counsel to pursue a recommendation that the subcommittee contact Dr. Thomas Noguchi, the Los Angeles County Medical Examiner and renowned forensic medicine expert. Dr. Noguchi indicated he had learned the hard way that American society is filled with hundreds of potential copycat killers who will imitate the latest homicidal or suicidal techniques seen on television or in the press.

One of our witnesses will state that a spokesman for the Republican National Convention telephoned him from Kansas City on August 13 regarding protective measures that might be taken at the convention in case of sabotage with nickel carbonyl.

In discussing nickel carbonyl poisoning as a possible cause of the Philadelphia outbreak, he emphatically stated that it would be, and I quote, "immoral to parade technical evidence before the world which could induce any number of deranged malcontents to embark upon a wave of nickel carbonyl slayings given the hideous potential which this modus operandi entails."

Therefore, I request that the precise details, in terms of methodology, be suppressed by witnesses in favor of more general descriptions of avenues of investigations. What I would like pointed out, however, is that, given the data derived and the circumstances involved in the collection of evidence, there is very much left to be desired in the overall approach to such an epidemiological investigation. Cause and effect are two entirely separate things: medical science can treat the symptoms of a disease, but cannot treat the cause until it is identified.

That has yet to be accomplished.

This leads us to the inquiry about the Federal, State, and local handling of the investigations of the Legionnaires' disease.

Currently, I believe it is safe to say that all of the ongoing investigations are at a dead end. Nothing is happening that can enable us to say that the prospects are encouraging. It is an unfortunate fact that when people stop dropping like flies, any governmental interest in the case seems to slack off to a marked degree. And in this particular case, there seems to be a credible amount of evidence pointing to gaps and lack of direction in the investigation of Legionnaires' disease.

For many months prior to the Philadelphia convention, the Center for Disease Control had been warning the American people that a crippling epidemic of swine flu might be on the way, and that some unprecedented measures might be necessary to prepare for that onslaught. The vaccine fiasco that followed—and continues today—is yet another story. The first legion deaths fit so well into the expected swine flu theory that the CDC's epidemiological investigation began with their analysts under the mistaken impression that their swine flu predictions had begun to come true.

It is now certain that it was not swine flu. There has not been a case of swine flu anywhere in the world in many months. The normal antecedents of an epidemic have yet to materialize.

What, then, was it?

We seem to be left with four general areas of possibility: (1) An as yet unidentified viral or bacteriological infection; (2) a coincidental convergence of unknown factors; (3) accidental introduction of some toxic, poisonous, substance, or (4) intentional introduction of a poison.

The bulk of informed scientific opinion has turned toward poisons—**toxic substances**—as the most plausible explanation. There are thousands of them available, but today's witnesses will narrow it down to a few suspects, the most prevalent of which is—or was for a time—**nickel carbonyl**.

The Center for Disease Control says:

There is no conclusive evidence . . . of nickel poisoning.

Yet some of our experts say it could be nothing else but nickel poisoning.

At the beginning, when CDC became involved and began its investigation, it did so with the assumption of swine flu as the cause. On the second day, CDC said it:

Looked less like flu,

and on the third day, after noting there was no secondary spread of the disease, said it was not flu, although they offered no alternative theories.

Unfortunately, however, because of the original faulty assumptions, the epidemiological study was led down the garden path.

Samples of body tissues and excreta, organ samples, and other body materials are gathered in a different manner for viral studies versus toxic investigations. Quite simply, nothing was done to search for toxic evidence until it was almost too late. Bodies were embalmed and buried before the determination had been made that other samples were necessary. Samples which were taken, were taken under viral study conditions, and methods incompatible with a toxic investigation.

Yet, in hindsight, we have found that many experts recognized the toxicological symptoms very early. How it got there was the subject of hundreds of theories—placed on telephones, in the ink on programs, in the food, in the ice cubes—but the point is that the symptoms were recognized very early as toxicological. The problem as expressed to subcommittee investigators was that no one in the bureaucracy would listen.

There have been charges that there has been a coverup of the way the outbreak was handled. Such statements appear to be buttressed when a reputable reporter is forced to use the Freedom of Information Act to obtain a report on the disease from the CDC. This may be true to a degree, but our purpose here today is not to throw stones at one person or agency who might have made a mistake. I don't think anyone purposefully sought not to find the cause of legionnaires' disease. We are here to develop a plan for the future. One that will work and hopefully eliminate any delays or lack of direction.

Despite some of the problems that transpired in this outbreak, what have we discovered?

Some of the tissue samples were shown to contain traces of tin, zinc, iron, silicon, aluminum—all used in similar situations, such as arc welding and soldering, casting of souvenirs, carbon arc projectors, and certain photographic and lithographic processes. Perhaps not too unusual, since many of the victims were working men, subject to exposure to any of these situations daily.

But another substance discovered in many cases was nickel poisoning. We will hear testimony on the nickel poisoning theory from the Nation's leading experts in this area.

These discoveries were made relatively very late in the investigation. There is a degree of uncertainty as to their credibility due to possible contamination of samples from scalpels, specimen containers, handling procedures, or simply the methods by which they were collected. The CDC, for example, did not have a toxicologist present in their initial team of investigators sent to deal with the swine flu epidemic. No apparent precautions were taken to deal with the possibility, however remote at the time, that something else might have been the cause.

Having noted this, I wish to repeat that it is not the intent of these hearings to lay the blame for the legionnaires' disease at the doorstep of the CDC. It is a bureaucracy, and like any other, it has difficulty functioning outside its very own narrow set of guidelines. CDC has been accused, however, of a lack of coordinated policy between itself and other concerned authorities, both Federal and local. Certainly, CDC's apparent failure to consider all possible causes from the very beginning, no matter what their expectations led them to believe, is questionable.

In summation, we apparently haven't learned from our mistakes yet. After all the searching, investigating, theorizing and hand-wringing, we have no idea either what the epidemic was or what to do if it happens again.

We are not prepared. If it would happen again, beginning today in this hearing room, with only our group present as the single common denominator to a series of deaths, we could be just like the legionnaires, and our epitaph would read "Mystery disease kills congressional panel; no clues of cause."

Our purpose then is to first bring together whatever knowledge we now have about the disease itself, and then to discover where the errors were made in the investigations. We may not find out precisely what happened before, but we can perhaps give some direction to the bureaucracy so that it cannot happen again.

Congressman Rinaldo?

Mr. RINALDO. Thank you, Mr. Chairman. Rather than repeat your excellent summarization of the facts, I will be rather brief so that we can go to the witnesses.

Certainly it is true that we are convening these hearings today to probe what may properly be called the medical mystery of the decade.

As you stated, a disease has claimed 29 lives without leaving a single, hard clue about its identity. In probing for the cause of this disease, the hearings will be partly scientific; however, they will also be a legislative inquiry. At the same time that we search for the causes of the legionnaires' disease, we will also be exploring inadequacies in the existing network of disease control agencies, inadequacies that have permitted possibly conclusive evidence to be lost or jeopardized.

In seeking better ways to respond to any future outbreaks of disease, a few tentative conclusions have already been reached in my mind. First of all, we need a better mechanism for the reporting of disease.

As several observers have noted already, legionnaires' disease might never have been detected if the Pennsylvania American Legion had not kept close track of the health of its members.

Indeed, a similar although less serious mystery disease struck the Pennsylvania Oddfellows in 1974, yet this disease was not discovered until researchers began to investigate this year's legionnaires' disease.

The lack of swift reporting has practical consequences; in the case of legionnaires' disease, tissue samples and other specimens were not obtained until days after the disease had reached its peak. The same specimens, if obtained at the height of the disease, might have yielded more definite traces of the agent involved.

Second, medical researchers must beware of burning bridges behind themselves. The early investigators of legionnaires' disease focused so intensely on a biological cause—upon a virus, fungus, or bacteria—that chemicals and poisons were apparently largely overlooked.

Thus, toxic traces that may have been found may now be gone and clinical concentrations which were detected are open to question since precautions against metallic contamination were not taken at an early stage of the probe. In any future outbreak of the mystery disease, disease control agencies must keep all avenues open, even as they correctly give priority to the likeliest possibilities.

In particular, the Center for Disease Control must develop the in-house toxicology capability that it now appears to lack.

I also believe that, in this investigation and in any future investigation, the possibility of foul play must not be written off.

It is entirely possible that a terrorist group or single fanatic might possess the technology to distribute a deadly poison or bacteria among a large group. Since health officials do not possess the training to track down evidence of criminal actions, I believe it would be prudent to establish formal organizational links between health agencies and knowledgeable law enforcement officials. Even military experts on chemical and biological warfare should perhaps be included. They should have, and must have, direct access to evidence which points toward criminal use of chemical or biological weapons.

In examining a subject which is both complex and certainly open-ended, the subcommittee has a great deal of work to do. Let us begin these hearings with the knowledge that lives might depend on how much we accomplish here today and tomorrow. Thank you very much.

Mr. MURPHY. Congressman Bob Nix?

Mr. Nix. Thank you. I cannot think of any subject that has been studied and restudied, and commented upon as this subject before this subcommittee today has been.

I think you deserve the commendation of Congress and the people of this country for calling these hearings at this time, corraling people who are learned in the field who may, through their testimony, give this subcommittee definitive reasons for proceeding to the end of arriving at some answers that might serve as a solution to the problem America faces.

Thank you, Mr. Chairman.

Mr. MURPHY. Thank you, Bob. Senator Schweiker?

Senator SCHWEIKER. Thank you, Mr. Chairman. I would like to commend you and the other members of this subcommittee for holding these hearings into the conduct of the investigation of the disease which afflicted participants at last summer's American Legion Convention here in Philadelphia.

I also want to congratulate you for the work you have done in toxic substances on the new bill which has now become law. We have also had tragic experiences with toxic substances elsewhere, and the new law will be helpful to us in this regard, too.

I appreciate the invitation to attend and participate in these hearings, first as a Pennsylvania Senator, second as the ranking Republican on the Senate Health Subcommittee, and third as a member of the Labor-HEW Appropriations Subcommittee which appropriates money for the disease investigation which we have seen here.

I have a very vital interest in exactly what our system did or did not produce in this case. Unfortunately, the cause of the tragic legionnaires' disease has not yet been discovered, despite extensive efforts on the part of Federal, State, and local health officials.

I want to uncover the reasons for this failure and determine whether any chance of solving this mystery still exists. We owe at least that much to the victims of this dread disease and their families.

Just as importantly, we owe it to the Nation to learn from this experience and to develop the resources and procedures necessary to prevent tragedies such as this from recurring. I believe we need a new early warning system to make sure health officials are aware of the proportions of an outbreak sooner, so that tests can be initiated before the traces of a causative agent have a chance to disappear.

A critical element of this early warning system is better coordination of Federal, State, and local resources, with firmly established lines of responsibility. It is clear that we can't afford delays born of confusion and overlapping authority.

In addition, procedures for concurrent testing for viruses, toxins, bacteria, and fungi should be established. There should be immediate preparation of laboratory samples, in sufficient quantity and quality to permit concurrent testing. And an epidemic-hot-line should be installed to insure 24-hour, 7-day-a-week response to reports of possible epidemics. A weekend's delay can cost lives.

We live in an increasingly complex world and it has become clear that there are many seemingly harmless substances in our environment that are potentially fatal. We must learn to deal with these dangers in a systematic, effective fashion if we are to avoid future tragedies.

Again, I want to express my appreciation to the committee for your kind invitation to participate in these hearings.

Mr. MURPHY. Thank you, Senator. Our first witnesses this morning will be a panel: Dr. David A. Soricelli, Deputy Health Commissioner for Community Health Services, in Philadelphia, and Dr. Lewis D. Polk, Acting Health Commissioner, Philadelphia Department of Public Health.

Dr. Polk, we certainly appreciate the response of Mayor Rizzo who has asked you to attend these hearings on his behalf. If you would proceed.

STATEMENTS OF LEWIS D. POLK, M.D., ACTING HEALTH COMMISSIONER, DEPARTMENT OF PUBLIC HEALTH, CITY OF PHILADELPHIA, AND DAVID A. SORICELLI, D.D.S., ACTING DEPUTY HEALTH COMMISSIONER FOR COMMUNITY HEALTH SERVICES

Dr. Polk. My name is Lewis D. Polk. I am the acting health commissioner of the city of Philadelphia. Seated to the right of me is Dr. David Soricelli, the deputy health commissioner for community health services of this city.

It is important to keep in mind that Philadelphia was the site of the convention of the Pennsylvania Department of the American Legion from July 21 through 24, 1976, and thus Philadelphia had the environment—the hotels, other meeting places, restaurants, et cetera—where whatever happened did happen. However, it was a State Convention, and people got sick who lived in all sections of the State. Thus, the cases and deaths were located all over the State of Pennsylvania—some even got sick and died outside the State of Pennsylvania.

Of the 180 cases, which included 29 deaths, only 29 cases including four deaths, were Philadelphia residents. The illnesses and deaths occurred after the convention and therefore the people left Philadelphia and went back home, or to other places. Thus, it was understandable that the State of Pennsylvania was involved from the very beginning. In addition, since there was some out-of-State involvement, the Federal Center for Disease Control was also involved from the very beginning.

Representatives of the CDC—about 30 individuals at one time or another—came in on the first day of the investigation, August 2, and for about the first week and a half worked out of Harrisburg.

For the next about a week and a half they worked out of Philadelphia, and then returned to the headquarters of the CDC in Atlanta.

A number of units of the Philadelphia Department of Public Health were involved and had different functions. Our Communicable Disease Control Section provided the epidemiological competence as well as medical and nonmedical disease investigators. I, as health commissioner, and Dr. David A. Soricelli, as deputy health commissioner for community health services, provided leadership to the Health Department activities, and, under the guidance and assistance of city Representative Gaudiosi, were involved in dealing with the media.

The Environmental Health Services unit of our Department took part in the investigation of many environmental aspects within the hotels that were involved in the convention as well as in the general community environment. Within Environmental Health Services, the sections pertaining to milk and food and occupational health, as well as the field sanitarians and environmental engineers were involved.

The Air Management Services component of the Philadelphia Department of Public Health was involved in terms of giving background weather and climatological conditions to various investigators as well as looking into incinerators at the hotel and elsewhere which at one time or another were considered to have a possible causative role in the outbreak.

The Emergency Medical Services Unit of the Department, through its contractual relationships with approximately 30 hospitals in the city which provided emergency medical services to the public, was in-

volved to get data as to what was happening in the community at the time of the outbreak as well as before and since.

The Health Program Analysis Division of Community Health Services provided vital statistics as well as the number of pneumonia deaths taking place in the community as reported on death certificates.

The Office of the Medical Examiner, within the Philadelphia Department of Public Health, did—or permitted hospital pathologists to do in some cases—post mortem examinations on the deaths that took place in Philadelphia. They also did a great deal of toxicological testing in the laboratory of the Office of the Medical Examiner. They tested material in the form of specimens from deaths or specimens from living patients. They also supplied nonoutbreak related control material for comparison testing by other labs.

Among the other city departments involved, in addition to the Health Department, were the Philadelphia Police Department which supplied a large number of city police detectives to participate in the followup of the large number of leads which came through the telephone hot line which the city set up on the very first day that the outbreak was known to us, August 2, 1976. Of course, the city Department of Public Property operates the city telephone system and provided the hot line.

The city water department was involved as was the Department of Licenses and Inspections, checking the hotels for such environmental matters as plumbing cross-connections. In addition, the city water department had taken the lead in the continuing activities in the investigation by contracting with the Franklin Institute for its heating, ventilation, and air-conditioning system competence, with the Drexel University for its chemistry and toxicological competence, and with the Philadelphia Academy of Natural Science for its biological and water skills.

The city managing director's office coordinated all of the activities of the several of the city operating departments related to this outbreak.

As mentioned above, the city representative's office, and Mr. Gaudiosi personally, provided leadership and direction as well as personal involvement in dealing with the media as well as playing major role in the entire direction of the city activities relating to this outbreak.

The State Health Department was the lead department at the State level, working on the outbreak. The State's Public Health Laboratory, located in Philadelphia, did many of the virus and bacteriological laboratory tests. The public health nurses and other field workers of the State Health Department were involved in picking up laboratory specimens and otherwise dealing with the patients scattered throughout the State.

Dr. Leonard Bachman, the State Secretary of Health, and others at the State Health Department headquarters held briefings for the press on at least a daily basis, at least for the first about a week and a half of the situation.

The Center for Disease Control took over the leadership role in the epidemiological investigation. They provided overall coordination of the entire investigation of the outbreak. Through their own laboratory capabilities they provided much toxicological laboratory test-

ing as well as various laboratory tests for living infectious agents, such as viruses and also bacteria. Through their environmental capabilities they participated in the environmental investigation. They were involved in coordination of the pathological examination of tissue specimens from the individuals who died in the outbreak.

There are some concerns which might be worth study, both in thinking about the ways this disease outbreak was handled as well as in considering how a future disease outbreak might be handled. These concerns include first, the fact that no cause or explanation has, as yet, been found. Apparently, the public finds it extremely difficult to deal with a situation which does not have a definite name or label; the aspect of an unsolved puzzle or continuing mystery leads to an atmosphere of uncertainty with a great deal of speculation, concern and anxiety.

Another concerning matter which must be considered is what is meant by a case in such an investigation. The representatives of the CDC were following sound epidemiological principles when they made a master list of suspect "cases" or instances of illness that were worthy of further study and investigation. They changed the definition of what constituted a "suspect case" approximately five times as the investigation proceeded and further aspects came up which changed the focus of the investigation.

Unfortunately, the media, and through them the public, were misinterpreting the use of the word case—which really meant one patient listed on the CDC's master list of "suspect cases"—and thought it meant a confirmed or definitely diagnosed case of a known disease. This latter usage of case is a concept with which we are all more familiar. Perhaps in a future situation, even more effort than was given to this aspect could be given to try to clarify this matter, perhaps by the use of a different term than case.

A third concerning aspect would be the inclusion, in the CDC's definition of what constituted a case of the name of the Philadelphia hotel, the Bellevue Stratford, that was the headquarters for the State American Legion Convention in July. Some of the epidemiological evidence did relate to the hotel, as well as much evidence which did not. However, since it was the headquarters hotel, it is difficult to conceive of any or very many participants in a convention that did not enter the headquarters hotel at least once.

A final suggestion for consideration in a future situation would be to give to local government a greater role, and the leadership role, regarding informing the public. This would be in contrast to giving that role to the State or Federal Governments since the local government would be sensitive to all aspects of a situation and not just to the technical aspects.

I will, of course, attempt to respond to any questions. Thank you.

Mr. MURPHY. Dr. Soricelli, do you have a statement?

Dr. SORICELLI. I have no statement. Dr. Polk has made the statement for us.

Mr. MURPHY. Thank you very much, Dr. Polk. Do you feel free to comment on any answers that you feel may be of use to the committee? Dr. Polk, what was the official count regarding deaths and illnesses?

Dr. POLK. The official count, by the definition of the Federal Center for Disease Control, I believe is 180 so-called cases and of the 180, 29 of them died.

Mr. MURPHY. What is the status of those surviving?

Dr. POLK. Again, those surviving, as I understand, are in no threat of death, none are in any kind of critical condition of which I know. There is the anecdotal information that some people have what some at least considered a relapse, whether it is in fact the same illness or another illness, I do not know.

Mr. MURPHY. Is your office or the city keeping a close touch with the progress of those survivors?

Dr. POLK. Once again, as I tried to explain in my written testimony, we, at the city level, are handicapped because the vast majority of both the survivors and deaths are not in any sense people who come under the jurisdiction of the city.

We therefore have to depend upon other governmental agencies which do have them in their jurisdiction, if we are dealing with some whose present locations are not in the city

We attempted to get secondhand information where we do not have the primary jurisdiction for people except those who might be in our own city.

Mr. MURPHY. Who has the jurisdiction?

Dr. POLK. Those who would be in the State of Pennsylvania would come under the jurisdiction, as I understand it, of the Commonwealth of Pennsylvania. Since some of the people died or actually went to locations outside of the State, it involves other State health departments, thus needing a Federal coordinating role to tie all of this together.

Mr. MURPHY. Was anyone other than Legionnaires attending the convention stricken with this illness?

Dr. POLK. On the master list again which has the 180, not all of them were in fact members of or participants in the convention of the American Legion, Pennsylvania Department, so yes, according to the master list kept by the CDC, others than participants in the Legion Convention were included.

Mr. MURPHY. At the present time, is there any official name or designation or title for this outbreak?

Dr. POLK. The title that I believe is the title used in the periodic reports through the Federal CDC's mortality report is Respiratory Disease-Philadelphia. That does not attempt to tie-it-in with a particular target population or a particular hotel or any other thing.

It does however, mention the name of the city where the presumed exposure happened and the nature of the illness, namely a respiratory illness.

Mr. MURPHY. Was there any indication of secondary infections?

Dr. POLK. There is no evidence which has held up of secondary infections.

Mr. MURPHY. Who assumed the leadership role in directing the investigation into the cause of the respiratory disease, Philadelphia outbreak?

Dr. POLK. The primary lead role in the investigation was assumed by the Federal CDC.

Mr. MURPHY. Who do you think should have had the leadership role?

Dr. POLK. In terms of the investigation, I believe they were the only logical group on the basis of the geographical distribution of the cases.

Mr. MURPHY. You have briefly discussed how the CDC came in. Would you tell us about the coordination between the State and local agencies of those private agencies and tell us whether you are satisfied with the way the medical investigation was carried out?

Dr. POLK. The coordination was on a basis of face to face contact where the people were physically in the geographical locations to do that, so during the first week and a half of the outbreak investigation, where most, though not all of the CDC people were using Harrisburg, as their major headquarters, while we had some working out of the city, most of them were working at Harrisburg, there was obviously face to face coordination of the State and Federal activities, and primarily telephone tie-in with people such as Dr. Soricelli or me or others at the city level with people in the Harrisburg location.

Later the CDC moved its base of operations to Philadelphia, actually moved into one of the Philadelphia Health Department buildings and thus we in the city could have face-to-face, in terms of coordination with other medical investigators.

That was done primarily at the State—by the CDC having contact with these outside people and they in turn contacted and coordinated, by talking to us.

In terms of could things have been done better, like any kind of human activity, I am sure it could have been done better. I do not, however, believe that in terms of the coordination, the three governmental agencies mentioned, that there were many major gaps.

Mr. MURPHY. Did you have a representative in Harrisburg during the first week and a half that CDC was there?

Dr. POLK. No, we did not. Again, we were depending primarily on the telephonic tie-in for tying us with the CDC itself, as I believe I mentioned, who had some of its people down in our buildings.

The main CDC people in the State were in Harrisburg or those housed in our health department building though they were not the top CDC people in the State at the time.

Mr. MURPHY. From the outset, in your opinion were the necessary manpower and funds, resources and technology made available?

Dr. POLK. As far as I know, they certainly were. I believe it is important that the manpower had to be manpower that could get the job done and had the background needed. That is why when we needed more trained investigators in Philadelphia to followup on the many telephone an other hotline leads that we were getting, we moved to bring in the city police detectives, not because we suspected that there was any necessarily criminal activity going on but we needed more trained investigators and the city police detectives were able to fill that need, to supplement the health department's own medical and health investigators.

Mr. MURPHY. Congressman Rinaldo?

Mr. RINALDO. Thank you. It is my understanding, Dr. Polk, that Dr. Steven Baskin, a scientist from the Medical College of Pennsylvania, has done a study of swine flu. He reported to the Philadelphia

Health Department his opinion that the legionnaires' disease was not swine flu.

Apparently, Dr. Baskin offered his services to the Philadelphia Health Department on several occasions but I understand he was rebuffed. Is this an accurate account of what transpired, and if, so, why were his services rejected?

Dr. POLK. I am not aware of the offers and contacts made as you suggest by Dr. Baskin. I am not saying that he did not make them. I am saying we got hundreds of phone calls, dozens to hundreds of letters.

These were in fact all screened and those things which needed followup were investigated. I personally did not take every phone call or even see a summary of every phone call. I did at least scan every letter which was addressed to me or sent to me by others that had it sent to them.

I do not know if Dr. Baskin made the offers, I am not saying that he did not, but I am not aware that he did. Therefore I cannot speak to if he did, and why his offer was turned down.

Mr. RINALDO. I understand that Dr. Baskin is now preparing a chronology of his unsuccessful efforts. Perhaps the chronology will shed some light on this matter.

Dr. POLK. Fine.

Mr. RINALDO. You stated in the initial part of your testimony that there were some out-of-state disease cases and that the CDC was therefore involved from the very beginning. Apparently, CDC would not have been called in if this had been entirely an intrastate outbreak.

If this is the case, do you think that CDC should have—in the future—intrastate jurisdiction?

Dr. POLK. I did not mean to in any sense mislead you. I was attempting to say that in part or in addition, and I believe that the written testimony may not be as clear as verbal testimony the CDC might be said to have said to or somebody had to coordinate the various different States' information.

The CDC would have been and was in fact called in and invited by the State health department and frequently is by the State government, by the city of Philadelphia government, by other local and State governments, even though as far as is known, the outbreak is within one governmental jurisdiction.

Because the CDC's technical competence is offered to assist and supplement the competence of State or local government, this is done. I am sorry if I accidentally misled you into thinking the only reason they were brought in is because of the fact that there were cases and deaths outside Pennsylvania.

They would have been called in and frequently are for other outbreaks, even if it is within one State or within one city.

Mr. RINALDO. Fine, that answers that question. To the best of your knowledge, has your department—or any other agency involved in the efforts to determine what caused the disease—had any indication that it could have been caused by any type of foul play?

Dr. POLK. I am not aware of any credible evidence which would say that it is caused by that. Obviously I cannot say it is not caused by foul play but the information that I have seen, which I have been made aware of, would not lead me to say that is the cause.

Mr. RINALDO. Since you apparently cannot rule it out either, would you support some sort of formal link between health control agencies and the law enforcement agencies in cases of this type?

Dr. POLK. I think this could be done. Again any such evidence which would indicate a criminal activity, obviously would have been given to the suitable people.

Mr. RINALDO. Do you think that the current system should be changed to provide for more rapid reporting of disease outbreaks?

Dr. POLK. Again, when you say rapid reporting I assume you mean by the physicians or the hospitals, the usual reporting of which I am conscious. To make sure that we are talking about the same thing, a person who knows of an illness is usually a physician giving medical care to the person or sometimes a hospital administrator or the person in charge of a laboratory who has had some lab tests.

As soon as people know of an outbreak, there are a list of reportable conditions which people have a legal obligation in the categories mentioned, physicians, hospital and laboratory heads, to report.

It would be particularly helpful if people, even if it is not clearly a reportable condition, would let the appropriate governmental health agency know of something that even looks to be an outbreak.

Mr. RINALDO. Are you saying that this approach could speed up the reporting of disease outbreaks?

Dr. POLK. That would be helpful.

Mr. RINALDO. Would you say that additional steps have to be taken in cases of this type? For example, do we need changes in the health control system to insure that tissue samples are protected from outside contamination and other forces which erode the value of the samples? After all, contamination of specimens could well hinder any final determination of what caused the outbreak.

Dr. POLK. Obviously, contamination should be avoided. I think it is important to keep in mind that the word contamination has been used frequently in this outbreak to mean the taking of pathological specimens at post mortem examinations by the usual techniques, that well trained pathologists take, namely the use of metal knives and the storage of the tissue samples in the usual containers that pathologists put things into.

I would not want in any sense anyone to accidentally be misled to think of contamination in a different context than that.

Mr. RINALDO. Have events to date, in this particular instance, indicated to you that improved coordination between various health control agencies is needed?

Dr. POLK. Once again, as I believe I said to the chairman, in any kind of large activity involving many people under a degree of pressure, I am sure things could have been better. I certainly hope that improved coordination could be done. I would like to emphasize however that there was coordination. There was not in any sense an un-nated activity which has been going on.

Mr. RINALDO. Would you not say that the coordination could have been better?

Dr. POLK. I say any human activity could be better and this is certainly in that category. It could have been better, yes, sir.

Mr. RINALDO. Thank you, Dr. Polk. I have no further questions.

Mr. MURPHY. Congressman Nix?

Mr. NIX. Thank you. I understand you to say that there were 180 who became ill?

Dr. POLK. Yes, sir.

Mr. NIX. That 29 died?

Dr. POLK. Yes, sir.

Mr. NIX. How many physicians were involved?

Dr. POLK. I do not know the number, sir, because they were in many hospitals throughout the Commonwealth of Pennsylvania as well as elsewhere. I do not know the total number of doctors who were caring for those 180 patients.

Mr. NIX. But that number has been recorded and would be available to you if you sought it, would it not?

Dr. POLK. I am not sure I know the number, if it is a given patient who is in a hospital, then he might have a number of physicians involved in his care whereas one physician might have taken care of several patients.

I am not sure that the number as such exists, the number of doctors who saw all of these 180 people. I am sorry I do not know how I could get that number.

Mr. NIX. What I am talking about is the number of physicians who were responsible for this department and the hospital in which any given person of the 180 was served. Certainly there is such a record as that?

Dr. POLK. Yes, sir, those patients were admitted to a hospital. This could be done presumably from checking the hospital charts of each patient. I assume this could be done.

Mr. NIX. That would be available to you?

Dr. POLK. This could be obtained by checking hospital charts, yes, sir.

Mr. NIX. What I would like to know is whether or not any examinations, any conference has been held between the physicians who were in charge of those who died as well as those who became ill, the 180, the totality of it, whether they sat down for the purpose of determining what causes can be written out or down as common to all of those patients and those symptoms that are not common to all. Have they done that?

Dr. POLK. The face to face conference has not been done but those doctors wrote on a daily and sometimes more often basis on hospital charts for each of those patients. All of those hospital charts have been studied by the people from the CDC.

They have in fact tabulated the various symptoms and findings. And that the kind of information that you are suggesting would be desirable has been pulled together by the Federal CDC staff, yes, sir, it has been done.

Dr. SORICELLI. If I may just add to that and say that while there has not been an aggregate conference, that everytime a case is reported, one of our epidemic intelligence service officers did in fact contact the physician, there was person to person communication regarding the status of that individual patient.

Mr. NIX. Then you do have in your records a compilation of causes, illnesses, whatever you call it common to some and not common to others?

Dr. POLK. We have the findings that are common. If you mean by illnesses, the name of the illness that the doctor thought it was, we presumably—we assume the CDC has that. We do have common findings like how many had fever, how many had cough, chest pain, high white blood count, how many had this particular laboratory test. Yes, sir, the CDC does have all that material.

Mr. NIX. Then you have also a list only by elimination of those that did not have the symptoms?

Dr. POLK. Yes, sir, or at least there is no evidence that they had it.

Mr. NIX. No evidence?

Dr. POLK. Yes, sir.

Mr. NIX. Have you made a study of that phase?

Dr. POLK. Yes, sir.

Mr. NIX. To what end?

Dr. POLK. To a very frustrating end. The pattern of the clinical illness, the way the patients looked, was very similar to a respiratory infectious disease.

However, the things that would seem to be not a respiratory disease are the fact that in that same list of laboratory tests, the various laboratory tests such as finding the virus or a germ or finding antibodies, chemical substances in the blood which the body builds after an infection, those have not been found so that therefore, the pattern then becomes finding what could have caused it, the toxic substances have been mentioned here frequently and elsewhere.

Very few if any toxic substances cause an illness exactly like the clinical picture the patients had, their symptoms, fever, and so forth. That is one of the reasons of course for the continuing mystery.

This in some ways acts like an infectious disease but not in all ways. As the chairman pointed out, there are no secondary cases. There is no spread from the sick person to his family, neighbors, the people with which he works. This would be very unusual in an infectious illness.

On the other hand, the way the disease acts is very unusual for most if not all toxic or chemical substances.

Mr. NIX. Even if there is something unusual about this, that is a factor to be studied, could you not say?

Dr. POLK. Yes, sir.

Mr. NIX. And to be analyzed?

Dr. POLK. Yes, sir.

Mr. NIX. And to be compared when you analyze and compare illnesses?

Dr. POLK. Yes, sir.

Mr. NIX. To what?

Dr. POLK. To no conclusive determination of the cause as of this point, sir.

Mr. NIX. And what factor do you have at hand that allows you logically to arrive at the conclusion that there is no cause?

Dr. POLK. I believe I tried to indicate, Congressman Nix, that we have not identified obviously the cause in the sense that something caused 180 people to get sick and 29 of them to die.

What I am saying is that if we want a definite diagnosis that we can, as physicians and scientifically trained people justify, we do not have the evidence to point to a particular illness.

We could say that they died of viral pneumonia. The point is the way the sickness went is similar to viral pneumonia but the things that should have happened if these people were ill with viral pneumonia did not happen.

They did not give it to anybody else. They did not have any positive laboratory test for viruses. Therefore, all I can say is obviously there is a cause and it is as yet unknown.

Mr. NIX. Let me just put one further point to you. Could you not list a number of causes?

Dr. POLK. Yes, sir.

Mr. NIX. Would that not place you in the position then to further analyze those causes?

Dr. POLK. Yes; sir and that has been done and the various confirmatory tests from each of those listed causes have been tested for and not found. That has been the major problem with the evaluation.

Mr. NIX. What steps have you taken after that?

Dr. POLK. To continue to follow up the patients, continue blood samples taken from the living patients to see if their blood contains antibodies or evidence of past illness which did not show up in earlier tests.

There is continuing toxicological testing, continuing environmental sampling testing to continue to see if anything will give the explanation to this puzzle.

Mr. NIX. Thank you.

Mr. MURPHY. Senator Schweiker.

Senator SCHWEIKER. Dr. Polk, coming back to the question of authority, you answered in response to the chairman's question that the lead role was assumed by the Center for Disease Control. About what day was that?

Dr. POLK. I believe it was the first day that various governmental jurisdictions knew we had an outbreak to investigate. That was Monday, August 2nd. There was phone contact between the State health department, I believe and the CDC on that day.

There were people from the CDC in on a regular basis. One person was in Harrisburg and one person was in Philadelphia's Health Department. Others arrived that night and the following morning. The local jurisdiction, the State jurisdiction, and the CDC jointly felt that the most logical people to take the lead in an epidemiological investigation was the CDC. That was done, I believe, the first day of our knowing that we were investigating an outbreak.

Senator SCHWEIKER. What did that taking of control mean? For example, since the CDC had control, would the CDC delineate how a sample would be prepared and sent to the laboratories for testing?

Did control of the investigation mean that or not?

Dr. POLK. At least early on, the usual methodologies were done. I do not believe anybody specified a particular technique. In other words, when a doctor, when a State public health nurse, when someone else wants to pick up a given sample, they all follow standard protocols, week in and week out. Those were done.

After there became a concern of certain types of toxicologic involvement and so-called contamination by the techniques used in the standard way to get certain types of samples, then the various other things were mentioned at that point.

Senator SCHWEIKER. So while they took over the investigation, they really did not have complete control. I think you answered my next question. Because it probably was a toxic problem, we now know by hindsight, sending stainless steel test tubes to laboratories or using metal knives resulted in samples that were contaminated for the purposes of a toxicological investigation.

However no specifications had been laid down for anyone when these samples were sent. Were the contaminated samples sent after Monday, August 2?

Dr. POLK. There was something else very important to keep in mind in some of the opening comments, there were comments about the embalming of some of the people. It is important to keep in mind the time sequence.

The convention was the 21st through the 24th of July. The people started getting sick sometime in the next several days. Some of the people who died either had an autopsy or did not and the bodies were embalmed before anybody in any governmental level knew there was an outbreak or that certain actions should be taken.

Unfortunately some of the people who were embalmed and some who had the post mortem examination had that done before anybody or any governmental level knew that there should be special precautions of any kind taken.

Senator SCHWEIKER. I certainly agree with that, but this was an on-going thing. There certainly were some live patients around from whom proper toxic samples could have been taken after August 2, weren't there?

Dr. POLK. May I suggest that some were. People in fact did have toxicological samples, the living patients as well as the tissues from some of those who then died. There were various samples of blood and urine and various other substances taken from some of the living patients and various toxicological as well as biological and bacteriological tests were in fact done on those patients.

Senator SCHWEIKER. But didn't most of the nickel carbonyl testing have to be invalidated, mainly because the samples were contaminated i.e. by stainless steel test tubes or by metal knives?

Dr. POLK. I believe that various other things were in fact collected as well. I believe the so-called contamination was of the tissue samples from patients who had died.

Senator SCHWEIKER. How would you suggest that procedure be handled in the future so that we can avoid this problem?

Dr. POLK. Again, I think it is important to keep in mind that the physician, whether he is treating one patient or a physician as a public health doctor who is treating an entire community in a large outbreak, has got to consider all of the thousands of possibilities and then follow most intensively the most likely causes, the things that would be most likely to explain what he sees before him based on the information that he then has.

Sometimes if you tried to do one thing, it interferes with doing something else. There is only so much tissue that you can take, so many samples from a living patient certainly before it hurts that living patient.

All I can say is if people were more conscious of toxicology perhaps they could have had more toxicological expertise in early and do other things. I would like to digress a moment.

I mentioned in my opening written statement that within the Philadelphia Department of Public Health, we do have toxicological competence, we do have that headed with someone with a doctor of philosophy degree in toxicology as well as others.

Again, there were toxicologists involved from the beginning. Obviously we can always do more of a good thing. Similarly the various samples that were taken, for the virtue of looking back and preparing perhaps for something else, could be taken in various other ways or multiple tissue samples taken, some tested by one technique and some by another technique.

Mr. MURPHY. Senator, would you yield?

Senator SCHWEIKER. Certainly.

Mr. MURPHY. We pointed out that there was no toxicologist on the CDC team that came up here and then that the samples that came in to the pathologist studies by the toxicologist did not come in for weeks afterwards.

Dr. POLK. I was only commenting that within the Philadelphia Health Department on an ongoing basis, we do have a toxicology laboratory that does testing, that was in fact doing toxicological testing on some of the tissues. For the local Philadelphia government that—toxicology—was being worked on and that was getting toxicologic consultation.

I was just picking up on was there any toxicological investigation at any governmental level and I can speak for the Philadelphia Department. In fact we had the availability of toxicological competence. We did use it. We always have done more than assuming one technique.

Senator SCHWEIKER. If that is true, and I accept your statement as accurate, why were they not consulted in choosing the kind of sampling techniques you were using in sending out samples for the University of Connecticut Medical School analyses?

They should have been brought in to all phases of the investigation process. This seems to be part of the tragedy of this incident.

Dr. POLK. Again, I keep in mind that we, as well as others, were sending samples for clinical testing, and I believe this is what you are talking about.

Senator SCHWEIKER. These samples came from the city?

Dr. POLK. We sent some of them, obviously not all of the deaths, but I mentioned in my testimony that we sent samples of some deaths and some so-called control samples. The samples were in fact taken with the knowledge and information of the toxicological competence that we had.

Senator SCHWEIKER. The next area I'm concerned about is the water connection. In a nutshell, can you tell us what your investigation showed about the connecting link between the drinking water at the top of the Bellevue and the circulating air conditioning water—which contained sodium dichromate as a rust preventive—in terms of any danger or potential harm?

Dr. POLK. The city water department and the city licenses and inspection department, as well as the city health department, found that particular potential, and I stress potential, plumbing cross connection.

The reason I say potential is because there was a hose connecting two different water systems. One was the drinking water system, the other was the chilled water system circulating through the hotel for air conditioning purposes.

There was a hand operated turnoff valve at either end of this hose. The point is that three things would have had to happen to have had water go through that hose. Both of those valves, one at each end of the hose, would have had to be turned open and the water in the city and hotel drinking water system, which has a higher water pressure, would have had to fall below the pressure in the chilled water system.

All those three things would have had to happen, both valves open and the pressure then go down for the water to go through. Therefore, as a potential thing, the substance that you mentioned in the air conditioning chilled water, the dichromate would not cause the kind of difficulties that the legionnaires and others had.

However, technically from the city code, building and plumbing code, it is a code violation. Therefore we had the information and we made the information available.

Senator SCHWEIKER. You are aware that the Center for Disease Control is testing mice to see if they die from being fed that kind of water, sir?

Dr. POLK. I think we are talking about different things. We are talking about was the plumbing potential cross connection a potential cause of this outbreak? I, and I believe the other groups, who can speak for themselves, say no.

The second point is that when you analyze the epidemiological evidence, who did this and who did not do that, water turns up in some ways. I do not believe that if the CDC says that there was something to do with the water, that the potential plumbing cross connection was the way it got into difficulty.

Senator SCHWEIKER. Obviously they thought it was a possibility, although they may agree that it was an unlikely possibility.

They thought enough of water as a possibility to check it out.

In a conversation I had with Dr. Fraser, he told me that CDC investigators were testing several groups of mice: one group was being fed sterile water, another group fed water found in that cross connection to the cooling tower, and a third group fed distilled water with sodium dichromate in it.

They obviously think this represented one possibility. Probably you are familiar with the results of the tests, they might all be negative, I do not know.

Dr. POLK. I would say that the typical illness caused by that substance, the dichromate is in no way like the illnesses caused—

Senator SCHWEIKER. They are also testing to see if there are any other ingredients in the tank?

Dr. POLK. We have too. We have not found anything which would be the explanation.

Senator SCHWEIKER. I do not know if you have seen the CDC report from NIOSH, but the NIOSH team observed bird droppings in the area of the water tank. They go on to say that it was possible for birds to have access to the auxiliary water supply.

We do know, I believe, that one person who died, did in fact die from parrot fever. That was Mrs. Palmer. You might be objective and say that is only one person who died and that is all that came of it.

My question to you is what about the bird droppings? Was there in fact an open drinking water tank at the top of the Bellevue? What about that possibility, how was it checked out?

Dr. POLK. The tank was accessible as you indicate. The possible role of something caused by birds either going through the water or in any other way was one of the things which was intensively looked into during the outbreak.

Some of the clinical symptoms, the nature of the illness the patients had was at least very similar to the psittacosis type of illness that you can get from birds. However, we again are left with the puzzle that we spoke of when I spoke to Congressman Nix.

While the clinical picture in many of the patients is similar to pigeon or parrot fever, so-called psittacosis, the scientific name for it, the various laboratory tests that you would find in people who have this did not show up so that while a given patient might even be on the Federal Government's master list, might in fact have had that illness, all it shows—as I said we are dealing with a list of suspects.

We do not know what all of these people had in common. It is possible one or more do not belong there but the other 179, they do not have the various laboratory tests that you would expect some or most or all of them to have. This is the explanation for the outbreak.

Senator SCHWEIKER. One of the other potentially harmful areas was the air conditioning filter. As I understand it, one filter system fed only to the lobby; and of course the CDC questionnaire showed that the high frequency of lobby visits and related incidents was correlated, as I understand it, to the one air filter that was to be checked and cleaned.

Actually, the cleaned filter was removed from the hotel before anyone had a chance to see it. What can you tell us about that air filter and why it was removed prior to inspection, in view of the fact that it was apparently being moved right in the middle of the outbreak?

Dr. POLK. As I understand it, and this is anecdotal on my part, perhaps some of the people from CDC and others who will be testifying later will have some firsthand information.

Again, I would like to emphasize that CDC, because it had such a major overall role, got much of the information on this firsthand. I am giving secondhand information.

As I understand, the air filter was in fact taken out of the air conditioner in the lobby for reasons as stated by the hotel and employees that they detected a decrease in the cooling power and felt that the air filter was clogged or somehow stopped up or somehow not functioning right. So it was taken down and cleaned. Again that is anecdotal, secondhand information, as far as I have.

Senator SCHWEIKER. We also have the coincidence or incidence, whatever you want to say, of an air conditioning serviceman who came down with symptoms similar to the Legionnaires' symptoms, is that not correct?

Dr. POLK. Again, may I just go into that. The air conditioner serviceman really was a gentleman who did not deal with air conditioning devices as most of us think of them in our homes or offices.

He did not go into the subbasement where the air conditioning machines were. He would go from room to room and adjust the thermostats and the devices in the individual guest hotel rooms. He is not the typical type of air conditioning man. Also there is some reason—CDC will have to speak—

Senator SCHWEIKER. I have the NIOSH report in front of me. It says this man's duties were to adjust air conditioner units on each floor, to change and steam filters, which is very much the issue.

Dr. POLK. Again, the point I was trying to make is that man who changes the refrigerant in the air conditioning is somebody different. I would agree that those are among his duties.

I was trying to interject that the gentleman's child had a very similar respiratory illness which came on a day or two earlier than his, that his illness started very early in the outbreak. CDC has said anecdotally that there is a question whether he really belongs on that list, there is some question whether he is a case of the so-called legionnaires' outbreak or whether he is a coincidence, but the CDC will have to say whether he is on that list or is not.

Senator SCHWEIKER. What disturbs me, though, is that I think one of the other members here mentioned that if these folks had not been at a legion convention would they not have said that about everybody who died? That it was just somebody in the family that had something or other, and the illness would have been classified as typical—in a typical, normal hospital way.

That is what is so scary to me about it. If they had not all been at a legion convention and been identified that way, I just wonder how much would have come through the medical system. It seems to me that that rationale would probably have been given as the explanation, if somebody had not awakened to the fact that everybody affected went to the legion convention.

Does that not disturb you a little about this system?

Dr. POLK. It does but I think we have to keep in mind that people die of viral pneumonia. In Philadelphia, there are between six and eight deaths every week, this year, last year and the year before, week in and week out. In the State of Pennsylvania there are approximately 40 deaths a week of viral pneumonia. Those cases clinically cannot be separated from these in the Legion outbreak. We do have evidence that on a city basis, there was no increase in the usual number of either people coming to hospital emergency rooms with this kind of pattern, no increase in people admitted to hospitals with this kind of a pattern, there was no increase in deaths from this.

What we can say is that we do have a system which obviously might miss one or two instances of something but something of this magnitude would show an increase in other things which we mentioned, which makes us feel comfortable that whatever happened to the legionnaires and the others on that list, there was no general illness going in Philadelphia, during that week, the weeks before or the weeks since.

Senator SCHWEIKER. The last question I would like to bring up deals with the herbicide. The NIOSH report indicates that apparently this was one of the top suspects. What can you tell us about the herbicide inspection and the spraying of the lobby with herbicides?

Dr. POLK. Just to make sure we are talking about the same thing, did they give it a particular name?

Senator SCHWEIKER. The paraquat?

Dr. POLK. The paraquat was mentioned earlier on. As I mentioned we had toxicological tests on living patients as well as toxicology from some of the ones who died. Paraquat was tested for in the urine and perhaps in the blood of a number of the living patients and it was not found. This was considered early on and it was tested for and not found.

Senator SCHWEIKER. I want to make clear that this is not a question of your responsibility, your expertise, or anyone in particular. But what disturbs me here is that the report goes on to say—however, just as you indicated, there was a report of a preliminary analysis, and paraquat was not detected in the biological specimens of the affected—the bottom line is that since it was reported that 90 percent of ingested paraquat is excreted during the first 24 hours, absence of paraquat in tissue may not be surprising at all. That time factor is the weakness of this whole system.

It is a critical weakness. It shows a tremendous binder that exists, that the system is not really geared up to measure. If the substance would all be gone in 24 hours, we do not stand much chance of finding out what happened. That is why I say we need a new kind of system to find out these things.

This observation is not intended to be in any way critical of what you or the department did. Do you have any suggestions on how we might go about facing up to that time problem with toxins today?

Dr. POLK. Again, as you point out, there are great difficulties in toxins, unlike the living infectious agents, germs and viruses that you might say leave their footprints behind if you get to the patient after the germ or the virus is no longer there, then it usually stays for sometime.

The body usually develops antibodies or chemical substances showing they have been infected. Toxins, as you point out, are quite different. Many of them are excreted and eliminated from the body fairly soon and others which are not excreted that fast are changed chemically within the body so even though they are still there, they are in a changed state and cannot be found.

Finding toxins is much more difficult than the type of infectious agents like the viruses or germs. Some of the things which we found out earlier should be helpful.

The earlier reporting of the doctors, the hospitals, even in a suspicious outbreak, keeping in mind possible toxicological causes, building in, as much as possible, toxicological expertise and competence and getting samples from the living and if any patients died, from the dead, which will be suitable for toxicological testing as well as for other types of testing.

All of these things should be helpful along the lines that you have indicated.

Senator SCHWEIKER. Thank you very much. I appreciate your patience and the committee's patience.

Mr. MURPHY. Dr. Polk, the subcommittee staff has made an effort to obtain from you certain reports and documents relative to findings obtained by your office pertaining to the Bellevue Stratford Hotel.

You told the staff that your superiors instructed you to deliver these documents only if you were served with a subpoena first. Is that a fair statement?

Dr. POLK. Could I correct the introductory part, sir? The document that I believe I was asked for yesterday by members of the staff was a document done by a consultant firm in the city under contract with the city water department, that I, like others, had a copy of.

I was asked could I give them that copy. I said that under the advice of my superiors for the legal protection of the City of Philadelphia, we would be most happy to give that document—we will give it and we will honor any subpoena but my superiors at the advice of their legal counsel wish the committee to get that from the city government by the legal subpoena technique which we will, of course, honor.

Mr. MURPHY. The committee would like that and we will prepare the necessary documents for your legal protection. What about the Franklin Institute report on the air-conditioning systems?

Dr. POLK. That is what I was referring to. If there is some other document, I was not aware there was another. I was specifically referring to the Franklin Institute Report on the air-conditioning system at the Bellevue to which I referred in my sentence before as the local consultant firm.

They are the Franklin Institute Laboratories, a local consulting firm who contracts with the city water department. I was given a copy of that report by the city water department.

Mr. MURPHY. I would like the document also from Drexel University studies as well as the Philadelphia Academy of Natural Sciences study. The staff will give you a written list and we certainly will appreciate your cooperation.

Dr. POLK. Yes, sir.

Mr. MURPHY. Are there any other questions?

Thank you very much. The witnesses are excused. Our next witness is Dr. Leonard Bachman, secretary, Pennsylvania Department of Health.

STATEMENT OF LEONARD BACHMAN, M.D., SECRETARY, PENNSYLVANIA DEPARTMENT OF HEALTH, ACCOMPANIED BY WILLIAM PARKIN, M.D., CHIEF EPIDEMIOLOGIST

Dr. BACHMAN. I would like Dr. Parkin to assist me.

Mr. MURPHY. If you will identify the gentleman for the reporter.

Dr. BACHMAN. Dr. William Parkin, chief epidemiologist for the department. I am Dr. Leonard Bachman, secretary of health for the Commonwealth of Pennsylvania and Governor Milton Shapp's health services director.

I welcome the opportunity to testify here today and to answer questions the Subcommittee on Consumer Protection and Finance may have. I also would like to take this opportunity to commend Representative John M. Murphy, chairman of this subcommittee, for scheduling these public hearings.

It will be only with the continuing open exchange of professional and scientific information, constructive criticism, and wide dissemination of the facts as we know them that we will ever come close to

solving the most tragic and baffling disease outbreak to hit the American public in 30 years.

The legionnaires' disease, that mysterious malady which killed 29 persons and sickened 151 others who attended a State American Legion convention in this city in July, remains unsolved.

Four months after this tragedy struck with its terrifying case fatality rate, we are no closer to identifying the causative agent than we were on August 2, when the most intensive scientific and medical investigation in recent years was launched.

Exactly what do we know—or don't know—about legionnaires' disease?

All evidence points to the fact that the legionnaires' disease derived from a common source and was not spread from person to person. We do not understand why the disease was so selective, so discriminatory in seeking out its victims.

Because of the data we have on single-day exposure and in light of the constancy of the incubation period, we know the disease had a start and cutoff and did not feed on a continuous source.

As to the way the disease was spread, no correlation was found with restaurants, food eaten in hotel hospitality rooms, or food eaten at the Bellevue Stratford Hotel.

Ice consumption was investigated but no correlation was found as to purchase of ice, the type of ice used, or ice in mixed alcohol drinks or soft drinks.

No correlation was found linking alcohol, delegate handout packets, beer mugs, use of beer mugs, or free cigarettes distributed at the convention.

No conclusive data was uncovered to link water consumption—on this point investigation continues.

There was no correlation with victim's proximity to pigeons.

There was no correlation with use of air-conditioners in the Bellevue Stratford Hotel rooms.

It was determined that attack rates for delegates who resided at the Bellevue Stratford were significantly greater than the attack rate for delegates residing at other hotels. Of those delegates who resided at other hotels, the ones who became ill spent significantly more time at the Bellevue Stratford. And when comparing ill delegates to well delegates, ill delegates spent significantly more time in the lobby of the Bellevue Stratford.

Was it a toxin, a virus, or a hypersensitivity phenomenon? The scientific community remains divided on this issue. We know from findings by the special pathologists convened at Atlanta that they found in the lungs a clear and definite characteristic phenomenon of diffuse damage of the lung's air cells seen in a majority of the cases. This is a nonspecific but consistent finding, which could be produced by infections or toxic agents. It was felt to be incompatible with an allergic or hypersensitivity phenomenon and primary bacterial pneumonia.

In liver tissues there were a constellation of findings that produced a characteristic picture in four-tenths of the cases. The experts know of no infectious or toxic agent that could produce this constellation of pathological characteristics. However, in the opinion of one liver expert, the spectrum of findings seen in the liver probably resulted from

a toxic agent, and furthermore did not represent damage from carbon tetrachloride or alcohol.

A formal report is expected shortly from the pathologists in addition to a report to be written by a special seven-man medical scientific team named by the Pennsylvania Department of Health, the Philadelphia Department of Health, and the Federal Center for Disease Control.

All in all, more than 15 broadbased epidemiological investigations have been conducted thus far, along with thousands of laboratory tests for viruses, toxins, and other known agents by all parties involved.

Thus far, the causative agent of the legionnaires' disease has eluded both the private and public medical and scientific communities. Unless we have missed something in our investigations and in our lab testings, we may very well be dealing with a new causative agent or a causative agent that has been with us for some time and was previously diagnosed incorrectly.

We have no way of knowing how many physicians over the years have listed viral pneumonia, or bacterial pneumonia on death certificates when in fact they were dealing with the same causative agent that exacted its toll here in Philadelphia this summer.

With each passing day, the chances that the cause of legionnaires' disease will be uncovered, dwindles. We need desperately a major breakthrough by the scientific community. I have seen with each day more and more experts becoming involved both privately and publicly in this continuing investigation and perhaps renewed interest will lead to the breakthrough we are seeking.

I share the dissatisfaction that Americans have over not being able to solve this mystery. As a people we are not acclimated to failure. But we should keep in mind that God in all his omnipotence has not as yet deemed it appropriate to share all the secrets of his universe with us. There are some things we, including the medical and scientific community, will never know, and that should be recognized.

In retrospect, what did the Pennsylvania Department of Health do to launch this investigation and what could we have done better?

It is apparent to us now that even as the American Legionnaires paraded and carried out their activities during the time of July 21 to July 24, they were coming down with the disease.

It was not until they were on their way home that the first victims became visibly ill. The first victim died in Bradford County on Tuesday, July 27. Others began checking into hospitals on Thursday and Friday, July 29 and 30. Most were being treated symptomatically for viral and bacterial pneumonia.

It was not until the weekend that the Legion's State Adjutant Edward T. Hoak started to receive telephone calls concerning a suspiciously significant number of deaths and flu-like illnesses. Adjutant Hoak notified me Monday morning, August 2, that he could confirm 13 deaths within a week after the close of the convention. At the same time, Mr. Hoak hastily called a news conference to get the word out to other Legionnaires around the State.

As Secretary of Health, I immediately launched a full-scale investigation, on Monday morning. By 1 o'clock the State health department had gathered all epidemiological information at that time and

had enlisted the aid of the Federal Center for Disease Control, Atlanta. The Center volunteered its resources and directed a 20-member epidemiological investigation team to Pennsylvania.

I immediately directed the Department of Health's field staff, and particularly public health nurses, to contact all hospitals throughout Pennsylvania to locate additional Legionnaire cases. Hospitals were alerted to call the State health laboratory in Philadelphia relative to the collection of appropriate specimens. Specific orders were given that tissues from the deceased were to be preserved without formalin and kept refrigerated. State police and National Guard helicopter services were contacted to speed up transportation of specimens to labs in Philadelphia and Atlanta.

By 1:30 p.m. Monday, I had conducted a statewide news conference outlining the situation at that time. This news conference was then followed by a twice daily briefing and a special communications center was created in the Governor's office to deal with the large numbers of new media personnel now streaming into the State. Later in the afternoon, a team had arrived from Atlanta and the investigation moved ahead with greater dispatch.

Faced with the resources at my disposal at the time, I feel the Pennsylvania Department of Health acted responsibly and averted what ~~could very well~~ have been a condition of State and nationwide panic.

The fact that we could tell a concerned public at a very early point in our investigation that the disease was not contagious, that no person-to-person spread was evident, went a long way to calm the situation.

Much remains to be done by the Commonwealth of Pennsylvania in continuing our investigation of the Legionnaires' disease. We principally bear the responsibility to address these priority areas:

To identify the causative agent or agents responsible for the epidemic and eradication of the agent, if possible.

To provide a full, detailed characterization of the epidemic.

To determine the existence of a continuing health problem.

To acquire sufficient resources to assure these objectives, and to continue an open flow of information and cooperation among the Center for Disease Control, Philadelphia Health Department, and other involved States and the public.

In order to accomplish this, I am presently recruiting a top-flight epidemiologist whose credentials are acceptable to both the State and the Center for Disease Control. This individual will serve as project officer for the continuing investigation of Legionnaires' disease.

The continuing investigation will include: one, a continuation of laboratory activities in an effort to identify the causative agent.

Two, development of new systems to gather epidemiologic information needed to answer questions posed by current and future computer analyses.

Development of on-going surveillance systems to determine whether this or similar public health problems exist on an on-going basis.

Four, development of a surveillance system to obtain a true picture of the incidence of pneumonia in Pennsylvania.

Five, involvement of experts in the fields of infectious disease, toxicology, and immunology for the purpose of developing a differential diagnosis of known agents capable of causing the outbreak. A brief

report will be requested from each expert. This would be of particular value in assigning degrees of significance to those relatively few agents about which little is generally known—for example, mutant viruses.

Six, the development of a final report within eight months, is possible.

It is my hope that with these increased, intensified efforts we can adequately probe the mystery surrounding the legionnaires' disease and ultimately come up with the answers.

I am also concerned about communications, about the network link that private physicians, scientists, hospitals, and other experts have with the Pennsylvania Health Department, particularly for the reporting of communicable diseases.

To assure that all medical and scientific entities throughout the State have direct access to our epidemiological unit, I am directing the installation of a communicable disease hotline in our Department headquarters in Harrisburg. This hotline will guarantee that every physician and hospital throughout the State will have direct 24-hour access to our epidemiologists for consultations, assistance, and for reporting disease outbreaks.

If I may sum up, the Pennsylvania Department of Health remains committed to finding the causative agent of legionnaires' disease. Hopefully, we will continue to have the assistance of the Federal Center for Disease Control, and other committed physicians and scientists throughout the country.

Should we fail in this quest, however, our efforts will not have been in vain. The lesson learned for the Legionnaires' disease is that we must continually look into and improve our communicable disease diagnostic and reporting systems; that we cannot take for granted that we know all there is to know about viruses and toxins, and that we must generate more interest and support for scientific studies into the causes of disease.

Thank you. At this time I will be happy to answer any questions you may have.

Mr. MURPHY. Thank you, Dr. Bachman. Exactly what State agencies have been involved in the search in Pennsylvania?

Dr. BACHMAN. Principally the Philadelphia Department of Health. We occasionally have gotten help from the Department of Environmental Resources and of course we have passed over to the State any kinds of suspicious letters, tips, or things like that that have gone to the Pennsylvania State police.

State police and National Guard helped us early on in transportation and communication. The Governor's office supplied a great deal of help in the handling of communication.

Mr. MURPHY. Can you tell us what Federal agencies entered into the issue and at what date?

Dr. BACHMAN. The Center for Disease Control was contacted almost immediately as soon as we could get telephone lines free practically. They were the lead agency in the Federal Government. From time to time, suspicious police reports which I had not any way of evaluating, that came into the State, were turned over to Federal police agencies.

Mr. MURPHY. Was the Environmental Protection Administration ever asked to come in or did they come in?

Dr. BACHMAN. They came in by the Center for Disease Control. It is my understanding or it was my understanding that the involvement of other Federal agencies would be through the Center for Disease Control which had access to the Federal establishment rather than for us to be dealing with each specific Federal agency many of which we have had no contacts or knew existed.

Mr. MURPHY. Did any of the military services come in?

Dr. BACHMAN. I believe through the Center for Disease Control, some of the agencies were contacted.

Mr. MURPHY. Who assumed the leadership role in directing the investigation into the cause of the respiratory disease, Philadelphia outbreaks?

Dr. BACHMAN. The epidemiological investigation as to the cause was definitely in the hands of the Center for Disease Control. At the very outset of the disease, we had three parts of strategy.

The first was the epidemiological investigation for which we had very little resources, only one epidemiologist and we would have to depend on the Center for Disease Control.

The second aspect was the laboratory which we have an excellent infectious disease laboratory but very little on toxicology.

The third was communications to the public about what was going on. The State health department assumed some of the responsibility for laboratory but shared all of its tissue specimens with Atlanta, because of the limitations of our laboratory.

The State health department provided the public daily information about the epidemic, particularly the needs to indicate whether it was spread.

Mr. MURPHY. Did the State agencies supersede the city agencies in the investigation?

Dr. BACHMAN. No. I do not understand supersede. It was hopeful that all of the agencies had jurisdictions and there were city agencies.

For example, they had responsibility for environment but the State health department does not have, the city government, under act 315, which is our public health act, runs a health department which has environmental responsibility so it was clear that in certain areas, that some agencies would take the lead and in some others would take the lead.

Mr. MURPHY. Who made the decision to bring in the CDC?

Dr. BACHMAN. I certainly made that very early, almost my first or second conversation with Dr. Parkin here who had already come to that conclusion so we requested them to come into Pennsylvania. I understand the Philadelphia health department also invited them at that time.

Mr. MURPHY. Who made the original decision that it was or might be swine flu?

Dr. BACHMAN. I do not know that such an original decision was made. As the epidemiologists used it, the possibilities, that was certainly one of the possibilities that had to be considered. That is how it was.

In the initial press conference, I was asked a question about swine flu. My answer was exactly that, that was one of the possibilities. It may have been overemphasized by the press but that was the answer.

I think the country was so concerned about swine flu and the symptoms, the diagnosis of most of the physicians who were handling the patients were virus, flu-like pneumonia.

Mr. MURPHY. CDC sent in 20 people and toxicologists. It was almost a predetermination on their part that this was swine flu, would you agree with that?

Dr. BACHMAN. They never told me that they thought it was swine flu categorically. I think that the epidemiology profession is very heavily oriented toward infectious disease because historically it has been an infectious disease that has caused acute outbreaks and killed lots of people.

One of the most important lessons in this particular epidemic is that the infectious diseases are not the threat that they once were. We have controlled most of them and the present threats to our health and life are subtle things, perhaps subtle toxins which are being produced ourselves in our highly industrialized society.

I think bureaucracies, and we are all part of them, operate just like the last war, the generals do not fight the war in which they are, they are all geared toward infectious diseases because that is what we have faced in the past.

I think epidemiologists do concentrate on infectious diseases and in infectious diseases, they have good technology. They can really run through a very well worked out series of tests that are well proven in infectious diseases.

Toxicology has not reached that stage of technology yet. All of those things I think focused them on infectious disease rather than toxins.

Mr. MURPHY. Were you aware of the attempts or renowned toxicologists to become involved in the incident at the very outset?

Dr. BACHMAN. I do not know about the very outset but I was aware that toxicologists wanted to become involved and I personally was very receptive to that idea to try to get as many people as possible involved.

I have not succeeded in getting them all involved and at that time, I was faced with a tremendous amount of responsibilities and at times, I may not have been as receptive to all of them as they desired. I felt that was a good idea.

Mr. MURPHY. What efforts were made to coordinate the activities of the local, State, and Federal agencies involved?

Dr. BACHMAN. I think the epidemiological investigation was clearly being done by the epidemiologists who came under the CDC. They had people in Philadelphia from the beginning and people in Harrisburg

Dr. BACHMAN. They had a team in Philadelphia.

Mr. MURPHY. Dr. Polk said they were not in Philadelphia, for a week or a week and a half.

Dr. BACHMAN. They had a team in Philadelphia.

Dr. PARKIN. The first night, they had three EIS officers come to the State, one to Philadelphia, one to Harrisburg, one to Pittsburgh. The next morning, two additional officers went to each location.

By Tuesday night, August 4, there were approximately 20 EIS officers in the State, about half in Philadelphia, the other half outside of Philadelphia. The EIS project director, the officer in charge, was stationed in Harrisburg and the second Tuesday of the investigation, that evening, the entire team moved to Philadelphia but approximately half of the team was in Philadelphia from the onset.

Mr. MURPHY. Are you satisfied with the way in which the medical evaluation was carried out?

Dr. BACHMAN. I am never satisfied when I do not have an answer; no.

Mr. MURPHY. Do you have any suggestions on how it could be improved in the future?

Dr. BACHMAN. I think one of the most important things that we can do in the future is to improve the communication from the health system to the public health authorities of the suspicious events.

That is not going to be only technical. That is certainly setting up a hotline and making those kinds of things available. It would be very easy and we could do that in a very short period of time.

We will also have to have a very strong educational campaign within the medical profession and within hospitals to make in effect every physician a public health officer, to have him think about public health as he is making his diagnosis and then making it convenient for him to feed this information into a good central location that could evaluate it and continue to monitor.

I think that is definitely needed and we will work on that. The other thing I think this epidemic has taught us is that we do not know enough about toxins and how to deal with them and the proper technology for them.

We have to be much more alerted to them than we have ever been before and perhaps give them more weight. One of the things Dr. Polk said that I would like to emphasize is that when you are faced—any physician, public health person, or anybody else—a crisis, you always have a limited amount of resources.

You cannot do everything that you would like to have done when you look back on it from the past. If you could do everything so you make judgment, you make decisions about how you are going to use your resources.

That is the essence, I guess, of any kind of management. I think in the future our judgments will be colored more by looking for toxins than they will be by looking for infectious diseases but we cannot let this pendulum swing too far.

Mr. MURPHY. I understand the weekend of the 1st of August was fairly critical in this issue. The State laboratories were closed over that weekend, is that right?

Dr. BACHMAN. I think the State laboratories close down early every weekend.

Dr. PARKIN. They are closed every weekend. Generally there is someone on call, though, someone who is reachable if there is an emergency.

Mr. MURPHY. Did any instructions go out from either the State department or the CDC on how to collect tissue samples or any instructions on autopsies, blood samplings, excreta samplings?

Dr. PARKIN. These went out from both the State laboratory and from the Center for Disease Control.

Mr. MURPHY. When?

Dr. BACHMAN. On the first day, Dr. Pidcoe is here. I think we sent out a directive with the first people who went out to collect samples. We have those directives.

Mr. MURPHY. Do you feel the Federal response was adequate and the proper manpower resource technology came in?

Dr. BACHMAN. I have no complaint about the resources. They obviously were very interested in solving it, and were unrelenting in the use of the resources. It is obvious in looking at this that we could do a lot better as far as toxicology.

Mr. MURPHY. Did your agencies of the State get involved in checking air pollution, plumbing, ventilation systems, industrial events that may have happened in the area at the time?

Dr. BACHMAN. No. We have no expertise along that line; and the Philadelphia Department of Health has that expertise along that line and responsibility under our public health act.

We did not get involved in that kind of investigation.

Mr. MURPHY. When the outbreak was first brought to the attention of the Federal disease control agencies was there any indication that the Occupational Safety and Health Administration should be involved because of toxicity possibility?

Dr. BACHMAN. No.

Mr. MURPHY. How about the Environmental Protection Agency?

Dr. BACHMAN. I believe they were brought in later on; in the early days, the CDC was handling that themselves.

Mr. MURPHY. Under the act just signed October 11 by the President, the EPA, of course, would be the central and control agency for toxic substances, antidotes, sources, and so forth. Why, after 120 days, do we not know more about the Legionnaires' disease, its cause?

Dr. BACHMAN. I personally think that when and if we do find the cause, we will find it to be something that we have never yet before described.

I am not saying we have never encountered it. It may be something that we have had. I think that those kinds of new causative agents do take a long time to ferret out. There is going to be a lot of original renares' epidemic." I wrote to CDC to learn more about the nature of animals.

Once you have a good hunch that you may have a causative agent, exposing that to laboratory animals and trying to reproduce the disease. That type of process is going to be a long drawnout process.

Mr. MURPHY. Mr. Rinaldo?

Mr. RINALDO. Thank you. The first person to recognize the pattern in the outbreak was Dr. Campbell, a physician in Bloomsburg, who observed three Legionnaires with the same symptoms.

He recognized the pattern in the illness on Friday, July 30, 1976. He called State health care authorities to arrange for tests which possibly could have been critical at that point.

He was told that the State laboratory was closed for the weekend. In response to the chairman's question, the answer was given that someone is reachable. Was anyone reached?

Dr. BACHMAN. In looking over that incident, he was given some response. There is some difference of opinion among my local staff as to exactly what response he was given but it was clear it was not an adequate response and I have no brief to a local person who does not respond as rapidly as they ought to a situation like that. I do not think that is good. I would like to have known about that Friday night. I certainly would have been available.

Mr. RINALDO. So as a practical matter, any possible medical investigation was delayed for at least 3 days until Monday?

Dr. BACHMAN. Two days.

Mr. RINALDO. At that time, would an immediate medical examination have provided some findings that would have led us to some determination as to the cause of the outbreak?

Dr. BACHMAN. That is possible. I think that is what I tried to address and in being concerned about this communications network that we had to have.

Mr. RINALDO. Since inadequate reporting was clearly a major problem, what other recommendations have you made for more rapid reporting and testing?

Dr. BACHMAN. Of course we would be helped a lot when we do find the actual cause. I believe developing a responsive 24-hour hotline is important. I think educating the medical profession to use it and developing that kind of interchange, alert all of us who practice medicine to be concerned about the new diseases that we now face, that are somewhat different than the older ones. I do not think I could point to dramatic sudden things that are suddenly going to improve our condition.

Mr. RINALDO. Do you think that because of the delay we may never find the cause or causes?

Dr. BACHMAN. I do not know whether it would be because of the delay, but it is possible that we may not find the cause. I do not think that you can say at this time, without knowing the cause of the delay, the cause, whether in fact, the delay did contribute to not finding the cause.

Mr. RINALDO. Would you say the delay was a factor in our present uncertainty about the cause of Legionnaires' disease?

Dr. BACHMAN. It is a possible factor, but you cannot say that with any definiteness.

Mr. RINALDO. In your statement, you said:

In liver tissues there were a constellation of findings that produced a characteristic picture in 4 out of 10 cases. There were no toxic agents that could produce this. We may be dealing with a new causative agent or causative agent that has been with us for sometime and was previously diagnosed incorrectly or not diagnosed.

I understand that there was a new virus found in a specimen from a Legionnaires' disease victim in New Jersey. In light of your statement, have you checked into that particular virus as a possible causative agent?

Dr. BACHMAN. I have been in contact with the New Jersey Department of Health. They are following through that lead. I do not know that particular lead has any great validity than a number of other leads being followed by scientists at CDC, at Philadelphia and other places.

It certainly is a lead that ought to be followed up and it is I believe being followed up quite competently.

Mr. RINALDO. What is your reaction then to the discovery that this new virus—while harmless to most test animals—causes viral pneumonia in suckling mice?

Dr. BACHMAN. It was not my information that it was viral pneumonia that killed them. I knew that it killed mice but it was not my

information that it was a pneumonia process. I would be quite interested in that and certainly think it should continue to be followed through.

Mr. RINALDO. This is how it was characterized by Dr. Kenneth Altman from New Jersey. Apparently, one factor in the *New Jersey* case was the existence of more valid reporting.

To get back to the delay over that weekend, could we be dealing with a previously unknown virus which does not live long enough to be communicable? Could such a short-lived, noncommunicable virus fail to show up in diagnostic tests—particularly if such tests were delayed?

Dr. BACHMAN. We have Dr. Satz who is a virologist for the State. If it is an unknown virus, that is a possibility but let us say that all viruses and infectious agents that are known to leave what can be called footprints that can be traced later, usually it is by sampling the antibodies in the blood.

It is possible that if we isolate this virus, we will be able to find the antibody footsteps in the blood of people who had this disease. It is possible it could be a new, previously undiscovered virus.

Mr. RINALDO. In addition to those that have already been discussed here, what measures would improve the coordination between the health agencies?

Dr. BACHMAN. I believe that first of all we have to look at a coordination of the problem to be discussed and worked out. In my 2 years as Secretary of Health, I do not believe that the Center for Disease Control or Health Department in Harrisburg or the Philadelphia Health Department has really good discussion on what our roles are ahead of time.

To look at the State, Federal role in health, I think those things need to be discussed and not wait until there is a crisis and try to look at what the law says who is responsible and so forth.

I think that the Federal-State role in health is a very difficult one. We have under the Constitution, the States have the primary responsibility to promote and protect the public health.

Yet we have very limited resources compared to the Federal Government. There is almost built into our Constitution, an adversary kind of situation that I think requires a lot of study and work to define it.

I think that would be in order.

Mr. RINALDO. You have been very patient, Mr. Chairman, and I have one more question. In response to a question from you, the doctor stated that they could do a lot better as far as toxicology is concerned. Have you taken any steps in that direction? Or do you feel that your department had or now has an adequate toxicology capability?

Dr. BACHMAN. We have no toxicology capability so it obviously was not adequate at the time of the outbreak. We are under a planning program now to define what toxicology capability the State ought to have, whether we should develop a centralized, highly effective, State laboratory that would observe all of the communities of the State or whether we should regionalize.

I believe we ought to have better State toxicology resources than we have. I have made that known to the legislature and asked for resources and institute a planning effort to try to develop that.

Mr. RINALDO. In that regard, have you taken any steps to insure that future disease outbreaks can be dealt with if they are initially reported over a weekend?

Dr. BACHMAN. That we have emphasized over and over again to our people, to be alert, be available. We put telephone lines in and I am hoping that this direct hotline to our epidemiologist will bypass some of our levels, will be the most effective for that.

Mr. RINALDO. Thank you.

Mr. MURPHY. Mr. Nix?

Mr. NIX. This tragic experience is not unprecedented in American medical history, is it?

Dr. BACHMAN. No; there have been other outbreaks that are somewhat similar to this that remain unknown.

Mr. NIX. Would you tell us just something about the last 25 years?

Dr. BACHMAN. There was one in St. Elizabeths Hospital in Washington, D.C., called the St. E's outbreak, one in Pontiac, Mich. Some of the details of the St. Elizabeths one—what were the numbers on the St. Elizabeths?

Dr. PARKIN. I honestly do not recall.

Dr. BACHMAN. St. Elizabeth numbers were somewhat comparable to the ones that we had here. It was also a pneumonia process that differed somewhat from the one we had here in that there was some neurologic signs which our patients did not have but indeed the St. Elizabeths epidemic was certainly close to this.

Mr. NIX. I asked the question because on each of those occasions in the past, the medical profession pursued certain courses of conduct designed to find answers. How many answers did they find?

Dr. BACHMAN. They did not have any answers in either one of those.

Mr. NIX. They do not?

Dr. BACHMAN. No.

Mr. NIX. They were following the same course of action and pursuit.

Dr. BACHMAN. I think in this case, they are doing much broader studies than were done in St. E's. I do not think they did the toxicology that has been done in this study in the St. E's investigation.

Mr. NIX. I notice in your statement you say a formal report is expected shortly. Scientific team named by the Pennsylvania department of health, that is to combat that?

Dr. BACHMAN. Yes; it is.

Mr. NIX. In addition to that 15 man broad based investigation, that is to come?

Dr. BACHMAN. Yes. That would be the continuing effort of the Pennsylvania health department.

Mr. NIX. What efforts are you making in addition to those that you have enumerated?

Dr. BACHMAN. I believe those are the efforts being done by the Pennsylvania department of health. There are lots of other efforts going on by other agencies. We will not be able to consummate those efforts without the resources.

Mr. NIX. One last question. When do you suppose that all of these teams who are making investigatory efforts will be able to sit down and compare their findings and hopefully can do some definitive conclusions?

Dr. BACHMAN. That is going on now. For example, the American Public Health Association meeting in Miami, the CDC presented papers to all of the public health authorities in the country, presented detailed scientific papers.

In addition to that, the American Lung Association last week in Philadelphia sponsored a scientific meeting at which they had experts from all over the country come in and present papers on this disease and have discussions like that.

I believe there will have to be more of them but those kinds of discussions are definitely one of the keys to the solution. They will have to continue.

Mr. NIX. Thank you.

Mr. MURPHY. Senator Schweiker?

Senator SCHWEIKER. First I want to congratulate you on your very positive recommendation on behalf of your State health department. It seems to me you have come to the heart of the matter. In a completely unrelated statement, I called for setting up an epidemic hotline, and you, simultaneously and without consultation, have structured one for the State, on a 24-hour basis.

I want to commend you for it. I think that is the kind of thing that we need to do to get our new technology and medical surveillance systems working.

Also I want to say that you certainly should also be commended for contacting CDC as fast as you did. I think the facts show that you did in fact contact them as soon as you had any indication at all of what was happening. There was certainly no breakdown here.

Based on your expertise, do you have any suggestions about the problem of sample collection, which you have heard about here and know about from your own experience?

We have an old way of doing business in the medical community, with virus and bacteria testing, which is perfectly proper and legal.

We sample small select tissues, just for the purpose of growing cultures, for which we need only a small amount of tissue. Then you come to the toxicologists, who need much more voluminous quantities because they have different techniques for their tests.

Obviously that is the heart of one of the problems here. I just wondered what suggestions you have in mind on this sampling procedure so that we would get sufficient samples in the future and also provide for concurrent toxicological testing given the 24-hour pass-through of toxins in human tissues. What do you suggest?

Dr. BACHMAN. First of all, as far as gathering samples in the public health field, it seems that we ought to change our guidelines. We ought to get the top toxicologists in the country to see if we could develop some standards and guidelines for the collection of tissues.

When we sent out that first directive, the first sample tissues, we were concerned about the tissues from the very first day. We sent out that directive. We felt that just refrigerated tissue, we certainly asked people to stay away from and preservatives would be enough.

It is clear that the toxicologist technology is not as highly developed. I think the only way to get at what the standard should be is to convene a group of experts and work very hard in developing the standards and then publish them widely and put them into a fact fashion.

Senator SCHWEIKER. I want to get this clear. Is there not really a lot of this toxicology information available, but not available within the medical profession? The medical profession is not used to dealing with toxicology knowledge that is available?

Dr. BACHMAN. I think it is probably more narrow than it ought to be. Certainly even today at scientific meetings, you get toxicologists together, if you get four of them, you get four different opinions about exactly how you should collect tissues.

They are by no means unanimous on tissues or standards of what they find. That is another problem in the bacteriology virology field. You know what you find and also the process itself continues to recreate and they keep your tissue whereas in toxicology you lose the tissue, therefore it is important in toxicology to have a very good hypothesis about the disease before you even use the tissue. You may be using up the tissue in the hypothesis that is not a good one.

Senator SCHWEIKER. I would certainly encourage you to see if you cannot bring to bear some toxicology expertise in your department. I realize it is innovative, different, and probably costly. I hope that in view of the importance, you can crank it in somehow with your new procedures.

Dr. BACHMAN. We will try.

Senator SCHWEIKER. I have a letter from a Dr. Richard Brunker, a heavy metal toxicologist who suggests that testing of the incinerator at Bellevue needs to be done.

I wonder if you have any knowledge as to whether or not any atmospheric tests were made on the incinerator at the Bellevue, to see whether this might be part of the cause.

Dr. Brunker's letter goes on to point out something of which I was not aware—that the incinerator had not been used for a number of years, but that when we had the trash collectors' strike, the incinerator was put into operation again and was operating sometime before and during the Legion convention.

He also goes on to say that this would explain a couple of things in his theory. I want to make it plain that it is just a theory but I think every avenue is worthy of some pursuit. His theory is that some of the employees in the lobby of the Bellevue might have been getting some levels of this hazardous material previously and would therefore have some immunity to it.

This would explain the discrepancy between new Legionnaires walking in, being exposed to a heavy metal toxin and becoming ill, while employees who worked there every day did not become ill.

It would also explain the 3-day delay for the symptoms to come home to roost, which is in essence what heavy metal toxicology is all about. His suggestion is that we should run an atmospheric test of the incinerator to see if incinerator emissions could have been a source of contamination.

I wondered if you know of any such atmospheric testing of the incinerator?

Dr. BACHMAN. There has been some analysis of the incinerator. I have no detail report of it. They were particularly looking for whether the incinerator had burned any copy paper that might have had nickel in it.

I believe they were looking specifically for that. I do not believe there was any kind of broad-based study of the incinerator. Maybe Dr. Parkin would know?

Dr. PARKIN. I am not aware of any such study. The environmental survey that was done along with the Philadelphia Department survey was done by Mr. George Mallson from the center for disease control who was an environmental specialist of the incinerator, air-conditioning systems.

These types of things were things into which he looked particularly and the lack of information at this time would tend to indicate to me that the findings were nonsignificant or he did not find anything worth reporting or following up in greater detail.

Senator SCHWEIKER. Who would be the one to conduct such an atmospheric test now? Would it be the CDC?

Dr. BACHMAN. I think probably cooperation between CDC and the city. We will certainly cooperate.

Senator SCHWEIKER. It is just a theory.

Dr. BACHMAN. If the employees for example had developed a tolerance which is well known in toxicology, it would be possible to do analysis of the employees.

Senator SCHWEIKER. Dr. Brunker also suggests that. I think that is a good idea. He suggests that analysis of some of the lobby employees might tell us if they have any immunity, and that would be a pretty good cue.

Supposing I could get CDC's consent, would you be willing to cooperate?

Dr. BACHMAN. Absolutely. In fact, we will take it from here and see if we cannot look into it.

Senator SCHWEIKER. Thank you.

Mr. MURPHY. Thank you. The next witness is Dr. Cyril H. Wecht, coroner of the county of Allegheny. Dr. Wecht?

STATEMENT OF CYRIL H. WECHT, M.D., ALLEGHENY COUNTY CORONER

Dr. WECHT. Thank you. In consideration of the remarks that have been made preceding me and recognizing that this is a formal hearing conducted by a congressional committee, I think it would be better if I were to read my report.

My involvement with this particular epidemic began on Monday, August 2, 1976, when our office learned from the news media that many individuals who had attended an American Legionnaires' Convention in Philadelphia, Pennsylvania, from July 21 through 24, 1976, had become seriously ill several days thereafter and a few had died.

We then received information that one such gentleman, Mr. Frank Harvey, a 54-year-old male, had died on July 30 at McKeesport Hospital in our county. We immediately assumed jurisdiction in that case, even though an autopsy had already been performed at that institution. A second autopsy was undertaken in our office, and various biological materials were collected for toxicology studies.

On August 4, a second victim died in Allegheny County, Mr. James Sykes, a 76-year-old male, and an autopsy was performed at our office. The following day, August 5, Elva E. Hamilton, a 73-year-old female,

died in Allegheny County, and our office also performed an autopsy in that case. Fortunately, no further deaths attributable to the American legionnaire disease were reported in Allegheny County.

On Monday, August 2, within a matter of a few hours after having learned about a possible widespread epidemic, our office sent an "Urgent Memorandum"—copy enclosed for your perusal—to all hospitals in Allegheny County, apprising them of the fact that any deaths of individuals who had attended the American Legion Convention in Philadelphia in July should be reported to our office immediately and we would assume jurisdiction.

We also advised the hospitals to contact the Allegheny County Health Department in nondeath cases involving Legionnaires.

On Monday, August 2, and again on Tuesday, August 3, we attempted to contact the Pennsylvania State Health Department to obtain information from them concerning the American legionnaires' disease. We were particularly interested in garnering as much data as possible concerning the epidemiological pattern: The number of sick people and individuals who had succumbed to the illness, any test data, advice or suggestions as to procedures for collection and submission of materials, et cetera.

We could not get through to Dr. Bachman or any of his aides, and on Tuesday, August 3, we submitted a telegram to Dr. Bachman requesting clinical and postmortem findings in American Legionnaire deaths. We never received any response whatsoever to that telegram.

Additional phone calls were made to Dr. Bachman's office on Wednesday, August 4, and then on Thursday, August 5, without success. We never received any response to those phone calls and messages, although we left the number of our office and informed them that we were calling because of the official involvement of our office.

On Friday afternoon, August 6, I received a call from Dr. Bachman who was extremely irate because he had read an article in a Philadelphia paper which quoted me as being critical of his handling of the American legionnaires' epidemic. During the course of that telephone call, when I asked Dr. Bachman why he had never contacted our office or other coroners' offices to obtain data and give us information that might be of assistance in handling related death cases, he responded that "I was much too busy to be polite."

Following that phone conversation, in which I reiterated my request for information, I did receive a call from one of the CDC physicians. Subsequently, I had numerous lengthy telephone conversations with various CDC physicians in Pennsylvania and with members of their staff in Atlanta, Ga.

Our office collected various body tissues and fluids in the three death cases that we investigated and voluntarily submitted them to the Center for Disease Control in Atlanta.

On Monday, August 16, I had two key members of my staff. Dr. Joshua A. Perper, chief forensic pathologist, and Dr. Charles L. Winek, chief forensic toxicologist, fly to Atlanta where they met for much of the day with various pathologists and toxicologists at the CDC.

It should be noted that the expenses for the trip were taken care of by our office, and no offer of financial assistance or subsequent remuner-

ation was ever made either by the State health department or the Federal authorities.

During the course of that consultation, which had been requested by the CDC, Dr. Perper and Dr. Winek reviewed our findings in great detail and also studied materials available at the CDC in other American Legionnaire death cases.

At that time, August 16, there were a total of nine cases with autopsy materials available for study at the CDC, and that number included three from our office.

On August 27, 1976, I received a phone call from Dr. Renate Kimbrough, a pathologist on the CDC staff, with whom I had talked on several occasions previously, inviting me to participate in a special pathologist panel that was being established jointly by the CDC and the Pennsylvania State Health Department. That panel was to convene at Atlanta on Wednesday and Thursday, September 8-9, to review autopsy materials in the various death cases.

I went to Atlanta on those 2 days and reviewed autopsy materials in 10 cases which had been attributed to the American Legionnaires' disease and 3 others which had occurred around that same time period which had not been considered as American Legionnaire deaths.

Extensive discussion was conducted by members of the special pathology panel along with many professional members of the CDC staff. It was agreed by everyone present that it would be necessary to have autopsy materials from other death cases as well as the opportunity to study additional materials from the 10 cases already at hand. At that time, it was also agreed by almost everyone present that we were dealing with a toxic chemical substance of some kind rather than an infectious organism.

On October 15, I did receive microscopic autopsy tissue slides from the same 13 cases that had been reviewed on September 8-9, in Atlanta. No materials from other cases were submitted then, and to this date, I have not received slides or any other autopsy materials from the other 19 death cases. We were told that 5 deaths did not have autopsies, but 24 did. Therefore, there were 14 other American Legionnaire deaths, supposedly with autopsy materials, that were to be collected, prepared, and distributed to members of the pathology panel.

In early November, I noted a story in my local newspaper which stated that a meeting was to be conducted in Philadelphia on Monday, November 15, of "various medical and scientific experts, for the purpose of reviewing and evaluating all the data in the American Legionnaires' epidemic." I wrote to CDC to learn more about the nature of this panel and was informed that they had no idea who would be attending that meeting nor the scientific value of the information that would be disclosed at that time. Apparently, that meeting was convened under the auspices of Dr. Bachman or in cooperation with his organization with no input by the CDC. I received no announcement or invitation.

It should be noted that an additional medical panel had also been convened by the CDC in Atlanta, Ga., subsequent to the meeting of the pathology panel on September 8-9. This was a group of clinicians, epidemiologists, and other physicians convened for the purpose of reviewing the medical data. I have not received any information concerning the deliberations, conclusions, or suggestions of that panel.

To this date, I have not received one single communication from the Pennsylvania State Department of Health concerning the American Legionnaires' disease. Allegheny County is the second largest jurisdiction of the 67 counties in Pennsylvania, with a population of approximately 1,600,000 people.

It is my contention that all coroners' offices in the Commonwealth of Pennsylvania, including the medical examiner's office in Philadelphia, should have been notified by Dr. Bachman immediately after it became known to him that an epidemic existed involving individuals who had attended the American Legionnaire Convention in Philadelphia in the latter part of July.

As a hospital pathologist, private physician with a pathology laboratory, member of the Allegheny County and Pennsylvania Medical Societies, and member of the Allegheny County Board of Health, as well as in my capacity as coroner of Allegheny County, I wish to categorically state today to this committee that I have never received one written memorandum, information sheet, or any other document from the Pennsylvania State Department of Health concerning the American legionnaires' disease. My files are open to members of your staff for their examination. I am not only referring to any personal communication, but also to any kind of Xeroxed, mimeographed or otherwise reproduced sheet, note, or letter.

In my opinion, the Pennsylvania State Department of Health did not undertake appropriate investigative measures following notification to their Department, which tragically was delayed 2 days because of the State Department of Health being closed down for the weekend, and private physicians who suspected some kind of epidemic were unable to establish contact with the State medical officials.

All attention was focused on swine flu or some other kind of influenza, and no consideration whatsoever was given to the possibility of a toxic chemical substance. Fortunately, such a possibility was considered by the Philadelphia Medical Examiner's Office and our office, both of which saved ample portions of body tissues and fluids in our respective death cases so that these could be subsequently studied. I do not know if any similar specimens were preserved in the other 22 death cases in Pennsylvania. I say that inasmuch as it is now the end of November and as a member of that pathology panel, I have not received materials in other cases.

I am extremely doubtful that such materials exist for dissemination to the 12 members of the pathology panel. I do not know that, as a matter of fact, but perhaps that answer can be given to this committee by the CDC people tomorrow.

I believe that coroners and pathologists throughout the State should have been notified immediately by the State department of health concerning appropriate post mortem investigative procedures. A team of experts should have been made available for consultation or indeed actual performance of autopsies if requested. Certainly, our office would have been quite willing to perform autopsies or render consultative assistance to communities in the western part of Pennsylvania, and I am confident that the Philadelphia Medical Examiner's Office would have been happy to extend the same services in the eastern part of the State.

Furthermore, pathologists and other experts from CDC were available in Pennsylvania throughout those weeks of August and could have traveled to any community upon request. If that had been done, then a 100 percent autopsy rate could have been obtained and ample specimens of body tissues and fluids in all death cases could have been collected.

It is my contention also that all hospitals and private physicians throughout Pennsylvania should have been notified by Dr. Bachman's office about the epidemic immediately after it became known to him on Monday, August 2. Memos should have been mailed to them apprising them of the nature of the epidemic and advising them what steps and procedures should be undertaken. Advice should have been given as to which body fluids and materials, for example, blood, urine, et cetera, were to be collected and preserved in the fresh, frozen state for future toxicological analyses.

This was not done and therefore, in the 151 cases of individuals who became ill as a result of the American legionnaires' disease and who fortunately survived, there are few, if any, specimens available for testing which were collected immediately following admission to the hospital of these individuals.

It is important to note that once an individual has been treated with various medications and other supportive factors, and after the body has metabolized chemical substances through the normal excretory processes of the lungs, liver, kidneys, and gastrointestinal tract, most toxic or chemical substances will be dissipated and will not be revealed upon subsequent testing.

Amazingly, I have learned much more about developments in the American Legionnaires' disease investigation from the news media and medical journals quite by accident, than I have in any official or formal fashion from the State department of health. For example, I read one small item recently which indicated that the individuals who were afflicted apparently had spent more time in the lobby of the Bellevue Stratford Hotel and may have consumed more water than their colleagues.

This is the kind of epidemiological and investigative data that I and others directly involved in the study of the Philadelphia epidemic have been attempting to obtain for the past 3½ to 4 months to no avail. Evidently, Dr. Bachman and his staff have the time to give out information of this nature to news media, but not to compile this information in proper scientific fashion and send it to members of the special pathology panel which they organized and to other scientists involved in this investigation.

This is not the appropriate time or place perhaps to embark on a lengthy discussion of the various theories concerning the etiology of the so-called American Legionnaires' disease. Suffice it to say that many theories have been advanced; some have been completely discounted, others are still receiving consideration.

The point I should like to emphasize today, however, is that proper scientific and medical research procedures mandate the compilation of all investigative data with frequent updating and revisions, and distribution of such information to all appropriate individuals and agencies involved in the epidemiological study. Unless and until this is

done, it simply is not possible for this unknown disease to be studied properly, thoroughly, and effectively.

Although I am not very optimistic at this time that we shall ever learn the actual cause of the Philadelphia epidemic, which caused at least 29 deaths and approximately 151 serious illnesses, I do believe that there is some slight chance that we can yet be successful. This potential for successful solution, however, rests solely upon the thoroughness, and extensiveness of our efforts to accumulate all available data, and to have all materials, information, investigative results, and other relevant items compiled, categorized, and distributed to the pathologists and other medical researchers who have been brought in for review and evaluation.

We know from routine regular clinical-pathological conferences conducted in hospitals and medical schools, and from regular medical-legal investigative techniques utilized in coroner and medical examiner offices throughout the United States, that the best opportunity for solving any medical or scientific puzzle rests to a great extent on the accumulation of as much information as is humanly possible to obtain.

After all information has been pooled, it is necessary to organize, separate and categorize it in a logical fashion, and then have all the materials and data reviewed and evaluated by appropriate experts. These are the techniques that we use in our office, and these are the methods which I learned in medical school, in my pathology residency and as a forensic pathologist. I am at a loss completely to understand how the Pennsylvania State Department of Health or the CDC ever hopes to solve this great mystery without undertaking these basic clinical, pathological and investigative techniques.

There is one very important and extremely beneficial result that hopefully will emanate from the American Legionnaires' disease investigation. This should be the establishment of some kind of a public health hotline that will have prearranged guidelines and procedures for the handling of future epidemics not only in our jurisdiction but anywhere in the United States.

There is no reason why appropriate Federal agencies and all State departments of health cannot have precise, detailed mechanisms adopted in advance and primed for implementation, whenever it is believed that an epidemic is developing, whether the etiological agent is considered to be an infectious organism or a toxic chemical substance. Obviously, State health departments and Federal agencies dealing with matters of this nature must have key medical and scientific experts available on call 7 days a week, 24 hours a day.

I might point out that this is nothing new for large metropolitan coroner and medical examiner offices, which always have forensic pathologists and toxicologists available if they are urgently needed by law enforcement agencies and others in the investigation of any puzzling death of an unnatural nature.

As a lifelong resident of Pennsylvania, practicing physician and pathologist, member of the Allegheny County Board of Health, and coroner of the second largest county in this Commonwealth, I am deeply embarrassed and keenly disappointed by the ineffective and inadequate scientific job that has been performed in this epidemic.

There is no justifiable reason why a large State like Pennsylvania, with seven medical schools and extensive scientific technological exper-

tise and facilities, coupled with the professional assistance made available through various Federal Governmental agencies, should not be better prepared to cope with an epidemic such as the American Legionnaires' disease.

We can only hope that no unnecessary illnesses or deaths occurred as a result of the procrastination, disorganization and lack of communication manifested by the Pennsylvania State Department of Health during the course of its investigation of the Philadelphia epidemic.

There are many more remarks that I could make but I do not want to impose further upon the time of this important congressional hearing. I would say in closing, a few nights ago, I saw for perhaps the third or fourth time, one of my favorite movies, "Cool Hand Luke" with Paul Newman.

As I sat in the back of the room this morning, I thought of the classical remark made by the sadistic sheriff after he has almost beaten Paul Newman to death: "What we have here is a failure to communicate."

Mr. MURPHY. Thank you, for a very outstanding statement. If on pages 8 and 9 the recommendations and conditions you bring out had been done, would we have the answers as to whether this was a toxin, a virus or a bacteria today?

Dr. WECHT. I cannot give you an unequivocal response and it would be unfair of me to do so.

I can only say, as I attempted to get across in this statement, that if all of these things had been done, we would have been in a much better position. To the extent that our investigation was delayed, to the degree that appropriate body tissues and fluids are not now available for studies, that is the degree, in direct proportion, of our inability to come forth with answers today, tomorrow, next week or next month.

Mr. MURPHY. With your expertise and experience as a pathologist, how long from the time of infection, of the time of death does a tissue or a blood sample or an excreta retain even viruses, bacteria, or toxic substances in order to make laboratory evaluations as to what affected the person?

Dr. WECHT. If body tissues and fluids are collected in proper fashion, and preserved correctly, then toxicological examinations can be done weeks, months, and even years later. Virology and microbiology studies would require faster action.

However, if tissues are kept properly for virology, then those tests can be performed at a time subsequent. I am speaking of days and even longer. Bacteriology would be the area that would require the fastest action, and also the investigation of fungi, parasites, and rickettsia.

Mr. MURPHY. The other question of the way that tissue samples were taken and we had much criticism of the—I think it will come out later from other witnesses, the manner in which samples are taken, what instruments are used, how they are stored is also significant in determining whether a toxin was present or not?

Dr. WECHT. Yes, sir, it is, as has already been discussed by this committee and presented here again this morning. Certain tests such as those for nickel carbonyl will be markedly compromised, or completely

negated in terms of the accuracy of results by failure to utilize proper cutting equipment and to save tissues in appropriate receptacles.

Mr. MURPHY: Throughout the period, say from at least two—the month of August, you indicate there was no bulletin or newsletter or memoranda that went out to all coroners advising them to be on the lookout for these problems; and then advising them how to do autopsies, how to collect tissue and samples?

Dr. WECHT: Yes; that is quite right, Mr. Chairman. I contacted a few coroners, I could not contact all, and they had not heard anything. I am a coroner and also a member of the Pennsylvania's Coroner's Association. Therefore, if in some fashion a communication had gone astray that had been mailed directly to me, I certainly would have received some communication from the Pennsylvania State Coroners Association assuming that organization had been contacted.

I would also point out that I am director of a pathology laboratory at a hospital in Allegheny County, and I received no communication in that capacity.

I do not know where all of these directives were sent. I can only tell you that I never received any. Our office fortunately knows how to collect materials, not because we are better than anybody else, but simply because we have a large office.

The same thing is true about the Philadelphia medical examiner's office. With all due respect to my colleagues, fellow coroners in other counties, they do not have these facilities or the necessary experts available.

We have five forensic pathologists and half a dozen forensic toxicologists, including three with Ph. D. degrees and three with masters' degrees. We were not just writing letters to horn in on the act; we had three deaths in Allegheny County.

We have expertise in our office and wanted to help, and we wanted to be helped. We did not accomplish anything until there was an attack on me by telephone and through the news media by Dr. Bachman, who was offended by my audacity in questioning his handling of the investigation.

Thank heavens, the reporter wrote the item, because otherwise I might never have had the opportunity to communicate with CDC. That happened after I was verbally abused by Dr. Bachman in a phone call. He wanted to know why I had the right to go to Connecticut on Friday to see my family where they were vacationing and my mother was in a hospital. That was his response to me, what was I doing in Connecticut; if I was such a hot shot, why didn't I stay in Pittsburgh?

Mr. MURPHY: Who should have the responsibility in this case, should the CDC, the Federal people or should the State, and obviously it is a question of those two agencies?

Dr. WECHT: Yes; and more than those two agencies. I believe that the State department of health should maintain primary control, somebody must. Somebody must be the coordinator. There should of course be total cooperation with appropriate Federal agencies.

The calling in of the center for disease control was a good idea and Dr. Bachman is to be commended, as Senator Schweiker has pointed out, for having done this so promptly on August 2. I would ask, however, and I do not know the answer to this—it would rest with

Dr. Bachman and the CDC people—why other Federal agencies were not also called in?

The Environmental Protection Agency and NIOSH, which did play some minor role later on, should have played a far larger role. It should be remembered that the center for disease control up until a short time ago had the initials "C.D.C." which stand for communicable disease center.

Its professional interest rests in the diagnosis of infectious organisms. It is not, as I understand it, and know it to be, the primary Federal agency in terms of toxicological examinations.

They have excellent people. I have had good relations with them; but I must state, and I think they would admit themselves, that they are not the No.1 Federal agency in this country in the investigation of toxic chemicals, whether they be industrial, in a home, or deliberately caused by somebody else. That is not their primary area of expertise.

Mr. MURPHY. Mr. Rinaldo?

Mr. RINALDO. You mentioned in your testimony the 2-day delay that I have been discussing at great length. Would I be correct if I inferred from your statement that the failure to move rapidly at that point—the failure to save the tissues from victims of the disease—could possibly be one of the reasons why we may never find out what caused the legionnaires' disease?

Dr. WECHT. Yes, it is a fair statement, a definite possibility, one which we cannot answer as I have indicated today. We might be able to answer this later if we ever find out what the causative agent is.

However, it can be said, I think with fairness and accuracy, that a delay of approximately 48 hours at such an early time in the development of the epidemic is a very critical period. It is a serious defect to have a 2-day hiatus in the investigation of such an epidemic. A 2-day delay at the beginning of an epidemic study and could be extremely critical.

Mr. RINALDO. To reemphasize the point, you disagree with Dr. Bachman as the significance of the 2-day delay. Would it be fair to say that you place a greater emphasis on the 2-day delay?

Dr. WECHT. Yes. It is a matter of degree. He did say that it might have been, but with a stronger degree of emphasis, I would say the same thing.

Again, I cannot say that the 2-day delay led to our failure to make the diagnosis. Hopefully, this committee's activities and final recommendations will prevent delays like this in the future in other epidemiological investigations elsewhere in the country.

Mr. RINALDO. I believe that in an earlier statement, you criticized the Pennsylvania State health authorities for being so preoccupied with swine flu that they overlooked other possibilities.

Dr. WECHT. Yes, sir, that is a correct statement. I also referred to it today in my statement.

Mr. RINALDO. What should have been done differently at that point in time? Your statement is excellent but I would like to bring this particular point out again.

Dr. WECHT. It has been suggested, if I heard correctly this morning, that one might not be able to undertake an investigation or give con-

sideration in terms of collection and preservation of specimens for infectious organisms, and at the same time undertake appropriate study with adequate preservation and collection of tissues for toxicological examinations.

That is simply not true. It is true that you cannot drain 3 or 4 quarts of blood from a live human being for testing, but you do not need 3 or 4 quarts of blood. One can take materials for tests in chemistry, microbiology, et cetera, such as urine and blood, as well as for toxicological analyses in both clinical cases and at autopsy. In death cases, there is no problem because you have as much of the body tissues as are needed: kidneys, brain, liver, blood, urine, bile, whatever is needed. It is not an either/or proposition between studies for infectious organisms on the one hand and toxicological analyses on the other.

I do not understand the presentation to this committee by a previous witness that our thinking today is different from former epidemic investigations, and we therefore have to revamp and revise our techniques. We have known about these problems in medical-legal investigative offices for decades.

It is not true that there are great differences of opinion among toxicologists as to what should be saved. Sometimes they argue about how much they would like to have but they do not argue about what they will need.

They tell you we want a kidney, a large section of liver, a large portion of brain, as much blood as you can get, and all of the urine and bile that are present. There is no disagreement among toxicologists and pathologists about what must be saved.

Before you collect those tissues, as you begin to open the body, you take appropriate swabs and smears and collect tissues for bacteriology and virology. One kind of study does not intrude upon the other and in no way negates the performance of the other.

Mr. RINALDO. In other words, you feel that guidelines not only should be established at this point for the handling of tissue samples in future outbreaks of disease, but that guidelines should have been established a long time ago. Would you say that there was some negligence in not having guidelines established at an earlier date because you have known all along that this should have been done?

Dr. WECHT. Yes, sir, it is correct. I believe that guidelines should have been established. There was no reason why they should not have been. It is appropriate to correlate with this answer a previous question and response having to do with the swine flu.

One of the very dangerous things in any kind of a medical or medical-legal investigation is to arrive at a predetermined opinion.

The way to approach an epidemiological study is to assume that you do not know the answer, that it could be anything in the world. Then you break down anything in the world into two major categories, infectious organisms and toxicology. You proceed to collect samples, tissues, and materials for both, and you notify the professional individuals who will be involved about what to observe, report, and preserve.

While the epidemic apparently developed in Philadelphia, the State health department already knew by virtue of the cases reported to it by August 2 that it was being spread by the American Legionnaires who went back to their homes.

It was no longer a Philadelphia or Harrisburg situation; it was a Pennsylvania situation. Listening to you today, I am inclined to believe that—

Mr. RINALDO. Are you saying that, at this point, any opinion offered by the committee about which agent is the likeliest cause of the legionnaires' disease would be premature and even presumptuous?

Dr. WECHT. Yes, sir, except to this extent. I think that almost everybody I know of is now in agreement that we are dealing with a toxic substance of some kind, or a chemical substance which while not toxic in its usually and properly used sense, may become toxic under certain changes in the environment.

Those changes could be temperature, humidity, quantity, combination with other substances, or anything of a physical nature.

I think most have ruled out infectious organisms as the cause. It simply does not fit the pattern of any kind of infectious organism that I can conceive of.

Mr. RINALDO. If the statement you have just made it correct then once again I would have to conclude, that the 48-hour delay becomes of paramount importance to this case. Would you agree?

Dr. WECHT. Yes, sir. I do not mean to quibble with you. I agree fully that it is of paramount importance. The only equivocation that I express is that I cannot say that if we had not had the delay we definitely would know the answer today.

That is the only hesitation that I have. I guess I am doing so because I want to be fair. I do agree that it was of paramount importance.

Mr. RINALDO. Would you change your response if it were definitely stated that the outbreak was the result of a toxic substance?

Dr. WECHT. If we had identified the toxic substance, of course, that would have been quite different.

Mr. RINALDO. As a hypothesis, assuming the disease the result of a toxic substance, would you then change your statement about the 48 hours? Would the delay, in that case, have been a responsible one?

Dr. WECHT. Was responsible for some increase.

Mr. RINALDO. Would the delay then have been responsible for not being able to pinpoint the cause of the disease?

Dr. WECHT. Yes; I think it follows. I think it also follows that we might have been able to do more in terms of coping with the disease process diagnostically and therapeutically if we had that kind of earlier input.

Mr. RINALDO. Thank you. I have no further questions.

Mr. MURPHY. Senator Schweiker.

Senator SCHWEIKER. Thank you. First I want to say I am pleased to welcome Dr. Wecht. I have had the occasion to work with him on unsolved mysteries before, and the lack of a properly functioning system to find out what happened in those cases.

Your statement was very comprehensive. I would just like to focus on two things, to put a little more emphasis on them. You have done that, really, but maybe we could do it in a more succinct form.

Why, in your judgment, was there a lack of initial interest in toxicology, whether you are talking about the CDC or State department of health or whatever? Why in your judgment, a failure to get the inside view of toxicology or toxin compounds?

Dr. WECHT. I would say from the standpoint of the Pennsylvania Department of Health, that there were two reasons. One, as you have heard from Dr. Bachman, they do not have toxicologists and they do not have toxicological expertise.

If you do not have something, you tend not to think of it because there is nothing for you to utilize. The second reason I believe was because they were already involved as part of the national Madison Avenue approach to sell swine flu. This was the big thing in their minds.

They were going to find swine flu one way or the other. They were thinking solely of swine flu. There was one case only in the United States at Fort Dix, N.J., a death in the first week of February 1976. This was across the river, a few miles away, so that meant it had made its way over the stream during the course of the summer and was now in Philadelphia.

That is my opinion as to why they did not think toxicologically. Then the second part of my response would be, that even though CDC was called in, as I have already explained, they are not really a primary toxicological facility.

They zero in primarily on infectious organisms. The question to which I do not know the answer, and I hope can be determined by this committee before the hearings are finished, is once one Federal agency is called in, to what degree are they willing to fully cooperate and in fact even maybe turn over the primary authority and responsibility to a second Federal agency?

After 3 or 4 days, when the second batch of eggs was cracked open and there was no viral growth seen. I would like to know, did the CDC then say, maybe NIOSH and EPA ought to take over? We will continue to play a role but maybe they ought to really be the primary people involved here.

I do not know. I just think that it might be something very basic and important to the deliberations of this committee. How do they function among themselves?

Senator SCHWEIKER. The second part of my question is, granted this lack of available expertise within the Government agencies we just discussed, why then was there an unwillingness or reluctance to use outside consultants who were experts in this field and who probably did volunteer their services in several instances? How do you explain that?

Dr. WECHT. I do not know. I can only tell you that our records available to this committee's staff for investigation will clearly demonstrate that while they were still talking about having to perform various tests in the latter part of the week of August 2, during Dr. Bachman's news conferences, many of those toxicological studies had already been completed at our office.

While they were talking about looking for this and that, we had already done those tests. It is just routine for us, and of course we speeded it up because of the nature of the epidemic.

Nobody was interested in our studies although we did not sit with them, we did not pout. We talked with Dr. Marvin Aronson, the chief medical examiner in Philadelphia, we had conversations with Dr. Kimbrough at the CDC. We did everything we could.

We were not able to find any particular interest in Harrisburg or the Philadelphia branch of the State Department of Health.

Senator SCHWEIKER. Would your own tests be sufficient to rule out any toxin? I know you were limited in terms of your samples and victims and people that came to you, because you were just dealing with a part of the whole sample. Were you able to conclusively rule out any toxins or were you not able to do that?

Dr. WECHT. We ruled out many toxins, I would just have to put a caveat on that, however, because in our three deaths as in most of the deaths, those people had been ill at a hospital for some days before their demise.

As I have already mentioned, an illness of some days can lead to the breakdown, degradation, and dissipation of various toxic substances. We tried to get tissues from the hospitals where these people had been admitted, but they were not available because the hospitals had not received any directives about obtaining blood and urine specimens upon admission and preserving them.

When we went back to those hospitals, McKeesport, Presbyterian-University, and St. Francis, they did not have these specimens. I am not aware of any directives they received saying they should collect blood and urine specimens upon admission and save them.

Senator SCHWEIKER. Thank you very much. That is all I have.

Mr. MURPHY. If you would submit what documents and records you have concerning coordination with the State Health Department as well as with the Center for Disease Control since I think probably the first of August?

Dr. WECHT. I would be happy to give you copies of all of my correspondence. There is nothing that is confidential and I have not been asked to treat anything that I have received in confidence.

As I have already indicated, I have never received any directives from the State department of health. I have already given you a copy of the telegram that we sent to them and told you about our phone calls.

Thereafter, my correspondence was with the Center for Disease Control, both their staff working in Pennsylvania and then more extensively with the people working in Atlanta. I will be happy to give you copies of any correspondence that I have.

In that correspondence you will find references to the materials which we submitted to them and on the days that we sent them.

Mr. MURPHY. Thank you and our staff will get copies of those documents. Thank you for your testimony. Before we call the next witness, I might remind the spectators that at a congressional hearing, the Rules of the House prohibit any demonstration of any type. I think the reasons are quite obvious.

Our next witness will be Dr. F. William Sunderman, professor of pathology, Hahnemann Medical School. If the gentlemen with you would identify themselves.

STATEMENTS OF F. WILLIAM SUNDERMAN, M.D., DIRECTOR, INSTITUTE FOR CLINICAL SCIENCE, AND PROFESSOR OF PATHOLOGY, HAHNEMANN MEDICAL COLLEGE, PHILADELPHIA, PA.; F. WILLIAM SUNDERMAN, JR., M.D., PROFESSOR AND HEAD OF DEPARTMENT OF LABORATORY MEDICINE, UNIVERSITY OF CONNECTICUT SCHOOL OF MEDICINE; AND RANDALL C. BASELT, PH. D., CHIEF TOXICOLOGIST, OFFICE OF THE MEDICAL EXAMINER, STATE OF CONNECTICUT

Dr. SUNDERMAN, Jr. Dr. F. William Sunderman, Jr., from the University of Connecticut School of Medicine.

Dr. BASELT. Dr. Randall Baselt, Chief Toxicologist for the Office of Medical Examiner of Connecticut.

Mr. MURPHY. We will hear your opening statement and we will have a recess and come back for questions after that recess. Dr. Sunderman, Sr.

Dr. SUNDERMAN. Although the causative agent for the recent outbreak of respiratory illness associated with Pennsylvania War Veterans, currently called Legionnaires' disease, is not known with certainty; nevertheless in our opinion, sufficient trustworthy data have been developed to warrant a provisional diagnosis of the probable cause.

The illness appeared to have affected only legionnaires who attended their convention in Philadelphia between July 21 and 24, 1976 and who visited the Bellevue Stratford Hotel during that period. One hundred and seventy-seven Legionnaires were reported to have become ill. This number represents only a small percentage of the several thousand Legionnaires and guests who attended the convention. In addition, there were many thousands of bicentennial visitors as well as the normal population in Philadelphia during this same period.

The severity of the illness was not recognized at the time of the convention, and thus the illness appeared to be attended by a delayed response. The first reported death occurred on July 27 and the association of the illness with the Legionnaire convention was not recognized until July 30. It was also observed that the illness was not contagious and that the general population was unaffected. Moreover, laboratory studies failed to isolate any responsible infectious organism.

Since the outbreak was apparently of a noninfectious nature and limited to a specific group of persons, it is believed the illness must be attributed to exposure to a toxic agent. Moreover, the symptoms of the illness were primarily respiratory with only secondary gastrointestinal manifestations and, therefore, it is reasonable to consider that the toxic agent was probably an inhalant. Of the toxic inhalants under consideration, nickel carbonyl is the only odorless one of which we are aware that will produce the type of delayed symptomatology,

physical findings, and pathological lesions that were reported to have occurred among the affected legionnaires. The onset of severe symptoms from 1 to 10 days after exposure, in our experience, is uniquely characteristic of nickel carbonyl poisoning. Since the vapors of nickel carbonyl are colorless and odorless,^{1,2} the victims would not have been able to detect the presence of the vapor or to have become aware of exposure to it. The delayed response, the course of the illness, the symptoms and the physical findings of the victims conform closely to those of acute nickel carbonyl poisoning. It is for these various reasons that the possibility was entertained initially that the outbreak might have been caused by exposure to nickel carbonyl.

A confirmed diagnosis of acute nickel carbonyl poisoning is normally established by the findings of high concentrations of nickel in urine and blood during the first few days after exposure. Since urine and blood samples were not saved during this early period, no analyses were obtainable.³

Although the results of nickel analyses on tissues obtained at autopsy from victims of the outbreak have been labeled inconclusive, owing to the possibility of contamination; nevertheless, the results are also labeled as being certainly suggestive. The nickel concentrations in the lungs of five of the six subjects with Legionnaires' Disease were from 45 to 162 micrograms per 100 grams of tissues by dry weight. These values are several fold greater than the concentration of 3 to 14 micrograms observed in unexposed persons. If contamination can be completely ruled out, then acute nickel carbonyl poisoning is the only recognized disorder that would yield these high values.

The summarization report of the panel of 12 pathologists assembled by the Center for Disease Control to review the autopsy material reasoned that the alveolar lesions in the lungs were probably caused by a toxic substance and that a virus etiology was remote. Furthermore, histopathologic examination of the tissues which we studied also revealed changes which were unusually similar and consistent with those observed in patients known to have died from acute nickel carbonyl poisoning.

Insofar as we are aware, no data have been submitted that negate the provisional diagnosis of acute nickel carbonyl poisoning in the outbreak among legionnaires; indeed, all of the available data supports this provisional diagnosis. Therefore, pending disclosures of which we are unaware, it is our present opinion that Legionnaires' disease was caused by exposure of the victims to the vapors of nickel carbonyl.

[The attachments to Dr. Sunderman's statement follow:]

COMMENTARIES ARE SUBMITTED AND OUTLINED ON THE FOLLOWING ITEMS

1. A BRIEF DIARY OF OUR INVOLVEMENT WITH LEGIONNAIRES' DISEASE

On August 3 and 4, 1976, reports were being received through the news media that a mysterious influenzal type of disease had struck certain persons who had attended the State American Legion Convention in Philadelphia between July 21

¹ Sometimes described as "slightly musty." On questioning victims of acute nickel carbonyl poisoning, the statement is usually made that they detected no odor.

² Most lethal gases have distinctive odors and produce immediate physiological responses such as lachrimation, respiratory irritation, vesication, sternutation, narcoses, etc.

³ Five acceptable samples of urine were received in Dr. Sunderman, Jr.'s laboratory on August 19, 1976. These salvaged samples were reported to have been collected from July 30 to August 3, more than a week after the presumed exposure. (See Dr. Sunderman, Jr.'s final report.

and 24. The city, State and Federal health authorities called in to investigate the outbreak appeared to focus their attention on infectious agents, and particularly swine influenza virus, as possible causative factors.

In discussing the matter of diagnosis with medical colleagues on August 4, 1976, I expressed the opinion that it seemed unlikely that the outbreak was of infectious origin since it affected less than two percent of the 10,000 Legionnaires and guests reported to be in Philadelphia during July 21 and 24. Furthermore, the many thousands of other persons in the city at the same time attending the bicentennial celebrations appeared to be unaffected. Moreover, the illness did not appear to be contagious and there was no evidence of any spread in the general population. The illness was attended by a delayed response time of a few days, in as much as the first reported death occurred on July 27 and the nature of the outbreak was not recognized until July 30. It occurred to us that the illness must be due to exposure to an inhaled chemical poison. Of the numerous poisons considered, nickel carbonyl when inhaled produces symptoms that closely simulate those reported in the outbreak.

As a result of our discussions, I was encouraged to telephone Dr. Lewis Polk, the Acting Medical Director for the City of Philadelphia to relate our opinion and concern. Although I was unable to reach Dr. Polk by telephone on August 4; nevertheless, I finally contacted him on Thursday morning, August 5, to suggest that chemical poisons should be considered as a possible causative factor in the outbreak. I also suggested that attention should be given to similarities of symptoms of acute nickel carbonyl poisoning to those encountered by the Legionnaires. Dr. Polk took my telephone number and stated that he would have one of the city toxicologists contact me. Later that day, Dr. Jane Speaker called at Dr. Polk's request.

I discussed with her the similarities of acute nickel carbonyl poisoning to the respiratory illness of the Legionnaires and called her attention to the fact that the disease is established by finding high concentrations of nickel in urine and blood during the first few days after exposure. I also suggested that analyses of tissue on a person who died of nickel carbonyl poisoning five years ago revealed high concentrations of nickel in lung, liver and kidney and suggested that such analyses might be helpful as an aid in diagnosis. Dr. Speaker inquired where such analyses might be made, and I referred her to my son, Dr. F. William Sunderman, Jr., Professor of Laboratory Medicine at the University of Connecticut, who had the facilities and personnel to undertake the analytical work. I mentioned that Dr. Sunderman, Jr. had undertaken the tissue analyses of the case reported in the literature. On August 6, 1976; Dr. Speaker called to obtain Dr. Sunderman, Jr.'s telephone number in order to discuss tissue analysis with him.

On Monday, August 9, 1976, Dr. Manuel A. Bergnes, Past President of the Pennsylvania Association of Clinical Pathologists and pathologist at Sacred Heart Hospital in Norristown, telephoned to ask me whether or not any member of the State health officials had been in touch with me regarding the illness that was occurring among the Legionnaires. When I indicated that I had not been contacted, Dr. Bergnes stated that he would call Dr. Leonard Bachman's office regarding the matter. Dr. Dennis Lucey, a member of Dr. Bachman's staff, telephoned me later that day at the request of Dr. Bergnes and I gave him the same information that was given to Dr. Speaker; Dr. Lucey also stated his desire to contact Dr. Sunderman, Jr. regarding tissue analyses. As a result of these contacts, tissues from autopsied cases were sent to Dr. Sunderman, Jr. at the Medical School of the University of Connecticut on August 9.

A spokesman from the headquarters of the Republican National Convention telephoned me from Kansas City on August 13, 1976 regarding protective measures that might be taken at the convention in case of sabotage with nickel carbonyl. I told the representative that I would make certain that adequate supplies of Dithiocarb, an antidote for nickel carbonyl poisoning, were made available if needed.

An antidote for nickel carbonyl poisoning, sodium diethyldithiocarbamate (Dithiocarb), was developed in our laboratory and reported a number of years ago. Since 1958, all persons with acute nickel carbonyl poisoning whom we have seen have survived provided they received Dithiocarb within the first few days after exposure. The International Nickel Company of Canada keeps adequate supplies of Dithiocarb on hand in case of accidental exposures to nickel carbonyl. I telephoned Dr. Kenneth Hedges, Medical Director of the Ontario Division of International Nickel Company, to alert him of our possible need. He stated that he would be pleased to cooperate with us if the need should arise.

It should also be mentioned that supplies of Dithiocarb had been offered to the public health authorities for use in any patient suffering from Legionnaires' disease. However, no requests for Dithiocarb were received.

2. A POINT OF VIEW REGARDING THE FAILURE TO CONSIDER INITIALLY CHEMICAL POISONS AND TOXINS

Frequent mention in the news media has been made of the failure of the health authorities to consider exposure to chemicals and toxins in the early investigations of legionnaires disease. This factor may, in part, be attributable to the political environment regarding health matters at the time of the occurrence of the outbreak.

A Public Health Service Act had been recently passed which authorized the expenditure of 135 million dollars for the establishment and implementation of an emergency national swine influenza immunization program for 1976. The drug manufacturers, however, were reluctant to release the vaccine unless they were afforded protection against liability suits. The public health officials were understandably engrossed in the problems of mass immunization for swine flu,—especially since the wisdom of spending 135 million dollars to vaccinate a population against influenza was being questioned in many parts of the country. On August 10, 1976, the New York Times indicated that Mr. Matthews, Secretary of Health, Education, and Welfare, described the situation (i.e., mass immunization) as being in a state of collapse and jeopardized by delays.

There is little doubt that the inference that Legionnaires' disease might be the beginning of an epidemic of swine flu was the spark that provided rapid passage of the amendment to the Influenza Immunization Act. On August 10, 1976, the Senate passed unanimously by voice vote the amendment making the government responsible for defending any lawsuit arising from alleged injuries or death resulting from the immunization program, if the injury was attributed to negligence.

The initial emphasis that the outbreak might be the beginning of an epidemic of swine flu may be understandably attributable in part to the zeal of the public health authorities to have the pending legislation enacted in Congress. The failure to consider chemical poisons and toxins as possible causative factors during the early stages represents a flaw in the scientific investigations. If these had been considered, samples of excreta and blood would have been saved for the analyses upon which a confirmed diagnosis might have been established.

Some of the press releases have been exceptionally critical. To quote one Washington press release:¹ "Had it not been for an eagerness bordering on mania on the part of CDC to find swine flu in Pennsylvania, it is entirely possible that the real cause of whatever snuffed out 29 lives and threatened 150 others might have been ascertained." Although these are not my words, nevertheless, I am inclined to agree.

While there is no desire to engage in recriminations; however, in our view the confusion and uncertainties regarding the cause of legionnaires' disease should be laid at the threshold of the public health authorities investigating the matter.

3. BRIEF RESUME OF NICKEL CARBONYL AND ITS TOXICITY

It is only within the past three or four decades that the hazards of exposure to nickel and nickel compounds have come to be recognized. In 1943, during World War II, it became apparent that exposure to nickel and certain of its compounds was a serious health hazard and a handicap to the furtherance of research work in atomic energy. As a consequence, studies were initiated to provide safeguards for the handling of nickel compounds during the war, and these studies are still continuing. Obviously, an enormous amount of data have been collected which can only be epitomized at this time.

The increasing industrial use of nickel in recent years has focused attention upon the varied clinical syndromes that may be encountered after exposure to nickel. These syndromes range from nickel dermatitis, pulmonary eosinophilia (i.e., Loeffler's syndrome), acute and subacute pneumonitis with adrenal cortical insufficiency and pulmonary cancer. The factors that determine the clinical response depend upon the nature of the nickel compound, its molecular state and

¹Randall, Judith. Bureaucrats Bungled Legion Fever Probe. Burlington Free Press, Sep. 15, 1976.

reactivity, the dosage, the speed and method of exposure and the sensitivity and resistance of the host.

Walter Reppe, a German chemist, made a major contribution in the field of chemistry when he discovered the oxo and related reactions with nickel carbonyl as a catalyst. As a result of his work, nickel carbonyl has been introduced into many of the large chemical industrial processes. In addition to the separation of nickel from its ores, one of the important uses is as an intermediate in the synthesis of acrylic esters for the production of certain plastics and paints.

It is also employed in nickelplating operations and as a medium for depositing thin layers of metallic nickel in electronic circuits and magnetic tapes. It is now being used for casting operations and in making dies for machine parts. It is ordinarily prepared for use in organic syntheses by the reaction of certain nickel salts and carbon monoxide at high pressures. Nickel carbonyl may also be formed inadvertently whenever carbon monoxide comes into contact with any active form of nickel. In this event, the hazards of exposure are increased because the presence of nickel carbonyl lacks any detectable odor to warn of its presence.

Nickel carbonyl is a clear, colorless liquid which boils at 43° C and has a vapor pressure of 380 mm of mercury at 25° C. Its high volatility creates a special hazard of exposure by inhalation since the vapors are essentially odorless.

Nickel carbonyl in gaseous form is unstable under atmospheric conditions and, if inhaled, nickel is deposited in active form on the respiratory mucosa.

Nickel carbonyl is one of the most toxic compounds encountered in industrial operations. The American Conference of Governmental Industrial Hygienists has placed the threshold limit value of nickel carbonyl for eight hours at one part per billion (by comparison, hydrogen cyanide was placed at ten parts per million,—a 10,000 times greater concentration). However, unlike hydrogen cyanide, a lethal exposure to nickel carbonyl is not usually immediately fatal. The LD₅₀² values for a 30 minute exposure to nickel carbonyl for mice, rats and cats are 0.067, 0.24 and 0.19 milligram per liter of air, corresponding to 10, 35 and 28 parts per million, respectively.

4. SYNOPSIS OF CLINICAL OBSERVATIONS IN ACUTE NICKEL CARBONYL POISONING

It is suspected that acute nickel carbonyl poisoning may not be too uncommon an occurrence, and that poisoning from it often goes unrecognized. The acute symptoms which follow exposure to nickel carbonyl are characteristically of two types, immediate and delayed. Even in exposures sufficiently severe to cause death, the immediate symptoms are usually mild and disappear when the subject breathes uncontaminated air. On the other hand, the delayed symptoms may develop insidiously from one to ten days after exposure. At times, the transition between the immediate and delayed response may be abrupt, and immediate symptoms may merge rapidly into the delayed. When this occurs in the absence of specific medication, the prognosis is apt to be ominous.

Within the past 25 years, an opportunity has been afforded the author to examine personally or to review the medical records of approximately 350 persons acutely exposed to nickel carbonyl. The initial symptoms that are observed generally include frontal throbbing headaches, dizziness, muscle pains and some of the patients become nauseated after exposure and may vomit. Hours after exposure, most of the patients experience a sense of constriction in the chest with concomitant shortness of breath and a dry, hacking unproductive cough. Occasionally, a patient may have a productive cough. A universal complaint in the critically ill patients is weakness and fatigue. At times, respirations cannot be sustained without pressure oxygen therapy. Breathing is frequently rapid, shallow and panting. Some of the critically ill patients may develop neurological symptoms. Two of our patients had convulsions terminally; others became irrational.

Diarrhea and abdominal distention may occur two or more days after exposure. This might suggest that nickel was being excreted by the intestinal tract, similar to the diarrhea that follows arsenic poisoning.

Fever is usually not a prominent finding after acute exposure to nickel carbonyl. Generally, the temperatures range from 101° to 103°, although higher temperatures at times have been observed in the more severe cases. Within recent years, since the therapeutic use of the specific antidote, Dithiocarb, patients with acute

² LD₅₀ represents that concentration that is lethal for 50 percent of exposed experimental animals.

nickel carbonyl poisoning survive; hence the patients do not develop the acute pneumonitis with attendant high fevers that are observed in patients who had not received the antidote. When high fevers occur, they represent either a superimposed secondary infection or perhaps an allergic manifestation of nickel in combination with other metals or other agents such as alcohol. Hepatomegaly is occasionally observed, but the patients are not icteric. It might be mentioned that many of the cases reviewed by the panel of pathologists revealed superimposed secondary foci of pneumonia which certainly accounts in part for higher temperatures that were observed in Legionnaires' Disease.

The pulse rate in exposed subjects is increased but usually not in proportion to the increased respiratory rate. Physical examination of the chest elicits signs that are compatible with pneumonitis or bronchopneumonia. These findings may be confirmed by roentgenographic studies. The leucocyte count is seldom increased above 12,000 per cmm. The physical signs and symptoms resemble those of a viral or influenzal pneumonia. In the fatal cases, death occurs from the fourth day to three weeks after exposure. Convalescence in those that survive is prolonged and may extend for several months.

5. NICKEL METABOLISM

Under normal conditions, approximately 90 percent of ingested nickel is excreted in the stools and 10 percent in the urine. However, when nickel is inhaled, the converse is obtained, i.e., most of the inhaled nickel is excreted in the urine and only a small percentage is excreted in the stools. This observation that there is a sharp increase in the nickel excretion in the urine immediately after exposure to nickel carbonyl has proved to be of major practical value and has led to the development of procedures for detecting accidental exposure to minimal amounts of nickel carbonyl in concentrations too low to produce symptoms.

After acute nickel carbonyl poisoning, the concentrations of nickel in urine may remain above normal for as long as eight or nine days. However, exceptions occur and, indeed, exceptions have been found in our most critically ill patients—one of whom died. It is suspected that this may be related to the nephritis that may develop.

Alterations in the serum electrolytes have been observed in patients and in experimental animals exposed to nickel carbonyl. These alterations follow the pattern encountered during the precritical period of pneumonia. They include diminished concentrations of serum sodium and chloride associated with increased concentrations of potassium. Such metabolic changes are consistent with the findings observed in acute adrenal cortical insufficiency. The favorable response of patients to corticosteroid therapy as an adjunct to Dithiocarb administration is consistent with the observed electrolyte changes.

A description of the metabolic and pathologic changes in acute pneumonitis from nickel carbonyl exposure may be found in papers I, II, V and XII of our series of publications on nickel poisoning.³

6. ANTIDOTE FOR ACUTE NICKEL CARBONYL POISONING

In 1958, our laboratory discovered that sodium diethyldithiocarbamate (Dithiocarb) was dramatically effective in counteracting the lethal effects of nickel carbonyl inhalation in experimental animals. This led us to employ the chemical in humans who had been accidentally exposed to nickel carbonyl. These exposures occurred in conjunction with a variety of applications of nickel carbonyl in several types of industry. To date, more than 350 workmen, accidentally exposed to nickel carbonyl, have received Dithiocarb. Of these, approximately 50 suffered severe to moderate exposure and excreted nickel in the urine in concentrations from 10 to 247 micrograms per 100 milliliter (from 2 to 50 fold greater than normally observed).

The observation of a sharp increase in the nickel excretion in the urine immediately after exposure, even before the onset of symptoms, has led to the development of procedures whereby certain manufacturing plants using nickel carbonyl in their operations measure the concentration of nickel in the urine of workmen at the end of each working shift. In those instances in which increased concentrations of nickel in urine above 10 micrograms per 100 milliliter of urine are reported, the workmen are given Dithiocarb as a preventive measure even though they may have developed no symptoms of exposure or may not have been aware

³ Nickel references to the scientific publications will be supplied on request.

that they had ever been exposed to nickel carbonyl. Such preventive measures have proved to be exceptionally effective in reducing the hazards of exposure.

An industrial accident occurred within recent years in which four men were accidentally exposed to high concentrations of nickel carbonyl vapors. Three of the men received Dithiocarb through their industrial dispensary 24 hours after exposure, but the fourth man was hospitalized by his family physician and treated for bronchopneumonia with antibiotics without benefit of Dithiocarb. The three workmen who received Dithiocarb became symptomless and returned to work within 72 hours after exposure. The fourth man who had not received Dithiocarb died within five days after exposure. The concentrations of nickel in the urine samples obtained from all four workmen were elevated. The concentrations of nickel in the lung and liver tissues obtained at autopsy from the workman who died following exposure to nickel carbonyl were, respectively, 11 and 6 times greater than the average concentrations of nickel found in the lung and liver control tissues obtained from persons dying from stab wounds, drug intoxication, hanging and carbon monoxide poisoning. The history, physical and laboratory findings left no doubt that the hospitalized, exposed workman who had not received Dithiocarb died of acute nickel carbonyl poisoning. In retrospect, this accident illustrates not only the therapeutic effectiveness of Dithiocarb in treating nickel carbonyl poisoning, but also emphasizes the fact that the diagnosis of acute nickel carbonyl poisoning may be readily overlooked in customary hospital practice.

7. ESTIMATE OF THE QUANTITY OF NICKEL CARBONYL THAT MIGHT BE LETHAL TO 18 PERCENT OF EXPOSED PERSONS⁴

The question has been raised as to the amount of nickel carbonyl capable of causing 29 deaths in 177 sick persons. This amount can be estimated providing the following reasonable assumptions are made:

1. That the exposure occurred in a hotel hospitality room 50 x 20 x 12.5 feet;
2. That the volume of such a room would be 12,500 cubic feet and could accommodate as many as 177 people; and
3. That the mortality rate is 18 percent (i.e., 29 out of 177 persons).

From our previous studies on the mortality rates of rats exposed to various concentrations of nickel carbonyl for 30 minutes, it is possible by probit analysis to calculate the concentration of nickel carbonyl in air that will yield a mortality rate of 18 percent. The LD₁₈ for rats is calculated to be 0.08 milligram of nickel carbonyl per liter of air for an exposure period of 30 minutes.

To fill a room of 12,500 cubic feet (353,750 liters) with nickel carbonyl to a concentration of 0.08 milligram per liter would require 28.3 grams of nickel carbonyl. If allowance is made for ventilation at a turn-over rate of three times per hour, the amount of nickel carbonyl for an exposure period of 30 minutes would amount to 42.5 grams. The density of nickel carbonyl is 1.82. Therefore, this would amount to 32.2 milliliters or a little more than a fluid ounce.

Since the vapors of nickel carbonyl have 5.9 times the density of air, the vapors would tend to be more concentrated at the lower levels of any space. Therefore, it can be estimated that in the assumed room of 12,500 cubic feet, a fluid ounce of nickel carbonyl would be at least lethal within five days for 18 percent of rats exposed for 30 minutes.

If a half pint of nickel carbonyl were vaporized in the same sized room, this would provide a 7.5 fold factor for uncertainty. Therefore, it would seem to be a reasonable estimate that one half pint of nickel carbonyl vaporized for 30 minutes in a room of 12,500 cubic feet would be more than necessary to produce 18 percent of deaths in exposed persons.

8. NICKEL CARBONYL AS A CARCINOGEN

The high incidence of pulmonary cancer in nickel workers was first reported in 1937. Since that time, the relation of the inhalation of nickel carbonyl to pulmonary carcinogenesis has been the subject of numerous investigations. In

⁴ The legionnaires used 18 hotel hospitality rooms where they brought in their own food and beverages. No records were kept of the attendance in these rooms; however, it appears that one room was implicated more than the others. It is noteworthy that hotel employees were not present in the hospitality rooms since there was no need for their services. If exposure to the toxic agent occurred in one of the hospitality rooms, this may account for the fact that none of the hotel employees became ill.

1958, it was shown in Wales that 35.5 percent of nickel workers died of cancer of the lung or upper respiratory tract whereas the incidence among the coal miners in the same area was only 1.5 percent. The average age at death in the nickel workers was 57.6 years. The average length of time that the affected workers were employed in the nickel refineries was 27 years; the average time between the first exposure and death from lung cancer was 30.5 years. In Great Britain, cancer in the respiratory tract is a compensable disease for nickel workers.

In our studies on nickel carcinogenesis, pulmonary cancers were induced in rats by two methods of exposure to nickel carbonyl: (1) A single, heavy exposure to a concentration of 250 micrograms of nickel carbonyl per liter of air for 30 minutes; and (2) multiple exposures to a concentration of 30 micrograms of nickel carbonyl per liter of air for 30 minutes, three times weekly, for one year. It is noteworthy that pulmonary cancers in our rats were not observed until two years or more after the initial exposure. It might be emphasized that the induction of pulmonary cancer in a laboratory rat is a severe challenge, in as much as spontaneous pulmonary neoplasms occur only rarely in this animal.

One of our patients, a chemical engineer, survived one severe exposure to nickel carbonyl during the construction of an industrial plant. This exposure occurred before Dithiocarb had been discovered and the engineer received no specific antidote. Approximately eight years after this initial severe exposure, our patient developed a fatal pulmonary cancer.

Assuming that Legionnaires' Disease might have been caused by exposure to nickel carbonyl, the implications of these observations are obvious.

9. RECOMMENDATIONS FOR CONSIDERATION

Since pulmonary cancer may develop in experimental animals and in man years after a single heavy exposure to nickel carbonyl, and assuming that Legionnaires' Disease was caused by exposure to nickel carbonyl, it is recommended that survivors of Legionnaires' Disease be given thorough physical examinations and chest X-rays annually during the next ten or more years. These would be helpful aids in the early recognition of pulmonary lesions should they develop.

It is strongly recommended that the survivors of Legionnaires' Disease be advised to refrain from smoking tobacco.

Recognizing the relative ease by which nickel carbonyl can be procured, regulations for its procurement and use should be developed as a safeguard against sabotage and for the protection of the public.

One of the breaches in the investigation of "Legionnaires' Disease" was the failure to consider and to include toxicologic examinations in the early phases of the inquiry. Biological materials should have been collected and saved for toxicological analyses at the onset of the illness. It is recommended that any public health team investigating an epidemic include persons with expertise in clinical toxicology.

It is recommended that public health authorities should alert practicing physicians that an illness suspected of being a viral or influenzal pneumonia might be actually caused by exposure to a toxic inhalant, particularly nickel carbonyl. Since the diagnosis of acute nickel carbonyl poisoning may be confirmed by finding increased concentrations of nickel in urine, clinical laboratories should be encouraged to make nickel analyses readily available. It is recommended that any patient suffering from acute nickel carbonyl poisoning receive the specific antidote, sodium diethyldithiocarbamate.

STATEMENT OF F. WILLIAM SUNDERMAN, JR., M.D.

Dr. SUNDERMAN, Jr. During the 6 weeks from August 9 to September 20, 1976, our laboratory was engaged in measurements of nickel concentrations in tissues and urine specimens from victims of so-called legionnaires' disease.

I supervised these analyses in collaboration with Dr. Randall Baselt, chief toxicologist of the Office of the Medical Examiner of the State of Connecticut, and Dr. Mirna Mikac-Devic, visiting professor of biochemistry from the University of Zagreb, Yugoslavia.

Our studies were conducted at the request of the Department of Health of Pennsylvania and the Medical Examiner of Philadelphia in order to confirm or refute an etiologic role of nickel carbonyl.

The possibility of nickel carbonyl poisoning was prompted by an observation by my father, Dr. F. William Sunderman, Sr., professor of pathology of Hahnemann Medical College in Philadelphia, soon after the outbreak of the epidemic, that the clinical and pathological findings in patients with legionnaires' disease were similar in many respects to the findings in nickel workers who had been accidentally exposed to inhalation of nickel carbonyl.

The clinical and pathological manifestations of nickel carbonyl poisoning will be discussed by my father in his testimony at these hearings and hence, will not be considered in this statement.

The analyses that were performed in our laboratory demonstrated increased concentrations of nickel in lung specimens from five of the six patients with legionnaires' disease whose lung tissue were sent to us.

The concentrations of nickel in other tissues, liver, kidney, or brain, from these patients were normal. Our finding of increased concentrations of nickel in the lung specimens is suggestive evidence that the patients may have inhaled a toxic compound.

However, our findings are not conclusive, since it was impossible to exclude contamination from exogenous nickel. Appended to this statement is our final report to the Bureau of Laboratories of the Pennsylvania Department of Health.

This report contains a detailed description of our analytical methods, together with tabulations of the results of all of our analyses of nickel in specimens of tissues, body fluids, and other relevant samples.

The names of the patients have been deleted from the report in order to maintain confidentiality. Our report was submitted on September 20, 1976, to the Bureau of Laboratories of the Pennsylvania Department of Health, the Office of the Medical Examiner of Philadelphia, and the Center for Disease Control of the U.S. Department of Health, Education, and Welfare.

Independent measurements of nickel in tissues from patients with legionnaires' disease are being performed under the direction of Dr. John Liddle at the Center for Disease Control in Atlanta.

According to news reports, the initial results of nickel analyses by Dr. Liddle and his colleagues revealed increased concentrations of nickel in tissues from certain patients with legionnaires' disease. However, these findings were also considered to be inconclusive, owing to analytical difficulties and to the possibility of exogenous nickel contamination.

Dr. Liddle and his colleagues are now attempting to perfect their technique for nickel analyses in tissues. We have been pleased to assist Dr. Liddle by furnishing methodological advice.

According to news reports, samples of tissues were collected from a few patients with stringent precautions against nickel contamination from scalpels, autopsy utensils, and specimen containers.

I presume that nickel analyses of these tissues will soon be completed at the Center for Disease Control, and it seems entirely possible that these measurements may ultimately substantiate the etiologic role of poisoning from inhalation of a volatile nickel compound, such as nickel carbonyl.

Other toxic compounds have also been suggested as possible causative agents in legionnaires' disease, including paraquat, ricin, ethylene glycol, phosgene, and alkylating agents, such as diazomethane.

The clinical and pathological findings in paraquat poisoning are similar to those found in nickel carbonyl poisoning. Since there is characteristically a delay of 1 to 5 days between exposure to paraquat or nickel carbonyl and the onset of respiratory signs, both of these compounds can be classified among the hit-and-run type of toxic agents.

I am not aware of any analytical data that support the etiologic role of paraquat, or then for that matter, of any of the other toxic substances that I have mentioned, excepting possibly nickel carbonyl.

Congressman John M. Murphy, chairman of the subcommittee, has recently stated:

It is inconceivable at this point in the investigation that we cannot say with 100 percent certainty, or as a matter of fact with any degree of certainty, what the cause was.

It could have been murder; a virus; accidental introduction of a toxic substance; or a coincidence, a convergence of factors yet to be determined.

I share Congressman Murphy's incredulity about the current uncertainty in the etiology of legionnaires' disease.

However, I appreciate the extraordinary difficulties of coordinating such an investigation, and I can testify to the analytical challenges of identifying such exotic poisons in tissues and excreta.

Some of these poisons that I have mentioned have not hitherto been suspected of causing nonoccupational illness, excepting perhaps in the arena of chemical warfare.

My statement on Legionnaires' disease is not directed to the epidemiological and environmental investigation of possible sources of the toxic agents. Instead, since clinical pathology and toxicology are my fields of professional specialization, my comments are focused upon the problems of laboratory diagnosis by analysis of tissues and body fluids.

Based upon our experience in the Legionnaires' epidemic, I wish to offer four constructive recommendations that might be helpful in investigations of future epidemics of this type.

We should remember that the Legionnaires' epidemic is not the first documented outbreak in the United States of unexplained disease that is presumed to have been caused by inapparent and initially unsuspected exposure to toxic agents.

In 1965, an unsolved epidemic respiratory illness occurred at St. Elizabeth's Hospital in Washington, D.C. In 1968, an epidemic of a curious febrile illness occurred at the office of the Oakland County Health Department in Pontiac, Mich.

In 1974, an epidemic of unexplained respiratory illness with three deaths occurred among attendees at an Oddfellows Convention in Philadelphia.

In these three previous epidemics and the recent epidemic affecting Pennsylvania Legionnaires, an infectious etiology appears unlikely, since there was little evidence of secondary spread, and since parasites, bacteria, fungi, rickettsia, or viruses were not consistently detected, by either isolation or by serological tests.

Inhalation exposure to a toxic substance or substances seems to be the most plausible explanation of each of these epidemics. Insofar as I can ascertain, the patients in these epidemics did not complain of

inhaling any smoke, irritating fumes or objectionable odors that might give a clue to the etiologies.

In the recent Philadelphia outbreak, there was delay and lack of coordination in collecting clinical and post-mortem specimens for toxicological analyses. This appears to be the unanimous opinion of many authorities who have reviewed the investigation.

For example, Dr. Donald S. Fredrickson, Director of the National Institutes of Health, was quoted on September 12 as follows: "We've got to change our set and next time be prepared immediately to assume that this could be just as much chemical as infectious."

He was also quoted as saying: "Maybe all of us thought about toxins just a couple of days too late. I would guess that we've lost those key specimens."

Similarly, Dr. Renate Kimbrough, a toxicologist at the Center for Disease Control was quoted on October 12 as follows: "The initial stress of the investigation was to look for a virus, such as swine flu, that might be causing the illness."

Moreover, she indicated that the chances of identifying the cause "would have improved if toxicology had been involved earlier, with greater stress."

On the basis of many such comments, my first recommendation is that protocols should be formulated for the systematic collection of blood, urine, feces, hair, and sputum from all affected patients in future epidemics of respiratory diseases that are investigated by Federal, State and local health authorities.

The protocols should insure that these samples are collected and preserved free from contamination and in quantities sufficient for toxicological studies.

Similar protocols should be formulated for systematic collection of tissues for toxicological analyses and for ultrastructural studies by pathologists who perform post-mortem examinations of victims of future epidemics.

Research is needed to develop methods for sampling tissues without contact with toxic metals. Development of acceptable and standardized protocols for collection and preservation of such specimens will require the cooperative efforts of governmental agencies and of professional organizations, including clinical and anatomic pathologists, clinical and forensic toxicologists, clinical chemists and clinical microbiologists.

My second recommendation is that a network of laboratories should be established for performance of specific toxicological tests for epidemiological investigations. Our Nation possesses vast expertise and resources for toxicological and pathological studies.

It would not be feasible for any single facility such as CDC, NIOSH, EPA, Armed Forces, to assemble the scientific staff or instrumentation that would be requisite for identification of the myriad poisons that are known to exist.

The most economical and effective approach would be to develop a consortium of carefully selected laboratories in governmental institutions, universities, medical centers, military research institutes, and industrial laboratories, each of which would agree to detect one or more specific toxic compounds or classes of compounds for epidemiologic investigations.

In my opinion, the most reliable identification and quantitation of specific toxic agents can be provided by laboratories that are regularly performing analyses of these compounds, such as in a program for surveillance of workers in industrial processes or as a facet of ongoing research programs.

My third recommendation is that determined efforts should be directed to improving communications between the clinical scientists who are involved in investigating future epidemics.

Many clinicians, pathologists, clinical chemists, and microbiologists who were involved in the Legionnaires' epidemic have told me their perception of a serious need for rapid means of disseminating preliminary data and information as they are developed, rather than attempting to wait until a definitive etiology has been established. Dr. Wecht certainly made that point in his presentation.

The weekly publication Morbidity and Mortality Reports of the Center for Disease Control could serve effectively as a vehicle for rapid interchange of information in future epidemics.

Similarly, the weekly AMA News of the American Medical Association could respond to such a challenge in medical communications.

Actually, in the recent epidemic, Dr. Lawrence K. Altman of the New York Times was an unsung hero of medical communications, for he worked tirelessly to improve communications among the investigators and to sift and to evaluate epidemiological and analytical findings as soon as they occurred.

My fourth recommendation is that a program for long term followup of the survivors of Legionnaires' disease should promptly be established. According to a recent news account, interviews indicate that many survivors of Legionnaires' disease are still invalids.

It seems advisable that the survivors should be given an opportunity to participate in a program of carefully standardized tests of pulmonary, cardiac, hepatic, and renal functions, and that these tests should be repeated periodically for many years in order to assess the long-term sequelae of the syndrome.

Particular attention should be placed upon the possible pulmonary and neoplastic sequelae of Legionnaires' disease. These victims deserve the best possible medical care and scientific observation.

It would seem most practical and economical to designate three or four specific medical centers in Pennsylvania as the loci for long-term followup of survivors of Legionnaires' disease.

In summary, my four recommendations are: development of standardized protocols for collection of biological samples for toxicological testing; development of a network or consortium of specialized laboratories for toxicological analyses; development of media for more effective communications between investigators in future epidemics, and establishment of a program for long-term followup for the survivors of Legionnaires' disease.

I wish to express my sincere appreciation for the privilege of testifying at these hearings.

Mr. MURPHY. Thank you, Dr. Sunderman, Jr., and Dr. Baselt. We will recess for 1 hour and proceed to questioning at that time.

[Whereupon, at 1:19 p.m., the hearing was recessed to reconvene at 2:45 p.m. the same day.]

AFTER RECESS

[The subcommittee reconvened at 2:45 p.m., Hon. John M. Murphy presiding.]

Mr. MURPHY. The subcommittee will come to order. Drs. Sunderman and Baselt, were there any other formal statements that you wanted to make before we went to questioning?

Dr. Sunderman, you suggest nickel carbonyl is still a possibility. Some investigators claim it has definitely been ruled out. Would you comment on that?

Dr. SUNDERMAN. Is this question directed to me? I do not know the basis or criteria on which nickel carbonyl would be ruled out. If I might be told the criteria by which they would rule it out. I would be able to answer your question.

Mr. MURPHY. The temperature?

Dr. SUNDERMAN. The fever. It is quite true that in uncomplicated nickel carbonyl poisoning, high fever is not common. The temperatures usually run from about 101 to 103. However, higher temperatures have been observed.

One should remember that within recent years, a specific antidote, dithiocarb, has been available. All of the patients receiving dithiocarb survive nickel carbonyl poisoning so that they do not develop the acute pneumonitis with attendant fever that is observed in patients who do not receive the antidote.

When high fevers occur, they represent either superimposed infections or perhaps an allergic manifestation of nickel in combination with other toxins, even alcohol.

It might be mentioned that several of the cases reviewed by the panel of pathologists revealed superimposed secondary foci of pneumonia which certainly accounts in part for the higher temperatures which were observed in Legionnaire disease. It should also be remembered that it was the older age group of patients who died. The Legionnaires also had complications such as diabetes, nephritis, and the like, in addition to acute pneumonitis, which was, of course, the primary cause of death.

Mr. MURPHY. You are certain that the causative agent was not fungal, bacterial, or viral?

Dr. SUNDERMAN. All of the histologic studies represent a degenerative type of pulmonary damage, especially in the alveolar lining. There is very little evidence of any regeneration as might be expected if the lesions were due to an infectious process.

Of course the point also should be made that the bronchiolar cells were not primarily involved. If nickel carbonyl was inhaled, this is the type of picture that one would observe since nickel carbonyl is not a primary irritant.

All of the sections that I have examined reveal hyaline membrane disease which is very typical of nickel carbonyl poisoning.

I believe that Dr. Cowart, director of the Armed Forces Institute of Pathology is going to be a witness here and would be more capable of discussing this matter.

Mr. MURPHY. To your mind, the Federal team that initially came to Pennsylvania, did they have the proper organization and personnel to carry out their investigation?

Dr. SUNDERMAN. Frequent mention has been made in the news media of the failure of the health authorities to investigate the chemicals and toxins as possible causative factors in their early investigations. I dare say that this failure was due to the fact that they did not have available expertise in toxicology.

One might recall that a Public Health Service Act had been passed which authorized the expenditure of \$135,000,000 for the establishment and implementation of an emergency national swine flu influenza immunization program for 1976 and that the drug manufacturers were reluctant to release the vaccine unless they were afforded protection against liability suits.

The public health officials were understandably engrossed in the problem of mass immunization for swine flu, especially since the wisdom of spending \$135,000,000 to vaccinate a population against influenza was being questioned in many parts of the country.

On August 10, the New York Times indicated that Mr. Mathews, Secretary of Health, Education, and Welfare described a situation—that is, mass immunization—as being in a state of collapse and jeopardized by delays. There is little doubt that the inference that Legionnaires' disease might be the beginning of an epidemic of swine flu was the spark that provided rapid passage of the amendment through the Influence Immunization Act.

On August 10, 1976, the Senate passed unanimously by voice vote, the amendment making the Government responsible for defending any law suit arising from alleged injuries or death from the immunization program if the injury was attributed to negligence. The initial emphasis that the outbreak might be the beginning of an epidemic of swine flu might be attributable in part to the zeal of the public authorities to have the swine flu legislation enacted. The failure to consider toxic agents in the early stages, represents a flaw in the scientific investigations.

Chemical and toxic agents should have been considered. If so, then excreta and blood samples would have been saved from which a confirmatory diagnosis of such conditions as nickel carbonyl poisoning might have been established.

Mr. MURPHY. How long does it take to diagnose a case of swine flu?

Dr. SUNDERMAN. You had better direct that question to the virologists. They could answer that better than I. I suppose a week or so.

Mr. MURPHY. Why does it take a week?

Dr. SUNDERMAN. For the cultures to develop.

Mr. MURPHY. The first hospital case that started on the 24th of July, why were we way up into August before they bring in the toxicologists in this case?

Dr. SUNDERMAN. I should like to defer that question to the virologists, who could give you a better and more authoritative answer.

Mr. MURPHY. Mr. Rinaldo?

Mr. RINALDO. I would like to direct my first question to Dr. Sunderman, Jr. You stated in your testimony:

The analyses that were performed in our laboratory demonstrated increased concentrations of nickel in lung specimens of five to six patients with legionnaires' disease whose lung tissues were sent to us.

Concentration of nickel in other tissues, liver, kidney, and brain were normal.

What accounts for all of those organs being normal and the higher concentration in the lungs? Why did not the same concentration occur in the other organs?

Dr. SUNDERMAN, Jr. Mr. Rinaldo, in people who are previously healthy and die unexpectedly from accidental causes, the concentrations of nickel are approximately equal in the various tissues that we have studied. I might emphasize there have been relatively limited studies of nickel in tissues of otherwise healthy persons and all have been with less than 14 micrograms of nickel per 100 grams dry weight.

In five of the six legionnaires' tissues whose lungs were sent to us, the increased concentrations of nickel were found only in lungs and not in the other tissues that we received.

We did not receive any consistent tissues from all of the patients. From some we received brain, liver, or kidney in addition to lung. The concentrations of nickel in the tissues except the lungs were all normal. I do agree that if the contamination were from the scalpels or from the stainless steel pans, the autopsy tables in these cases, that one would have expected it to be uniform then you would have higher values in the other tissues as well. The fact that we do not find that is one point that would support the possible exposure of the lung preferentially. This might be an indication of nickel poisoning.

The fact is that nickel was higher in the lungs than in other tissues, especially in one case that was sent to us by Dr. Schumaker and Dr. Pidcoe on August 10.

In one sample, A7652, we found 162 micrograms of nickel per dry weight of the lungs compared to 9.4 and 1.0 in the brain and liver respectively. That certainly raised our suspicions that it might be an inhalation exposure to nickel that would be responsible for the high value in the lungs and not the other tissues.

Mr. RINALDO. Because the other tissues were relatively normal?

Dr. SUNDERMAN, Jr. Correct.

Mr. RINALDO. Assuming for a moment that this is correct, and assuming that your theory is correct, then how could this occur accidentally?

Dr. SUNDERMAN, Jr. The target organ, the tissue which is primarily affected by nickel carbonyl is usually the lung. Characteristically people who die of nickel carbonyl poisoning die of a lung death just as the Legionnaires did.

They may have some liver and kidney damage or some spleen effect, but the damage is principally in the lung. Dr. Baselt and I perform experiments every Friday afternoon in which we are poisoning rats with nickel carbonyl.

We see this week in and week out in autopsies of hundreds of rats, so these findings are consistent with poisoning by nickel carbonyl. I do not know of any other nickel compound that is sufficiently volatile.

Nickel carbonyl is a clear, colorless liquid which boils almost at room temperature, almost 37 degrees, which is very volatile and easily inhaled. It does not have any characteristic odor and can produce these symptoms as my dad already said.

The findings of these concentrations of nickel in the lung tissues of some of these people certainly suggested to us the possibility that they could be poisoned with nickel carbonyl.

We were not able to say that conclusively because some of the control tissues that were sent to us also had increased concentrations of nickel. We do not know where that came from.

Mr. RINALDO. You still did not answer my question. My question is this: If all of your contentions are correct, how could such nickel poisoning have occurred accidentally?

Dr. SUNDERMAN, Jr. There could have been many scenarios.

Mr. RINALDO. In other words, assuming that there was no contamination during the autopsy, and assuming that nickel carbonyl was indeed the cause of death, exactly how might nickel carbonyl exposure have occurred?

Dr. SUNDERMAN, Jr. Inhalation of nickel carbonyl would be the principal scenario—accidental or other—if it were not contamination, they must have inhaled it. The question would be why would they have inhaled it.

Mr. RINALDO. Or, if they did inhale it, where did it come from?

Dr. SUNDERMAN, Jr. That is purely speculative. There have been hypotheses of accidental formation of nickel carbonyl during fires or during a release of nickel carbonyl from say dry ice that might inadvertently have trapped nickel carbonyl.

There have been many things discussed and they are all speculation. To my knowledge there is no proof or evidence to support one possible cause or exposure to nickel carbonyl from another.

Mr. RINALDO. You will not rule out a willful act?

Dr. SUNDERMAN, Jr. No.

Mr. RINALDO. Under the conditions discussed, once again assuming for a moment that your contentions are correct, would you say that the nickel carbonyl exposure was more likely a willful act or more likely an accident? Can you rate the likelihood of either explanation?

Dr. SUNDERMAN, Jr. I do not think I can say; there is a possibility certainly but I know that when one mentions a possibility in the presence of the press it often becomes translated as a probability so I would like to leave it as a possibility.

Mr. MURPHY. If you do not mind yielding, where would a person acquire nickel carbonyl?

Dr. SUNDERMAN, Jr. Purchase it? It is sold from many places.

Dr. SUNDERMAN. There are three prime suppliers of nickel carbonyl. You could purchase it from about 10 different companies. Nickel carbonyl is very readily procured. Our studies on nickel carbonyl were started in 1943 and are continuing. The easiest way to get nickel carbonyl is to make a request to one of the large chemical companies and then to go to their gas fields and obtain a pound and transport it to the laboratory. Of course very careful protection is required against leakage. The matter of procurement is very simple these days.

That brings us to one of the recommendations that I think should be considered and I have those noted in my submitted statement. One of the recommendations is that recognizing the relative ease by which nickel carbonyl can be procured, regulations for its procurement and use should be developed as a safeguard against sabotage and for the protection of the public.

I undertook to estimate the amount of nickel that would kill 16 percent of exposed people. There were 29 out of 177; as I understand it, there were 13 hospitality rooms in use. No records were kept as to the

attendance of these hospitality rooms, but it would appear, at least a statement was made, that one particular hospitality room was implicated more than others.

If you assume that the room was about 50 feet long, 20 feet wide and 12½ feet high, and then calculate the volume, one can estimate the amount of nickel carbonyl by probit analysis of our own data, that would kill 16 percent of rats. This amount would be little over an ounce of nickel carbonyl.

One should recall that nickel carbonyl is a clear liquid; it looks like gin or vodka, and that it is quite volatile and has no detectable odor and leaves no trace of its presence once it has volatilized.

Certainly a half pint of nickel carbonyl in a room the size of a hospitality room would be more than sufficient to cause 16 percent deaths.

Mr. MURPHY. We are talking 16 percent deaths. What about contamination? You had 179 cases?

Dr. SUNDERMAN. It was very noteworthy that none of the personnel of the hotel were involved. As I understand it, the Legionnaires brought in their own snacks and their own liquor.

They had no need for hotel personnel in these rooms. Perhaps that might be one of the factors that might account for the fact that none of the personnel of the hotel were involved.

Mr. RINALDO. I would like to ask Dr. Sunderman, Jr., one more question. A Massachusetts research team headed by Dr. Paul Horowitz of Harvard has been analyzing hair samples of legionnaires' disease victims.

As I understand it, the team has operated on the theory that hair would probably not be subject to unintentional contamination. In any event, although the research team has found nickel in the hair samples, the nickel traces have been uniform throughout.

The uniform traces support the theory that the victim did not receive an extra dose of nickel at any given time. This finding does not really square with your assertion that nickel carbonyl would be the most likely agent.

Dr. SUNDERMAN, JR. When Dr. Horowitz and Dr. Grodziens contacted me early in the epidemic and offered their help, I suggested that they really should pursue this. I encouraged them to do so. I have talked with them on many occasions during the course of the investigation. We have performed hair analyses in our own laboratory and victims of a nickel accident in South Carolina and found high concentration in their samples.

This is still a matter of litigation. There is precedent of oral ingesting in that case for measuring hair nickel as an intoxicant. The failure of the hair analyses to demonstrate consistent localization in Dr. Horowitz's study I do not think negates the possibilities of exposure.

If it were volatile nickel, presumably it would have plated on the hair surface from the atmosphere, rather than have been incorporated after inhalation and have gone into the hair.

You would find diffuse contamination. I am sure that Dr. Horowitz and Dr. Grodziens would agree with that viewpoint.

Mr. RINALDO. I have no further questions.

Mr. MURPHY. Senator Schweiker.

Senator SCHWEIKER. You were asked earlier about the kind of local situation that might have caused the nickel emission, and you referred to the burning of carbonless carbonless paper. Roughly what percent of carbonless paper today uses nickel as an agent?

Dr. SUNDERMAN, Jr. To my knowledge, the Minnesota Mining and Manufacturing Co. carbonless paper comprises approximately 18 percent of the market, I think I was told. These papers contain impregnated nickel rosinate on one surface of the paper.

When you press the paper with a ballpoint pen, it transfers nickel from one surface into a dimethylglyoxin reagent, so a color develops on the second surface.

Senator SCHWEIKER. How great a volume of this paper would have to be burned to cause the kind of thing we are talking about? Would it have to be a large volume of paper?

Dr. SUNDERMAN, Jr. It would probably be quite a large volume. It seems to me it is a matter of concern for firemen who would have to combat a fire say in a warehouse which has large amounts of such papers being burned.

I doubt from the public reports that there was any fire of the magnitude that might have liberated nickel carbonyl to the Legionnaires would be exposed without them complaining of smelling smoke.

Senator SCHWEIKER. What about possible incinerator emissions?

Dr. SUNDERMAN, Jr. That is certainly one possibility and one that was investigated by Mr. Bear, and Dr. Butler of NIOSH early on in the study at my suggestion. I do not believe they found any of the evidence to support that hypothesis. However, I have not received any formal report.

Senator SCHWEIKER. What about batteries? You were mentioning to me that, possibly, contamination could come from batteries, nickel cadmium batteries?

Dr. SUNDERMAN, Jr. Finely powdered nickel is found in some nickel cadmium batteries. That is a possibility. I have not made any calculations as to the magnitude of exposure that could come from consideration of such.

Senator SCHWEIKER. Does nickel become a factor as one element of the dry ice process?

Dr. SUNDERMAN, Jr. Several engineers in the dry ice industry have written to me indicating the possibility that if there was a diesel engine producing dry ice that had carbon monoxide-rich air passing over steel surfaces, during freezing there could be the potential for the formation of nickel carbonyl that then might become concentrated in the dry ice.

That is not my suggestion. It is a suggestion that came unsolicited from several letters. I have correspondence from a representative of the dry ice manufacturers that indicates that is probably an extremely remote and highly unlikely possibility.

I merely mentioned it as an example of the speculations that have gone on.

Senator SCHWEIKER. Did I not read where some kind of plastic material manufacturing process would do it too?

Dr. SUNDERMAN, Jr. I am not aware of that. Nickel is used as a catalyst in various organic chemical reactions but by the time the plastic is made the nickel carbonyl has been oxidized.

Senator SCHWEIKER. Could any part of an air conditioning filter, or any metal element in an air conditioning filter, or any cleaning compound used in processing air conditioning filters be a causative agent here?

Dr. SUNDERMAN, Jr. Not to my knowledge.

Senator SCHWEIKER. You or your father mentioned that you considered both paraquat and nickel carbonyl as possibilities. Why did you select nickel carbonyl over paraquat in terms of eliminating one as opposed to the other?

Dr. SUNDERMAN, Jr. I believe my father made the very good point that paraquat is more severely injurious to the liver and kidneys than the lung. It is extremely irritating if the material is inhaled or ingested.

Most principally I understand there have been careful analyses of excreta and tissues of many of the patients. On the basis of the information that I have received there does not appear to be any evidence of paraquat. That probably would have been demonstrated had it been there. Again, this is secondhand information.

Senator SCHWEIKER. Dr. Sunderman, Sr., you say in your summary something that I think we ought to be apprised of. You mentioned peripherally that if nickel carbonyl was in fact the culprit, you would advise the victims to keep a physical check on themselves because of the danger of cancer developing.

Would you repeat that? I think we owe it to the victims to alert them to the potential danger, if in fact they are not already alerted to it.

Dr. SUNDERMAN. The high incidence of pulmonary lesions in nickel workers has only been known since about 1937. The inhalation of nickel carbonyl, the relation of that to pulmonary carcinogenesis has been the subject of many investigations.

The reason that nickel carcinogenesis had not been detected for so many years was because of the length of time that it takes to develop pulmonary cancer. Some of the nickel workers in Wales, as shown by the studies of Doll in 1958, indicated that 35½ percent of all of the nickel workers died of respiratory cancer as compared to their next door neighbors, the coal miners, about 1½ percent.

Since that time, nickel workers who develop a pulmonary cancer are eligible for compensation in Great Britain. In our own studies on nickel carcinogenesis we were able to induce cancer in exposed rats. The induction of pulmonary cancer in rats is a very severe challenge since the laboratory rat does not spontaneously develop pulmonary cancer. We were able to induce pulmonary cancer in rats by one heavy exposure. If the rat survived the initial exposure, the animal would develop pulmonary cancer in 24 to 26 months after that.

One of our patients with nickel carcinogenesis was a chemical engineer who survived one severe exposure to nickel carbonyl during the construction of an industrial plant. This exposure occurred before the specific antidote dithiocarb was available. Approximately 8 years after this initial exposure our patient developed a pulmonary cancer and died at Jefferson Hospital.

Assuming that Legionnaires' disease might have been caused by exposure to nickel carbonyl, I think that the implication of this type of observation is obvious. Therefore, since pulmonary cancer can develop

in experimental animals after a single heavy dose and assuming that legionnaires' disease was caused by exposure to nickel carbonyl, it is certainly recommended that the survivors of legionnaires' disease be given not only careful physical examinations annually but chest X-rays and pulmonary function studies.

Some nickel workers in Wales developed pulmonary cancer as long as 33 years after exposure, so that perhaps for 10 years or more this type of program should be placed into operation.

We feel that follow-up examinations would be helpful as an aid in the early recognition of pulmonary lesions should they develop. We believe that the Legionnaires should be deserving of these types of observation and study.

Senator SCHWEIKER. How long after nickel carbonyl exposure must the antidote be applied to be effective? How many hours?

Dr. SUNDERMAN. We have studied an exposure in Japan a few years ago where over 100 workmen in Nagoya were exposed to nickel carbonyl and were placed in 13 hospitals in Nagoya. We were asked to send our supplies of the antidote as an emergency measure.

We got all available stores and shipped them. It was about 7 or 8 days after the initial exposure before dithiocarb was received in Nagoya. Some of the workmen were moribund when dithiocarb arrived and the material had to be given by stomach tube. However, there were no fatalities in that group. Approximately 7 or 8 days is about as long as we have given the antidote after exposure.

Senator SCHWEIKER. The trouble is that it sometimes takes that long to determine the symptoms, does it not, except in an industrial situation?

Dr. SUNDERMAN. Most of our observations have been in workmen we know have been exposed to nickel carbonyl.

Senator SCHWEIKER. Dr. Sunderman, Jr., you make a statement in your opening statement that it is still quite possible that we can find out what happened. I presume that nickel analysis of tissues will soon be completed at the Center for Disease Control.

It seems highly possible that these measurements may ultimately substantiate the role of poisoning from nickel compounds.

As I understand your testimony, you are saying that it still might be possible to determine whether nickel carbonyl was the culprit, and you are anxiously awaiting the results of the tests from the Center for Disease Control? Is that accurate?

Dr. SUNDERMAN, Jr. Yes, indeed, sir.

Senator SCHWEIKER. What kind of tests are they doing there, compared to the tests you were doing?

Dr. SUNDERMAN, Jr. Basically similar. Dr. John Liddle who is conducting the test called me Thursday for some advice on the methods. I understand the tests are about to get underway. Some results should be forthcoming from their analysis.

Senator SCHWEIKER. What about contamination of these samples?

Dr. SUNDERMAN, Jr. I really think that the view from CDC—I think they should discuss the samples for test which they have. I really do not know how many samples they have that are free from contamination or what control specimens are available.

I would hope they would be substantial but Dr. Wecht has already discussed the limited number of autopsy materials and limited quanti-

ties of tissues that are available. I expect this may handicap the CDC people just as it did us.

Senator SCHWEIKER. That is all I have.

Mr. MURPHY. What Senator Schweiker has just questioned—would you describe the labeling and type of tissues that were sent to you and just what type of professionalism was involved in it? Who sent them to you?

Dr. SUNDERMAN, Jr. I would be happy to do that but I will ask Dr. Baselt who received the specimens from the medical examiner to respond.

Dr. BASELT. The samples were received from both the medical examiner's office in the city of Philadelphia, Dr. Jane Speaker, who is the toxicologist there coordinating in shipping specimens to us.

They were received also from the State of Pennsylvania Health Department under the authority of Dr. Pidcoe. The specimens were sent in a number of different batches. We received them primarily via air freight although one shipment was sent up by special courier from Philadelphia.

There was quite a range of type of packaging and handling of the specimens from somewhat less than adequate to moderately well performed. I think this is evident from the results which we obtained which showed in some instances and gross contamination in other instances. They seemed as if they behaved as we would have expected them to.

Mr. MURPHY. Did you have any mislabeled samples?

Dr. BASELT. Actually many of the specimens were only given numbers for our purposes. We did not know what they contained so we would not be able to tell you specifically whether there was any mislabelling.

Once we had performed the analysis, we contacted the people who had sent us the specimens and they told us what they represented.

Mr. MURPHY. What about control samples?

Dr. BASELT. We ran our own controls as a matter of course. These were specimens I personally obtained from the medical examiner's office in Connecticut. Also some controls were included with the specimens that were sent.

We were not aware of it at the time that we were analyzing these so subsequently we determined that some of the highest results that we did obtain for nickel concentrations were the control specimens sent obviously representing gross contamination.

Mr. MURPHY. From what would that contamination have been?

Dr. SUNDERMAN, Jr. Again we can only speculate but the use of stainless steel autopsy knives or placing the specimens in stainless steel containers once they had been sampled, storing them in containers which utilized metal tops all present possibilities for contamination, nickel contamination.

Mr. MURPHY. In your statement on page nine, you discuss the condition of the surviving patients, that they are not in such good condition, of course also the fact that evidence we have received indicates that people who suffer or laboratory mice who suffer from nickel carbonyl poisoning do get lung cancer, is there any control or treatment factors ongoing for these people who have survived?

Dr. SUNDERMAN, Jr. My statements were based on the very interesting investigative news report in the Hartford Courant approxi-

mately a week or two ago in which interviews were conducted on surviving Legionnaires which indicated that there were cases of invalidism, that persisted.

I am not aware of the ongoing health surveillance plans of the Department of Health of the State of Pennsylvania or of the CDC. I am sure that they can speak to these. I mentioned that such programs should be evolved to detect the long-term sequelae, such as the possibility of chronic lung disease or hepatic complications.

Many of the people poisoned with nickel carbonyl in industry have convalescences of several months. These are usually very energetic workmen in chemical plants who were previously healthy, whereas many of the Legionnaires were of an older age group at the time and perhaps were more susceptible to whatever the poisons were.

The point I am trying to make is that there should be in my opinion a continuing and well-coordinated surveillance of the survivors.

Mr. MURPHY. Going back to the response to the last question, the nickel contamination of these various tissues, would they have all been the result of contamination of scalpels and containers or tops or what would be the source of nickel contamination?

Dr. BASELT. It certainly looks to us at least that there is a very strong suggestion that the people were exposed to nickel when they were alive because in several of the cases, we found high concentrations in the lungs.

You have to really relate the high nickel concentrations in lungs to the normal concentrations in the other tissues. This suggests nickel poisoning. It is not suggestive of contamination since you would expect all of the samples to be contaminated, assuming they were all handled in the same manner.

There was no reason to believe that they were not.

Mr. MURPHY. Did the lung tissues of the Legionnaires compare with the lung tissues of workers who had been affected by nickel carbonyl?

Dr. SUNDERMAN, Jr. I believe they were in the same range as cases previously studied.

Mr. MURPHY. Is not a 105° fever atypical of nickel carbonyl poisoning?

Dr. SUNDERMAN, Jr. The fever in nickel poisoning complicated by infection is higher than in uncomplicated poisoning. However, we do not usually see nickel carbonyl poisoning in the older age group. In addition, there might have been other factors, such as alcohol.

Mr. MURPHY. How long does it usually take for the symptoms of nickel carbonyl poisoning to become evident?

Dr. SUNDERMAN. The symptoms might be divided into two types, an immediate and a delayed. The immediate symptoms, unless there is an overwhelming dose, are very nonspecific and they are apt to disappear when the subject goes into uncontaminated air, headache, sometimes a little nausea, a little vomiting sometimes but it is variable.

It is sometimes anywhere from 1 day to 10 or more days. Suddenly the patient comes down usually with a constrictive type of symptom, a constriction of the chest, become very short of breath, very weak very fatigued very easily.

Some of them are unable to turn over in bed. Then this goes on to terminal and in many cases, I would say sometimes the symptoms

merge into a delayed symptom very rapidly but from 1 to 10 days usually the symptoms develop.

Nickel carbonyl, although it is probably—it is the most poisonous gas used commercially, the tolerances, although have recently been increased. They were 1 part per billion by comparison hydrogen cyanide is 10 parts per million, a 10 thousand fold greater concentration.

However, unlike cyanide, nickel carbonyl does not kill immediately, it takes about 4 or 5 days before death ensues. I know of no other case except that I was trying to think the other day excepting perhaps plutonium, another chemical that would have the toxicity of nickel carbonyl.

Mr. MURPHY. Data from CDC indicates that there is a significant linear correlation between the time the victim arrived at the hotel and the time the illness developed. This suggests that the source of exposure was ongoing in time.

Is that not inconsistent with the theory of willful introduction of the chemical?

Dr. SUNDERMAN. Restate that please.

Mr. MURPHY. The amount of time exposure at the hotel is indicative that people were in the environment longer than say a person who would inject the nickel carbonyl into a specific room?

Dr. SUNDERMAN. The length of exposure and the concentration would determine to some degree the ultimate effect and toxicity. In other words a longer exposure at a lower concentration might be expected to give the same results as a higher concentration with shorter exposure.

Mr. MURPHY. Would you comment on that?

Dr. SUNDERMAN, Jr. As I understand what you are saying, that is if an individual came on the 22d of July, he was likelier to develop the symptoms prior to an individual who first arrived at the hotel on the 23d?

Mr. MURPHY. The 21st or the 24th is the span.

Dr. SUNDERMAN, Jr. That would certainly tend to contradict the theory of willful introduction, assuming that they were only exposed on one time in one place.

Dr. SUNDERMAN. As I understand it, there was an implication that it probably occurred around the 23d of July; that was the implication or at least the inference I obtained at the Monday meeting at the Bellevue Stratford.

Mr. MURPHY. And the deaths started on the 26th?

Dr. SUNDERMAN. The first reported death was on the 27th.

Mr. MURPHY. How strong a possibility is there that this might have been caused by something that laboratories and medical science have not encountered before? What would be the odds on that?

Dr. SUNDERMAN, Jr. Statistics is the prediction on the basis of past experience, the probability of an event. I do not think you can use statistics to calculate the probability of a hitherto unidentified or undetected event, something that is unknown.

I do not know any way in which you can express the probability of an unknown compound. Certainly there is a possibility of something that has never been identified before that could have caused

these findings. I think that topic was very well covered in a presentation this morning.

Mr. MURPHY. Over 120 days away from this unfortunate incident, it would be safe to assume then that the causative agent no longer exists in a toxic form in the environment in the area. There have not been any cases of secondary infections.

Dr. SUNDERMAN. And there is no evidence of contagion.

Dr. SUNDERMAN, Jr. It seems like a reasonable inference.

Mr. MURPHY. Did the epidemiological search include research into recent hospital records in Philadelphia to see if some of the symptoms were noted in patients prior to the legionnaires' disease?

Dr. SUNDERMAN. I do not know of any but I am not the one to ask. I think that question should be referred to the CDC group perhaps. I do not know of any.

Mr. MURPHY. Are these other questions?

Thank you very much. We appreciate your comments, and testimony. The next witness is Mr. Lorne Cook of Cook Associates, Hockessin, Del.

STATEMENT OF LORNE COOK, OWNER-MANAGER, COOK ASSOCIATES, HOCKESSIN, DEL.

Mr. Cook. Before I get into reading my report, I would like to enter into the record the issue of October 10 of the Philadelphia Magazine regarding the legionnaires' disease.

Mr. MURPHY. This is a news article?

Mr. COOK. Yes; it is.

Mr. MURPHY. How long is it?

Mr. COOK. It is quite long. The reason I request this is because the people did a lot of the legwork for my investigation because I could not get hold of it myself. I was completely barred from getting any particular information that I required.

Mr. MURPHY. Without objection, the article referred to will be examined by the staff and placed in the record at their recommendation.

[The article referred to may be found in the subcommittee files.]

Mr. COOK. I am an independent consulting chemist qualified by the courts in four States as an expert in chemistry and hydrometallurgy and related areas of technology.

My professional career covers 27 years of experience at junior and senior levels of technical executive management in a variety of industries as an analytical chemist, engineer, and hydrometallurgist.

I am a university graduate in chemistry and biology with post-graduate work in medicine, histology, and physiology.

Currently, I am the owner-manager of Cook Associates and Avon Ridge Laboratories and the president of Aldorado Chemical Services, Inc. Cook Associates is a consulting agency specializing in technical investigations for the insurance and legal professions and analytical expertise.

Avon Ridge Laboratories is a commercial laboratory engaged in the testing and analyses of various materials and products. Aldorado Chemical Services is a research and development company specializing in the design of equipment and development of processes to treat and recover valuable materials from industrial wastes.

I might add that I have handled in the past in my role as president of Aldorado Chemical Services, a considerable amount of wastes of nickel carbonyl and other nickel products.

Since my vocation and avocation for the past 20 years has been the solving of complex technical problems, the mystery surrounding the Legionnaires' disease presented a challenge and prompted me in the first week of August to initiate, at my own time and expense, an independent survey of the circumstances related to a common illness that was responsible for 25 deaths, and the hospitalization of 130 people by August 7. Most of the people involved in these statistics had attended the Pennsylvania State Legion Convention held in Philadelphia on July 21 to 24. I conducted my studies of the causative factors of the Legionnaires' disease during the period August 1 to November 15, using data derived from news media, radio, and television reports, medical, chemical, and refrigeration textbooks, personal experiences, and knowledge common to my profession.

The results of these investigations indicate that there was a logical and realistic explanation of the Legionnaires' disease based on simple textbooks chemistry and medical toxicology in conjunction with malfunctions in the air-conditioning and ventilating systems in an area where large numbers of Legionnaires had congregated for their meeting and social activities.

Early in August, my review of the environmental and living conditions during the period of July 21 to 24 of legionnaires that had died or were ill in the first part of August, revealed that the only condition that was common to all of them was the fact that they had all breathed the same conditioned air within the same confined area. This indicated that the mode of entrance of disease mechanism into the body was through the respiratory tract and mucous membranes in the form of airborne pathogens or chemical toxins. I immediately eliminated airborne pathogens, such as swine flu as the source of the problem because the epidemiology of the Legionnaires' disease was not consistent with past histories of epidemics of bacterial or viral infections.

With the elimination of ingestion and pathogens, poisoning by airborne chemical toxins appeared to be the only logical and plausible cause of the Legionnaires' disease to be considered. A comparison of the symptoms of the disease exhibited by the Legionnaires prior to their deaths with the toxicology of numerous chemicals listed in chemical and medical reference books, reduced the number that could be involved in the poisoning to a small group of metals and their compounds and halocarbons and their derivatives providing the chemical or chemicals were not intentionally added to the ventilation or air-conditioning system in an act of sabotage.

Of the metal group, the toxic effects of nickel carbonyl agreed very closely with the symptomology of the disease. However, my professional experience as an extractive metallurgist in separating nickel from other metals by the carbonyl technique, prompted me to discard the possibility that nickel carbonyl was the source of the chemical toxins, as suggested by a number of experts, because the production of nickel carbonyl is a slow reaction and must be carried out under precise conditions in an atmosphere of carbon monoxide. The burning of papers coated with nickel compounds under oxidizing conditions

would not produce nickel carbonyl under normal circumstances. If nickel carbonyl was produced under the abnormal conditions in a deficiency of oxygen during the burning operation, it would oxidize immediately to nickel oxide on contact with the air.

I would like to add that nickel carbonyl is a highly flammable material. You have to use great care in handling the material especially—it has to be refrigerated and kept below approximately 50° C. in order to keep it in solution. If you go above this level of temperature, it goes into a gas form; 50° C. is in the neighborhood of about 108, 110° F.

With the elimination of the metal group of chemical toxins halocarbons and their derivatives became the prime suspects as the cause of the legionnaire's disease. A review of the toxicology of halocarbons, such as methylene chloride, methyl chloride, carbon tetrachloride, chloroform, and carbonyl chloride, phosgene, listed in text books such as "Dangerous Properties of Industrial Materials" third edition, editor, N. Irving Sax, published by Reinhold Book Corp., indicated that the symptoms of poisoning by these compounds by inhalation are very similar in the early stages to the morning-after effects of a heavy ingestion of alcoholic beverages.

The symptoms of the later stages of inhalation poisoning by phosgene— CCl_2O —showed a marked similarity to symptoms exhibited by Legionnaires prior to their deaths. Phosgene is a member of a group of chemical compounds listed under the common name of phosgene with different chemical formulas and physiological actions on the body.

The Army FM3-9/Air Force AFR 355-7 Field Manual "Military Chemistry and Chemical Compounds" lists four members of the phosgene family and its description of the toxicology of phosgene, carbonyl chloride, is very similar to the symptoms displayed by the afflicted legionnaires.

In my investigation, I attributed the early rejection of phosgene by Government investigators as the causative factor in the legionnaires' disease to failures in some reference texts on chemical toxicology to describe the various members of the phosgene family and define the differences in their physiological effects on the respiratory system.

Statements by the Government investigators that the chemical toxin could not have been phosgene because there were no immediate indications of irritation of the eyes, throat and respiratory system indicate references to the toxicology of diphosgene ($\text{C}_2\text{Cl}_4\text{O}_2$), phosgene oxime (CCl_2NOH).

Phosgene (CCl_2O) is not lacrimatory and is an insidious poison gas since there is no immediate irritation to the eyes, nose or skin at lethal levels of this compound in the air. This point is emphasized in the military field manuals and handbooks on the subject of phosgene poisoning. In addition, the discrepancies between the lung conditions found in the deceased legionnaires and the descriptions in reference text books on the subject, was used by the Government investigators to discount the theory that the inhalation of phosgene was responsible for the legionnaire's disease.

It is obvious from these statements by the Government's experts that military information on phosgene poisoning was not recognizable to civilian doctors or not readily available to the people involved in

the medical investigation. It is difficult to understand why the military data was not used in the investigation because most of the military reference books on the subject are unclassified.

By the third week of August, it was apparent from the data that I had developed that halocarbons toxins and the air conditioning and ventilating system in the area where the legionnaires had congregated for their meetings and social events were the major factors to be considered in determining the cause of the legionnaires' disease.

The source of the halocarbons was not difficult to find. The majority of large commercial air conditioning units in operation employ halocarbons in the refrigerating units to chill the water used in cooling the air. The majority of large commercial air conditioning units in operation employ halocarbons in the refrigerating units to chill the water used in cooling the air.

In the earlier installations, a halocarbon designated as fluorocarbon 11 (F11) was employed as the refrigerant and is still used in many of the older and obsolete units. I believe again it is still used or was up until 2 or 3 years ago to clean out initially the other refrigerating circuits when they are going to use the other different types. In later developments of the air-conditioning industry, F11 was replaced by fluorocarbon 12 and fluorocarbon 22. F11 and F12 are manufactured simultaneously by reacting carbon tetrachloride with hydrofluoric acid.

Separation of F11, F12, and residual carbon tetrachloride are carried out in secondary and tertiary stages of the process. The level of purity of the marketed fluorocarbons is dependent on efficiency of the separation process and the efforts of the manufacturer to produce and sell a high purity product through the maintenance of a rigid quality control program. Inadequate control of the process will produce a number of undesirable halocarbon side products. Reduction of the carbon tetrachloride during the reaction produces chloroform. Chloroform is easily oxidized to phosgene by air and sunlight or ultraviolet light. Carbon tetrachloride in contact with water and flames or hot metal surfaces will produce phosgene through the reduction of carbon tetrachloride to chloroform.

Reducing agents, other than metals will also react with carbon tetrachloride to form phosgene. This is the reason that carbon tetrachloride has been banned as a fire extinguisher.

Monofluoride fluorocarbons are known to be unstable. F11 (CCl_3F) is a monofluoride and is easily decomposed by low temperature pyrolysis into a variety of halocarbons, hydrochloric acid, hydrofluoric acid and phosgene.

F12 (CCl_2F_2) is stable up to 1,050° F. Above this temperature it can be pyrolyzed to produce compounds similar to the decomposition products of F11.

In addition to its reactions with heat and water to form phosgene external to the refrigeration circuit, F11 is subject to decomposition within the circuit itself by reacting with oil additives, refrigerant impurities and cooling water that may have leaked into the circuit through the condenser. The speed of these decomposition reactions would increase significantly if high temperatures and high pressures developed in the compressor discharge and the condenser due to low flow rates of cooling water relative to the refrigeration load.

Cooling water leaks into the condenser would bring treatment chemicals, such as dichromates or amines in contact with the F11 and catalyze the decomposition reactions. F11 could also be decomposed external to the refrigeration circuit by leaking into the atmosphere in the refrigeration room and reacting with the ozone produced by the large electric motors on the pumps and compressors.

This reaction is similar to the reaction in the upper atmosphere that we read about in the newspapers every day with the NAS. We got into the destruction of the upper atmosphere by aerosols and the aerosols contain F11 and F12, a reaction with ozone produced by the motors is exactly the same reaction, the same type of reaction going on as in the upper atmosphere.

The breakdown products are similar in the upper atmosphere. The final one would be chlorine from the halocarbons, so essentially it is the same thing.

By the end of August, my investigations had defined the Legionnaires' disease as phosgene poisoning and established that the refrigerant, either F11 or F12, in the air-conditioning unit or units was the probable source of the compound through a decomposition involving heat and water in the atmosphere or an internal reaction within the refrigeration unit.

On August 13, the National Information Service, on FM 98 in Baltimore, reported that an autopsy report of deceased legionnaires indicated that the lungs looked like Brillo pads—burned—and the bodies contained a fluorocarbon residue.

The presence of fluorocarbons in the bodies indicated that the legionnaires had inhaled fluorocarbons and their decomposition products.

The mechanism of the decomposition appeared to be related to smoking. Sixty-six percent of the legionnaires were smokers. Lighted cigarettes, cigars, and pipes burn at temperatures of 1,200 to 1,400° F. and generate sufficient to decompose either F11 or F12. The tendency of F11 to decompose under smoking conditions would be an order of magnitude of 50,000 or 100,000 greater than F12.

If 750 people were smoking cigarettes and 250 were smoking cigars over a period of 8 hours within a confined space, it would be equivalent to passing all the air in the room through a pyrolytic reactor 5" by 48" with temperatures ranging from 1,400 degrees to 100° F.

In September, inquiries by the Philadelphia Magazine established that the refrigerant used in the air-conditioning circuit was F11.

The textbook "Dangerous Properties of Industrial Materials" indicates that 25 ppm, volume basis, is dangerous at 30- to 60-minute exposure and 50 ppm is fatal. If F11 was completely decomposed into phosgene, the presence of 2.9 pounds of F11 in a room 200 x 50 x 30 feet for 30 to 60 minutes would be dangerous. If there was 10-percent conversion to the F11 to phosgene, the presence of 28.8 pounds would be dangerous and a 1-percent conversion would require 288 pounds of F11 in the room to reach the danger level.

Early in October, official reports indicated that two refrigeration units with 600 and 880 ton of refrigeration capacity were in operation during the Legion convention. Standard texts on refrigeration indicate that the refrigerant effect of F11 operating at 95 degrees to 48° F. would be approximately 65 to 70 Btu/min.

This figure calculates a refrigerant flow of approximately 3 pounds minimum per ton of refrigeration. The refrigerant flow in a 600-ton unit could be as high as 1,800 pounds per minute. In the 800, it could be 24 pounds per minute.

A one-half percent leak at these flow rates could provide sufficient F11 to cause dangerous levels of phosgene in the room where the Legion held its meetings. On October 20, 1976, David Fraser of CDC, in a report to the American Public Health Association, indicated that the 800-ton unit was leaking F11 at the rate of 300 pounds per month. In the same report it states that there was only 20-percent fresh air makeup in all units and the air in the lobby area was 100 percent recirculated. In September David Fraser reported to the Philadelphia Magazine that there was no indication of any leak in the air conditioning circuits.

At the same time, another member of the CDC investigating team told the magazine that there was a leak because he noticed a lot of cans laying around the refrigerating equipment. Here we have a significant conflict in information reported by two members of the same department of CDC.

I would like to add, as far as the ventilation system goes, the NIOSH report states that the ventilation system for the lower floors of the hotel were located in the subbasement of the hotel. It also states that the compressor was located and refrigerating machines, which includes a very large condenser, was also located in the same area. The NIOSH report also indicates that the compressor, in case of leaks, the compression, it went up to the second floor in close vicinity to the ballroom and I think it was on the second floor of the hotel.

It is recognized that much of the data presented in this letter is based on theoretical calculations and unsubstantiated news media reports. However, the preponderance of evidence strongly suggests that the causative factor in the legionnaires' disease was phosgene poisoning derived from the leaks in the air-conditioning system.

It is my recommendation that the military be consulted on this issue since they are the authorities on the uses of refrigerants in confined spaces.

The Navy and Space Center research programs should have an extensive file of information on the decomposition of refrigerants and the physiological effects on phosgene.

I would like to add that the Navy in many cases has been aware of the lethal effects of refrigerants. I think if the committee and whoever is interested in the documentation to support my statement here, if they will go to the Navy or Army, I think they will be able to pull much of the data to which I have referred here out of testbooks and records.

Mr. MURPHY. Mr. Cook, when someone inhales phosgene we were told there was immediate reaction resulting in some respiratory irritation, yet there was no apparent upper respiratory irritation among the Legionnaires?

Mr. Cook. I think I explained that. One of the phosgenes, the garden variety type, CCl_2O does not give any indication like this, neither do the military reference books, to which I referred, say that there is any. It is specially underlined that this does not exist.

It may be 2 or 3 days before minor systems develop on low levels of poisoning.

Mr. MURPHY. Does phosgene usually produce a fever?

Mr. COOK. Usually it will not produce a fever per se. It has not in my particular case. The fever generally results from pneumonia. I have not been poisoned, but I have inhaled phosgene on numerous occasions. It has not produced any fever when I have inhaled it. The reason that I have inhaled is that I have done a lot of testing work in analyzing aerosols for their contents and I have to be very careful that I do not liberate the phosgenes when I am breaking them down. In the many cases that I have inhaled phosgene, I have never noticed anything unusual. Of course the odors in the lab would cover up any particular smell. I have never had any irritating effects from it. I have had a lot more irritation from hydrochloric acid and nitric acid than what I have had from phosgene. The only way I can tell that I am inhaling a refrigerant is if I am smoking a cigarette and a bad taste develops in my mouth. If you are inhaling phosgene, it also makes your mouth very dry and reaction to this type of sensitizing is different in a lot of people. With me, it is very sour and very dry. To a lot of others it tastes like a metal. I am not the only person who uses cigarette smoking to indicate refrigerant leaks. The Navy uses this technique in their submarines. Leaking refrigerant is more sensitive to detection by a person smoking than it is by the most sensitive electronic detectors. In addition, when a very large company was using phosgene in an industrial process, they made sure that all of the people they recruited for the work were all smokers for rapid detection of phosgene leaks.

Mr. MURPHY. Mr. Rinaldo?

Mr. RINALDO. Mr. Cook, it is my understanding that phosgene poisoning generally takes effect within 12 hours of exposure. Is that correct?

Mr. COOK. Not according to the military textbook. Low levels could be more than that. I can probably answer your question by making reference to some of the newspaper media which I have with me here.

I quote from the Newsweek of August 16, 1976. "As the convention wore on, however a number of empty places began to turn up at the breakfast table. Some of the cause of morning malaise and the buildup did not seem to respond to the eye opener or little hair of the dog. Some normally sturdy Legionnaires developed dry mouth and complained of feeling a bit feverish." This is at the exact time the convention was on.

Others felt chest pains, Craig Britton, 61, lost his appetite, did not go out at night, seemed tired on the drive home and came down with a case of the chills during the weekend and 2 days later he was dead.

This is what I referred to in my formal statement. A lot of these people at the time of the convention were showing the initial signs of a low level poisoning of phosgene.

Mr. RINALDO. I received a figure from a CDC report that phosgene poisoning generally takes effect within 12 hours and that is why I brought it out.

Mr. COOK. I would not call this an exact report but these are on-the-spot interviews that Newsweek had taken. It is very clear to me that these people showed signs of phosgene inhalation at the very time the

convention was going on probably in the 12 to 16 hours to which you have referred. They had symptoms of early phosgene poisoning because they indicated that they were feeling chest pains, were feeling terrible, had dry coughs, and started to get a little feverish. This was during the time the convention was in progress. I would say probably in the July 23-24 area.

Mr. RINALDO. Did not most of the Legionnaires' disease reveal itself during a period of 3 to 8 days afterward?

Mr. COOK. These were latent periods after the preliminary symptoms. One of the proponents of the phosgene theory, Dr. Norman Runsdorf, is in the audience. I am sure that if the committee would like to call on him, he would be quite happy to explain the exact medical details associated with these latent periods.

In his report, in the Philadelphia Magazine, Dr. Runsdorf states that his reference books indicate that the initial symptoms may be only minor chills or a runny nose and that is all. Nothing happens for 3 or 4 days and after that they come down with the real severe symptoms of phosgene poisoning.

Mr. RINALDO. How would you refute CDC airflow studies which show any leaking Freon being blown by a fan exhaust through a vent that empties out into the street?

Mr. COOK. I cannot refute that it was exhausted into the street because I have never been in the hotel, but let me point out that in one of my remarks to the committee in my formal statement I indicated that a NIOSH report stated that the ventilating equipment in the sub-basement, not in the exact location, but in the same area as the compressor, was used to recirculate the air on the lower floors of the hotel.

This indicates to me how the Freon could get out of the subbasement into the hotel. The only other way the Freon could get there is through the fresh air makeup system. They also state that in the area of the lobby there was 100 percent recirculated air and that the other units had 80 percent recirculated air.

Mr. MURPHY. Go ahead.

Mr. RINALDO. If there was a leak of Freon by the air-conditioning system, under what conditions would the leaking Freon have generated phosgene gas?

Mr. COOK. I have outlined a number of ways that this could happen earlier in my statement. I favor the smoking of cigarettes in the ballroom or the lobby as the most probable conversion system. There is another way that I told you about. Phosgene could have been generated in the area of the compressor and brought up and out to the ballroom by a vent. We have to remember that we are dealing with an air-conditioning circuit that is particularly difficult to operate. The codes for an F-11 circuit calls for a 30-psi relief device on both the low and high side of the circuit. The saturation temperature for 30 pounds psi of F-11 is 120° F. You have up to 120° F to play with before the safety valves open up. You must remember that it was a hot day and extra cooling water would be required to remove the excess heat in the hotel. About 5 to 6 thousand gallons per minute would be required to maintain an adequate cooling. If this rate is reduced, the circuit overheats and the water temperature may exceed 120° F. There may be as much as 1,800 lbs of fluorocarbon per minute moving through the circuit. If the safety valve opens up, the fluorocarbon will

flow up the vent to the outside the second-floor level and into the circulating fresh air venting system, pass through smoking cigarettes, and into the lungs. This is probably the logical way for entry of the fluorocarbon into the hotel and lungs of the victims. Somebody found Freon residues in the lungs. I do not know who it was, but it was definitely reported in an autopsy report given to news media on an FM station in Baltimore. This indicates that fluorocarbons had been inhaled, not nickel carbonyl. There is a simple explanation for the presence of nickel in the lungs of the victims. If you had nickel metal dust in the air from either corroded filters or stainless steel valves or ducting, it would cause the same analytical results as nickel carbonyl because you would find nickel in various tissue due to the inhalation of nickel containing dust from the corroded metal.

Mr. RINALDO. I have no further questions.

Mr. MURPHY. Senator Schweiker?

Senator SCHWEIKER. I have no questions.

Mr. MURPHY. The next witness will be Mr. Chiavetta.

**STATEMENT OF GEORGE B. CHIAVETTA, HARRISBURG, PA.,
ACCOMPANIED BY RICHARD FRIEDMAN, ATTORNEY**

Mr. FRIEDMAN. I am Richard Friedman, an attorney from Harrisburg.

Mr. CHIAVETTA. I just want to relate an incident that I would like to bring to light. I made some notes. On Wednesday, July 21, we checked in at the Holiday Midtown. We walked up to the Bellevue Stratford to browse around and to watch the other Legionnaires checking in and out. We were in the hotel lobby. I went out to the front desk for a smoke, this was approximately 1 p.m. to 2:30 p.m., Wednesday afternoon.

As I looked around, I stood on the steps, there was a man in a bright, royal blue suit, single breasted, light brown hair, straight, parted on the right side and combed down toward his left eye.

He had a receding forehead, light skin, about 38 to 45 years of age, approximately 5'10" to 6' tall and had a thick lower lip. This man was mingling among the crowd on the sidewalk and appeared to be saying things directed at the Legionnaires.

For example, he said, "It is too late now, you will not be saved." Later I was told by another Legionnaire that he also said Legionnaires are doomed or something to that effect. He was very neat in appearance, I saw him smoking and diplomatic and a slight waving of his hand as he made those remarks. He looked as though he had a piece of scripture rolled up in his hand.

At the time, I really did not pay too much attention to him. I do not recall if he was alone or with anyone else. That happened on Wednesday afternoon. On Wednesday evening after the opening ceremonies, I again left early and stood on the pavement next to the tree stand which was in front of the hotel.

This was approximately 7:30 to 8:30 at night. I again saw the man in a royal blue suit milling around the pavement talking or attempting to talk to various Legionnaires. Again I do not remember if he was alone but I do remember I saw him earlier in the afternoon and then some of my friends came out and we went back to our hotel.

Thursday, I do not remember seeing this man. I cannot recall seeing him at all on Thursday. On Friday—this was July 23—about 10:30 p.m., my wife and I left the Holiday Inn and went to the Bellevue to visit the 19th district hospitality room.

As we walked up the Broad Street side of the Bellevue steps we were approaching and entering a right entrance to the hotel when I noticed the man in the blue suit was coming out of the inner door of the hotel.

He had on the same blue suit he had on Wednesday. As we passed each other, and went into the doors, I quickly advised my wife that this man was maybe some sort of a nut or something, just to be careful because I recalled seeing him.

I turned my back slightly to the man so that my wife would pass without him brushing her. I looked at his face, he looked glassy eyed and his face was flushed. That is also when I noticed that his necktie was twisted. I took a quick glance at him.

I also noticed that he appeared to have an item that resembled a tobacco pouch that was ready to fall out of his inside right coat pocket. It also appeared that a light or thin plastic string coming from the pouch was entangled around his necktie and could have led to his right hand which was holding what resembled a piece of literature rolled up.

After my wife and I passed through the doors, I mentioned to her that a big city of Philadelphia's size has a lot of these people around and I had seen him before. The incident was forgotten and we proceeded to the hospitality room.

Later when the news of the illness began to be known I asked my wife if she recalled seeing a man in a bright blue suit as we entered the hotel and she did remember. We discussed it.

I also discussed it at the American Legion Post when we were filling out the health board questionnaire. On the 9th of August, I called a friend of mine, a detective, and met with him and related what I have just mentioned to the committee.

He believed me and said he would report it to the health department, he did and never got a reply. In early August, I received a phone call at work and I was not at my desk. At that time I was left a phone number to call a Mr. Calvin Edmonds of the State Health Department.

I returned the call and was advised to call back later in the evening. About 7:30 p.m., I called Mr. Edmonds and he asked the same questionnaire as I had filled out previously at the Lawton Post.

When he asked question 23, which is "describe anything unusual which you think may be related to the illness." I must mention here that I did have an extra copy of the questionnaire at home at the time I called him.

I said I saw two young boys selling bags of ice in the elevator in the rear Friday afternoon about 2:30. He replied that he thought that was interesting. I also asked him did you people check out the man in the blue suit in the front of the hotel.

He replied oh, yes, we checked him out, don't worry about him, he is clean, so I had assumed that the detective to whom I had gone had made his inquiry. They checked it out and I just questioned.

On the 14th of September I went to the 19th district meeting in Lebanon, Pa. I requested another Legionnaire to ask the people at the meeting if they recalled seeing the man in the blue suit and would they

please give me their name as I would like to have it for myself. I did receive four other names. Should I read them to the committee?

Mr. MURPHY. Please.

Mr. CHIAVETTA. The names I received, the people who saw the same person I saw, Mr. Alex Banks, 1802 North 6th Street, Harrisburg; Mr. and Mrs. Fred Wagner from Humelstown, Pa., they have an unlisted number but are at Post 265.

This couple saw the man in the blue suit in Commander Joey Adams Hospitality Room sitting on a window sill. Another was Mr. Thomas Payne from Chippensburg, Pa. He was in the hospital with a temperature of 105.

He said he recalled the man and he was going home to think about it. There was another man, A. Trune Castle, he is our post adjutant. He said he did hear the man say Legionnaires are doomed but he could not describe him as anything but a crackpot.

I thank you very much for letting me submit this testimony.

Mr. MURPHY. Thank you.

Mr. RINALDO. As you know, I have to leave in a few minutes to get a plane back to Newark. To the best of your knowledge, did anyone to whom you reported this investigate this matter?

Mr. CHIAVETTA. To the best of my knowledge, no, sir.

Mr. RINALDO. Did anyone else, to the best of your knowledge, observe the apparatus, the pouch and the tubing?

Mr. CHIAVETTA. Not to the best of my knowledge. I was the only one who saw that.

Mr. RINALDO. Thank you.

Mr. FRIEDMAN. If I might interject, your office was the only one that followed up this to any degree whatsoever or to talk to Mr. Chiavetta.

Mr. MURPHY. Did you or your wife get a fever or become sick?

Mr. CHIAVETTA. I did go to the hospital, my wife, my son and myself. I had a 99 degree temperature and she carried—I usually have a low temperature but hers was up to 97 or something.

I believe the hospital made the determination that if you had anything less than 101 they sent you home but if it went up to 101 then you were to come back to the hospital.

Mr. MURPHY. Did you get any diagnosis?

Mr. CHIAVETTA. No.

Mr. MURPHY. From the hospital or the doctor?

Mr. CHIAVETTA. Other than what they gave to Sarah which I have just told you. We had X-rays, blood sample, and they took our temperature. They isolated us until this was done.

Mr. MURPHY. Do you have a copy of that?

Mr. CHIAVETTA. Yes. I know in thinking over how could Legionnaires only get the sickness, I wish you would also consider maybe I did not get it because at no time did I wear my hat unless I was in the convention center session.

There was no way you could identify me as a Legionnaire unless I was wearing a hat or a delegate badge. I could be down on the sidewalk, inside the hotel or anywhere unless I was in the Legion Convention session.

Mr. MURPHY. Thank you. Our concluding witness is Ms. Estelle Ingenito, Ph. D., Havetown, Pa., a medical research scientist for the Commonwealth of Pennsylvania.

**STATEMENT OF ESTELLE F. INGENITO, PH. D., MEDICAL RESEARCH
SCIENTIST, COMMONWEALTH OF PENNSYLVANIA**

Ms. INGENITO. I cannot very well listen to the document and story without getting a little bit shaky. We have heard some very excellent presentations this morning and this afternoon.

I would simply like to reiterate some of the points into which I was going to go in detail but I do feel that because of the hour and because they have been said so beautifully, I will simply refer to them as a matter of stressing these needs.

First and foremost, we must all realize that hopefully from all of this tragedy, we are going to be able to develop some much needed cooperative efforts in the field of medical research and clinical and medical medicine.

Second, we have to also stress the fact that it is very important for us to not forget there is such a thing as a scientific method that we must not come to conclusions when we are faced with such a tragedy, look into this and perhaps weeks or days later, maybe too late as we will see with paraquat, look into other possible areas.

We have to get the Federal, State and county levels of all State government agencies functioning and working together and cooperating. I do not think this one point can be said too often.

I think Dr. Sunderman, Jr. said this very beautifully and I am not going into the recommendations he made because what he has said is very similar to what I was going to say.

Let us remember the tragedy of thalidomide through which we were able to utilize tragic facts to be sure but we learned something about human embryology, we have learned something about the etiology of birth defects and hopefully through this tragedy we can at least say that some Legionnaires have given up their lives and have thereby been able to do something constructive in the development of all the cooperative efforts that we have talked about earlier today.

I am now with the Governor's Council on Drug and Alcohol Abuse. I am presently establishing a toxicology laboratory for the Commonwealth of Pennsylvania within this particular agency.

I feel very sad that because of various delays that none of us have been able to control, that this laboratory is about one or two months away from actually functioning. Very sad, because I do feel that although this laboratory will be particularly for drug and alcohol abuse determinations, that we will be doing a lot of research and hopefully will be able to function, participate and be very constructive in some of the advice and help that we can give out if unfortunately a similar tragedy arises.

I have known of particular cases of accidental death due to paraquat. These two individuals happened to be drug addicts who bought street drugs and thought they were buying something that was going to make them feel real good.

Instead they died. I am therefore very much alerted to paraquat. I am very much alerted to the accidental use of paraquat. I am not going to talk about paraquat as a suicidal agent which is being written up in all of the journals today because the amounts taken are abnormally high.

We are concerned with kinds of concentrations that might have been present in food or drink within the rooms occupied by various members who attended the legionnaires' convention in the Bellevue Hotel.

I think we have just heard from someone who attended and was in the rooms. Throughout the course of my establishing this laboratory, I have been very much involved in the investigation of methodology for toxins.

I was very much concerned that the actual search for toxins did not start immediately. I assume that those who were doing the studies had their plans and that the toxicologists would be brought in at the proper time.

I have learned today that perhaps this may have been a little bit too late. Paraquat is a water soluble substance. It contains two pyridene rings, methylated rings. It is what we call an ordinary ammonium salt.

It is because of its very structure with chloride ions that it becomes very soluble. To the best of our knowledge paraquat is not metabolized in the body. It is ingested and goes through the whole toxicologic spectrum of absorption, dissipation or distribution throughout the body and excretion.

Herbicides of which paraquat is a component are generally far safer than some of the insecticides that we have on the market and are currently used in much greater quantities for that purpose.

One member of a series of herbicides, however, paraquat, nevertheless has a peculiar, sinister distinction. As far as can be definitely ascertained, no adverse effects have resulted from its proper use in conformity with the official instructions.

However, if deliberately or accidentally taken by mouth it can be catastrophic even in small quantities. It is the only bipyridylum compound among a number developed as herbicides that develops these outstanding toxic features.

The others which we have often heard about such as diquat, and morfamquat, though chemically very similar are much less noxious.

The acute lethal dose of paraquat in laboratory animals ranges from 30 to 50 milligrams per kilogram of applied weight. That in man is judged to be rather more than 40 milligrams per kilogram.

For an adult this is equivalent to a dose of only two to three grams of the pure substance or 10 to 15 milliliters of the commercially marketed 20 percent concentrate.

This material is available in any hardware store, sometimes it is called Ramoxzone.

Usually it is diluted and used as a herbicide in those particular areas where it is intended. Initially it gives rise to ulceration of the upper part of the alimentary tract but recovery from this is usually spontaneous, over the course of a few days.

Rarely is there vomiting or diarrhea at this point but then despite a systematic absorption, there is only one to 5 percent of the total oral dose, there may be signs of transient hepatic, renal, and myocardial damage which tends to resolve on its own.

I think these points are very, very important, that these effects happen and take place in the body and without any rhyme or reason they revert back to normal. Subsequently pulmonary changes appear, with

at first a diffuse mottling of the lungs radiologically, progressing to consolidation.

Pathologically, at first there is alveolar exudation leading to fibrin deposition, together with peribronchial oedema. This gives way to increasing cellularity, proliferation of the lung tissue with alveolar cell and peripheral broncheolar proliferation and ultimately intense and generalized fibrosis.

Once the pulmonary change has started, there is seldom any restitution though this occasionally occurs. The characteristic course is overwhelming pulmonary insufficiency and death by respiratory failure, ironically being aggravated by oxygen administration.

I have documentation for these findings. I do recall the two drug ethics I have mentioned to you because these were the symptoms that they exhibited.

Most of the absorbed chemical is rapidly excreted in the urine unmetabolized, though a small amount continues to be eliminated over several days in some individuals. A treatment scheme has to be formulated against this background.

Oral administration of an absorbent such as bentonite as soon as possible after ingestion of the chemical has been urged with the intention of suppressing uptake from the gut. This has to happen immediately.

In belief that accelerating of the removal of the chemical from the body might minimize the subsequent complications, forced diuresis and hemodialysis have been adopted as methods of treatment when we have diagnosed that in fact this toxin is present.

There is no objective evidence that this is really efficacious at all times, the rapidity and intensity of the pulmonary abnormalities are related to the concentration of inspired oxygen, yet to withhold oxygen in the face of advancing cyanosis seems a negation of therapeutics.

There are various chemical substances which have been recommended for use in the therapeutic modality for treatment of accidental ingestion of paraquat but again including corticosteroids, these do not always function properly.

Fortunately not everyone who takes paraquat by mouth, whether by accident or by intent, manages to ingest a sufficient quantity to prove lethal. Even if the scope for treatment is very small it may be enlightening to the clinician if he can reliably assess the prognosis.

In this connection, there are urine tests to determine excretion and thus, by inference, systemic absorption can be valuable if not infallible and we have discussed some of the actual urine color tests this morning. I will not go into the details of those tests.

In summary then, we can say that there might be three distinct phases that can be distinguished in the evolution of the paraquat poisoning: an initial phase of 2 to 4 days without specific poisoning symptoms but with some kind of gastrointestinal irritation; a second phase with infection of the pharynx, gastrointestinal ulceration may be present, inflammatory processes in the lungs, liver damage, with jaundice usually, and acute renal insufficiency.

The final stage with proliferative changes in the lungs, lung fibrosis, parenchymal hemorrhages, and lung edema. The fibrosis is what may lead to death due to general hypoxia within 3 weeks.

We have heard some statements about increased body temperature in some of the individuals who came down with this respiratory dis-

tress. I think a few words in terms of regulation of body heat are necessary.

I do not know how much reliability we can really place on body temperature per se. We all have usual body temperatures of 98.6 which is recommended and so called normal but there are some of us who occasionally have lower body temperature.

There are some of us who can have the flu and never have any kind of increased body temperature. The constant body temperature simply means that the regulatory processes of the body are in such homeostatic relationship to each other that heat production by physiological oxidations and heat loss are really in symbiosis and planning together.

If we do have an individual who exhibits fever, elevated body temperature, it is due mainly to the interference with heat loss and interference of the equilibrium between heat production and heat dissipation or heat loss in the body.

Viruses, bacteria, toxins are capable of altering body temperature in some people at some time. The actual fatal dose of paraquat is really in uncertain factor. We have some individuals who have ingested 2.8 grams and they recovered.

We have others who have taken 0.2 gram and even a few cases documented in the history of those who have taken a mouthful and spit it out for the equivalent of a gram or two.

The fatal period varies from about 4 days to 2 weeks. Death is usually due to a diseased process characterized by cellular proliferation of the lungs which is usually not reversible.

I would like to just read very briefly the types of tests that we can do and hopefully we still have some tissues that have been removed under proper conditions and stored under proper conditions.

What I hear here today is that there are some of these tissues available and hopefully they will be able to be analyzed.

A very important factor however that we must take into consideration is the time of removal of these tissues. These various tests that have I mentioned include the crystal test for urine excretion, some very sophisticated esoteric procedures including ultraviolet absorption spectrum studies, gastronomic studies, and every day we are reading about new procedures and new techniques for the actual investigation and detection in quantitative as well as qualitative amounts of paraquat.

Infrared absorption spectra which would identify some of the molecular structures within the molecule and even simple thin layer chromatograph is done. Paraquat then is extremely toxic to man.

The estimated lethal dose is stated to be 5 grams but as I said, death has occurred wherever there has even been much lower dosages. As I said, to the best of our knowledge today, paraquat is not metabolized but is excreted or as an ordinary ammonium salt.

However, I think there is, as someone stated earlier, a great need for molecular research as we delve into the field of toxicology. I anticipate that one day just as we have great books of epidemiology, the "Control of Communicable Diseases" written by John Gordon, we will have one day a similar text for the analysis and study of those diseases produced by chemical toxins.

It is with a sad note that I state that analytical findings may not be of much value as death usually delayed beyond a week during which

time most of the paraquat is eliminated and you know many of us do not go to a physician within the period of time if we are suffering and we think tomorrow is another day and we are going to feel better.

Daniel and Gauge quote that there is 90-percent elimination within 24 hours of ingestion, much of which is excreted by the urine and some through the feces.

I would like to just briefly go through two cases of paraquat poisoning by accident in which death ensued in one case after 4 days and in another case after 10 days. Certain analytical, quantitative studies were performed on various biological fluids and tissues including blood, urine, brain, fat, heart, liver, kidney, lung, muscle, and spleen.

The tissues that were removed and excised from the 4-day death, 4 days after ingestion showed that there were in those samples the following findings. In the blood, 20 micrograms per 100 ml of blood and in the urine, 1.6 micrograms percent.

That is a pretty small amount. In the 10-day death case, they were not detected. In the kidney, the 4 days demonstrated 580 micrograms per 100 grams of tissue by weight, 4-day death as opposed to 95, there were considerably less in the 10-day case.

The liver 4 days, there was 16 micrograms percent by weight per tissue, 10-day case, 20 micrograms percent. In the lung there were 160 micrograms percent of tissue weight, not detectable in the 10-day case.

In the spleen, 140 micrograms percent in the 4-day case and no detected in the 10-day case. I might add that in the muscle tissue of the 10-day case, there was a small amount of paraquat found, namely 40 micrograms per 100 grams of weight of that particular organ.

In our analysis of epidemiological data, I think with specific reference to the respiratory disease to which we are referring today, I think there are several factors that have to be considered, in terms of drugs and drug toxicity.

First and foremost, there are what we call pharmacoid genetic differences. We react differently to different drugs even though the amount taken in may be equivalent. Age certainly plays an important factor.

We know that the physiology of the agent is certainly very different from that of the younger population, although it has been documented in studies and drug toxicity that there is very little difference in the actual absorption from the gut of drugs.

There is a high difference, a large difference in the actual dissipation and excretion level of drugs. If a drug is not metabolized, it may very well in an aged person of whom we must also consider the status of health, it is very likely and possible and we must at least realize that the paraquat could perhaps remain in this body for a longer period of time.

Blood alcohol level is very significant. I have read some of the statements about the drinking and some of the Legionnaires who told me about it also. We know that with a high blood alcohol level, that the alcohol per se is very toxic to the pedicles in the liver where so much of our oxidation takes place.

It could be that other interferences have taken place which in turn may have contributed to the toxicity of paraquat in some individuals. Smoking must not be ignored. Some of the other important factors in the aged person where there has been altered physiology which could

affect reactivity, sensitivity to tolerance to drugs, and what we are really saying is it could, therefore, modify the drug at the molecular level and at the molecular level of drug action would include some changes in body protein circulating, blood proteins.

We know that a lot of our drugs are transported through the circulatory system by binding to proteins. If there has been an alteration in these proteins, then there perhaps has been an alteration in the actual excretion of some ones of these drugs including paraquat.

There certainly are changes in the renal function and in extra renal function and therefore renal and extra renal clearance of the drug paraquat. Without question, there are changes in kidney, g.i. tract.

Paraquat, as was said earlier, is a hit and run drug. It does its thing and takes off. Perhaps by the time some of these unfortunate individuals felt that they were ill enough to see a doctor the evidence may have been gone.

I heard today about a few of the hospitality rooms and perhaps the cans of beer were kept in the bathtubs being cooled by ice cubes. There were times when there were other meetings going on and those rooms were probably left unattended.

What is to stop someone from accidentally or otherwise putting something on those ice cubes which the legionnaires stated had to be used at time when there was no more ice supply available.

In summary, I think what we have heard here today has certainly illustrated to us that there are toxins which can do the things that we have seen in those Legionnaires who took ill and survived and those who died.

Hopefully through these deaths, through this respiratory illness we will be able to utilize our knowledge, our expertise in fully cooperative efforts only in terms of virolytical studies and bacteriological studies and also in terms of toxicologic studies.

Thank you.

Mr. MURPHY. Does paraquat poisoning normally produce a high fever?

Ms. INGENITO. Yes; in some individuals paraquat poisoning does produce a high fever but as I said I do feel that the high fever has perhaps been overemphasized in being used as the criteria of the actual disease.

The two individuals that I specifically know of who died of accidental paraquat poisoning did have high fever. In much of the literature, there is little or no reference to temperature. Yes; there was elevated temperature and no; there was not.

I feel, as with so many other toxins, for some reason there will be temperature elevations in some individuals and none in others and low temperature production in still others. I think this is one of the individual variations that we must concern ourselves with in the study of toxins and the production of disease.

Mr. MURPHY. Were there any traces of paraquat found in the tissues examined?

Ms. INGENITO. To the best of my knowledge, the literature that I have seen was on three specimens, I do not know whether this meant three individuals. They stated that there was no paraquat found.

Mr. MURPHY. Your paraquat traces will last up to 3 weeks in tissue?

Ms. INGENITO. Paraquat traces may last. The symptoms may last up

to 3 weeks but the traces may very well be gone in the first 24 hours with individual variation. There may be some individuals where one could find a patient who died after 10 days, that some of the tissues did exhibit presence of very small amounts of paraquat.

I do not know whether the tissues analyzed for paraquat or urine which is sometimes referred to as a tissue body, tissue body fluid or actual tissue or organs but it is not surprising because there are variations and there are those who would then within 48 hours have no evidence of paraquat present when in fact paraquat has been known to be the agent that caused the individual's illness.

CDC stated that they did certain testing for paraquat and that it was then discounted as a causative factor.

Ms. INGENITO. I did speak with Dr. Liddle of CDC and had a very pleasant, professional discussion with him. I was not directly concerned with the Legionnaires' disease because I am not a member of the health department but I was at one time a member and I do feel I must explain why I took the liberty to call Dr. Liddle.

It is because there were many individuals who did not realize that I had been transferred to another State agency and were asking me what are you doing, why are you not doing something about this respiratory disease, Philadelphia outbreak.

I felt I had to do something because I felt morally and professionally obligated to do so. I wanted to share whatever knowledge I had on paraquat.

I did call Dr. Liddle and after I received many of these phonecalls I spoke with Dr. Liddle and we both felt that perhaps one of the factors could have been the time of removal of the tissues that were analyzed.

I have not seen any further data. I would like to see the data. I would hope that all of the testimony presented here today can actually be presented in light of all of the clinical biochemical, physiological, toxicological studies that have been done on these individuals with proper controls from perhaps the areas where those individuals lived.

Mr. MURPHY. Are you familiar with the toxicologists employed by the city, the State and CDC, their background?

Ms. INGENITO. I am not sure about any toxicologists in the State Department of Health. They do have a division of clinical toxicology but I believe their main function is to evaluate, approve and license clinical laboratories who perform analyses for drug abuse.

I am not sure that they even have the responsibility of doing any of these studies. I spoke with Dr. Shirra of the city health department. I am not sure if he is a toxicologist. His title is epidemiologist. I spoke with Dr. Polk who assured me that studies would be done in every possible area of concern.

I would like to see what has been done and correlate it with just about every toxin that we have heard about today so that perhaps by retrospective studies we can start putting something together.

Mr. MURPHY. Was there any indication to you by other doctors that a toxin was suspect from the beginning?

Ms. INGENITO. Yes, other physicians have suspected a toxin and thought it was probably not a virus. I recently participated in a

seminar about a week ago for a medical society and had occasion to speak to several physicians on the Legionnaires' disease.

They talked about the toxicity of another drug. I made the statement that not everyone that was exposed to whatever the toxin was in this disease actually came down with the illness and not everyone took ill and died.

After this meeting, I have a workshop table and took a pool of various physicians who were sitting at the table with me. Many of them felt along with their colleagues that indeed a toxin was probably the culprit.

Mr. MURPHY. Did you offer assistance to CDC, the city and the State?

Ms. INGENITO. I talked to CDC.

Mr. MURPHY. Early on?

Ms. INGENITO. I do not remember the date when I finally took up the phone and took the liberty to call Dr. Liddle. I did tell him that I would like to cooperate with him in terms of working out methodology. I suspect this will definitely take place at the proper time.

With the city, I spoke with Dr. Polk by phone and he assured me that paraquat was being investigated and I felt comfortable knowing that I had at least shared my information and my knowledge and that it was being looked into. What has come of those studies in a definitive fashion, I do not know.

Mr. MURPHY. Did you ask CDC for clinical studies on patients who were hospitalized?

Ms. INGENITO. I called Dr. Fraser, actually I had spoken with Mr. Gaudiosi of the city health department and he asked Dr. Fraser to call me because he was at that time in the city working on the epidemiologic aspects.

I mentioned to him that I would certainly like to collaborate and cooperate with the analysis of clinical studies. I was particularly interested in the various enzymes that would indicate liver damage and maybe heart and muscle damage.

I was also interested in the globulin patterns. There was a time that we thought that toxins did not alter our protein fractions. Today we know that this does happen. Dr. Fraser stated that was being done and he would certainly remember that my assistance was there and I was prepared to assist.

This was all on my own time and concern.

Mr. MURPHY. Thank you very much. The hearing will stand adjourned until 10 a.m. tomorrow morning in this hall.

[Whereupon, at 4:54 p.m., the hearing was adjourned, to reconvene the next day, November 24.]

“LEGIONNAIRES’ DISEASE”

WEDNESDAY, NOVEMBER 24, 1976

**U.S. HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON CONSUMER PROTECTION AND FINANCE,
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
Philadelphia, Pa.**

The subcommittee met at 10 a.m., pursuant to notice, in room 3306-10, William Green Federal Building, 600 Arch Street, Philadelphia, Pa., Hon. John W. Murphy, chairman, presiding.

Mr. MURPHY. The subcommittee will come to order.

Our first witness this morning is Dr. David J. Sencer, Director, Center for Disease Control.

Dr. Sencer, I understand that Dr. David Fraser, from the Bureau of Epidemiology, is with you.

STATEMENT OF DAVID J. SENCER, M.D., DIRECTOR, CENTER FOR DISEASE CONTROL, ACCOMPANIED BY JOSEPH BOUTWELL, M.D., DEPUTY DIRECTOR, BUREAU OF LABORATORIES, CDC, AND DAVID FRASER, M.D., CHIEF, SPECIAL PATHOGENS BRANCH, BUREAU OF EPIDEMIOLOGY, CDC

Dr. SENCER. Dr. Fraser is on my left and Dr. Boutwell is on my right.

Mr. MURPHY. Dr. Boutwell, if you will identify yourself for the reporter?

Dr. BOUTWELL. I am Joseph Boutwell, Deputy Director, Bureau of Laboratories, Center for Disease Control.

Mr. MURPHY. Dr. Sencer.

Dr. SENCER. I am delighted to appear before you, this morning, to go into some of the background of the so-called Legionnaires' disease.

I have prepared a rather lengthy statement which I would like to submit for the record. I would like to use the time, only to hit some of the highlights of it.

Mr. MURPHY. Doctor, we are here only for the specific purpose of going into the facts in detail.

We are not limited by time in any way. Please feel free, entirely free, to go through your entire statement and you can elaborate and let them audit and the gentlemen with you can do the same.

Dr. SENCER. All right, sir.

As I said, I am accompanied by Dr. Boutwell and Dr. Fraser.

The outbreak of Legionnaires' disease which afflicted 180 people and caused 29 deaths has presented a number of unusual and complex features which I will try to describe. It has run counter to our expecta-

tion that contemporary science is infallible and can solve all the problems that we confront.

I would like to briefly tell you about our part in this overall investigation in which we worked with the Philadelphia and Pennsylvania State Health Departments, and the current status of our efforts that are continuing. Let me, however, begin with a very brief description of the Center, its capabilities and some of its programmatic resources.

The Center for Disease Control is now more than 30 years old and is one of six health agencies of the Public Health Service in the Department of Health, Education, and Welfare. The others are the National Institutes of Health, the Food and Drug Administration, Health Resources Administration, Health Services Administration, and the Alcohol, Drug Abuse, and Mental Health Administration. CDC represents the Department's principal focus of preventive medicine and acute disease control.

With respect to its functions, the Center provides technical assistance in widely ranging aspects of preventive medicine, including field epidemiology, laboratory reference diagnosis, and consultations on many topics relevant to disease control. It conducts and collaborates in studies oriented to improving the diagnosis and identification of disease, conducts surveillance of a wide range of important conditions, studies the ecology of many diseases in this country and elsewhere, and attempts to determine the role of certain environmental factors in the causation of disease. Becoming a part of the Center in 1973, the National Institute for Occupational Safety and Health has extended the scope of CDC's preventive medical responsibilities into the workplace.

CDC is the principal Federal agency supporting the practice of public health in State and local health departments. For the most part, CDC's assistance is provided directly to or through State and local health agencies. In essence, the Center extends the competency and the resources of these health agencies by providing supplementary professional manpower and technical capabilities to help them fulfill their statutory responsibilities for disease investigation and control. The Center does not act as an independent investigative body.

In addition to providing technical assistance and consultation, the Center assists State and local health departments with programs of tuberculosis control, venereal disease control, immunization, and selected environmental health improvements such as lead-based paint poisoning control.

At the present time, the Center employs approximately 4,000 people, including 1,400 scientific and professional staff representing more than 100 different scientific specialties and subspecialties. Approximately half the CDC staff is located in our headquarters in Atlanta, Ga. Most of the remainder are on assignment in State and local health departments, assisting in regular programs of disease prevention and control and contributing to the overall surveillance of acute diseases.

The Center is both a domestic and an international organization. Its international activities are generally related to programs of the World Health Organization for which the Center provides consultative services, laboratory reagents, and field personnel for periodic epidemiologic and laboratory investigations. The Center is widely recognized as an internationally unique organization because of the breadth and depth

of its expertise in disease prevention and control and an organization that offers a capacity for immediate response to emergency health needs when its range of special talents become needed. Most countries would be unable to assemble the same range of resources or would find them scattered in a number of different governmental agencies and academic centers.

We have about 285 epidemiologists on our staff. We investigate an average of 100 outbreaks of disease in the United States at the invitation of the State health departments as well as a good number of outbreaks abroad.

Currently, the much publicized epidemic of hemorrhagic fever in Zaire and Sudan is under investigation by members of our staff in conjunction with the World Health Organization and other countries.

In addition to investigations that are conducted from headquarters, the people we have assigned to State and local health departments assist in the investigation of over 1,500 outbreaks a year. More and more of the outbreaks investigated by people from our headquarters have been proved, or suspected, to have been caused by toxic agents. In the last 12 months 13 percent of the epidemics that we studied were of a toxicological nature.

Let me now turn to a description of the investigation itself.

Since August 2, 1976, when the Center first became involved in assisting with the investigation of Legionnaires' disease, nearly 100 people on our staff have been involved in the effort, most of them essentially fulltime.

We estimate that approximately 20,000 person-hours are represented in that—60 percent of them in the laboratory effort alone.

Let me just mention something about the volume of work that we have done.

In toxicology so far, we have conducted 2,603 determinations in pathology. We have prepared 5,120 tissue slides. In microbiology we have made 803 examinations for etiologic agents and have made 990 serologic tests for possible infectious agents.

More or less directly related to these efforts we have been assisted in the field and in our headquarters by 53 additional consultants and significant contributors to the effort. Their assistance represents the involvement of approximately nine Federal Government Agencies and more than 39 academic or scientific institutions.

The Center has received thousands of spontaneous public inquiries, many with thoughtful suggestions and offering encouragement.

We first learned of the cases of pneumonia associated with the American Legion Convention in Philadelphia at 9:15 a.m. on the morning of August the 2d. That morning, a physician working in the Veterans' Administration clinic in Philadelphia after informing the State health department, called CDC to report 26 cases of febrile respiratory disease including four deaths that occurred among persons attending the American Legion Convention held in Philadelphia between the 21st of July and the 24th of July. Within an hour, additional reports brought the number of known deaths to 11.

The large number of cases concentrated in time suggested a common source of exposure during the convention. The cause of the illness was unknown, but the uniform symptoms of fever, chills, headache, and cough raised the possibility of its being a communicable respiratory

disease that could have rapidly spread. CDC's quick and full response to a request from Pennsylvania for assistance reflected its concern either that, if communicable, the illness might be spreading rapidly or that the source of exposure might still be present in Philadelphia.

After consultation with staff at the Center as well as health department officials of Pennsylvania, Philadelphia, and Pittsburgh, three medical epidemiologists departed that same day for Pittsburgh, Harrisburg, and Philadelphia to begin work with local and State health officials in the investigation of the outbreak. Arrangements were made the first day for an employee from the regional office in Philadelphia to carry specimens from patients to CDC for immediate laboratory processing, and the first specimens arrived at CDC that night.

A meeting of CDC epidemiologists and laboratory personnel was held the first evening to discuss the possible causes of the outbreak and plan additional support for the investigation. The first phase of the meeting was a review of all information known about the clinical, epidemiologic, and laboratory characteristics of the illness. Understandably, at that time, information was sketchy, but an attempt was made to construct a preliminary list of etiologic possibilities.

Reasonable suggestions included various infectious agents, among them certain bacteria, viruses, fungi, and Chlamydia. It was clear, however, that more information was needed before a precise list of infectious agents could be developed or their role established. Because of the concern that the epidemic might be spreading and because of the wide geographic distribution of the cases, it was clear that the most intensive field effort would be needed. Accordingly, on the second day of CDC's awareness of the outbreak, 10 additional epidemiologists were dispatched to Pennsylvania, and CDC set up its headquarters of field activities in Harrisburg.

From the beginning, the approach to investigating this outbreak was similar to that of many outbreaks in which the Center participates whether they be infectious or toxic. This investigation was particularly intense, but the pattern of the study followed time-tested lines.

In all investigations the first requirement is to characterize the illness and take steps to confirm the diagnosis. When cases are identified, the second step is to show that there is an epidemic, that is, that cases are occurring with unusual frequency in a certain population. The third stage of the epidemiologic process is to characterize the ill people in terms of their distribution in time, place, and person and to find the activities or exposures which set the ill people apart from those who stayed well.

The differences found between sick and well people can be used to discover the manner of spread of the agent, whether it be infectious or toxic.

On the morning of Day 2, the CDC field team integrated with the existing State investigation. Over the next 3 weeks, 32 CDC personnel—including 25 epidemiologists, 2 industrial hygienists, a specialist in occupational health, 3 statisticians, and an engineer—would be in Pennsylvania working on the investigation with a larger group of health workers from State and local governments. CDC epidemiologists in three cities planned with State and city health personnel a

coordinated investigation. The State Health Department Laboratory was designated to manage the collection and distribution of clinical specimens.

Early in the morning of Day 2 of CDC's involvement in the investigation, specimens from 20 cases were inoculated into eggs, tissue culture, and bacterial media to begin the look for an infectious agent. Specimens from four autopsies were immediately prepared for electron microscopy and fluorescent antibody staining. Also on the morning of Day 2—9 days after the convention and 13 days after the onset of illness in the first case—there was no confirmed evidence of any secondary transmission.

No members of the families had become ill as a result of being exposed to the first cases. This was strong preliminary evidence that a common infectious respiratory agent was not the cause of legionnaires' disease.

At the first of daily meetings, the possible causes of the illness were reviewed including microbiologic and toxic agents. The chief of the toxicology branch was contacted on this day at a meeting in Houston and briefed on the situation. The need for urine specimens, specifically for identification of paraquat, was recognized.

On the afternoon of August 3, and continuing for the next 48 hours, an attempt was made to contact, in person, every case of suspected legionnaires' disease in Pennsylvania using CDC medical epidemiologists working out of Harrisburg, Pittsburgh, and Philadelphia. These officers collected the much needed clinical information in a standardized form, examined patients, and set up liaison with private physicians concerning handling of clinical specimens and pathologic materials and reporting of additional cases.

At the time, while we were not sure that this was not infectious, we did not have the toxicology laboratory begin work immediately, because they did not have safety equipment to keep infectious agents from escaping.

Therefore, on the afternoon of the third, we said they should hold until we had ruled out a highly infectious agent.

On the next day, additional requirements for clinical specimens were specifically discussed including requirements for specimens for electron microscopy, mycology, and toxicology. These needs, and others as they were identified, were passed on to the field staff in daily phone consultations.

On Wednesday afternoon, the third day of the investigation, at press conferences held in Harrisburg and at CDC, it was stated that it was unlikely that the disease was influenza and that toxic substances were under consideration.

The process of this investigation was also described on the fourth day in hearings called by Senator Kennedy, of the Health Subcommittee. We stated at that time that we had almost completely ruled out influenza and that increasing emphasis was being placed on toxic substances being the fault.

Mr. MURPHY. What day was that?

Dr. SENCER. That was Thursday, August 5, sir. We were first notified of the outbreak on August 2, yes, sir, and the first death was the 27th of July.

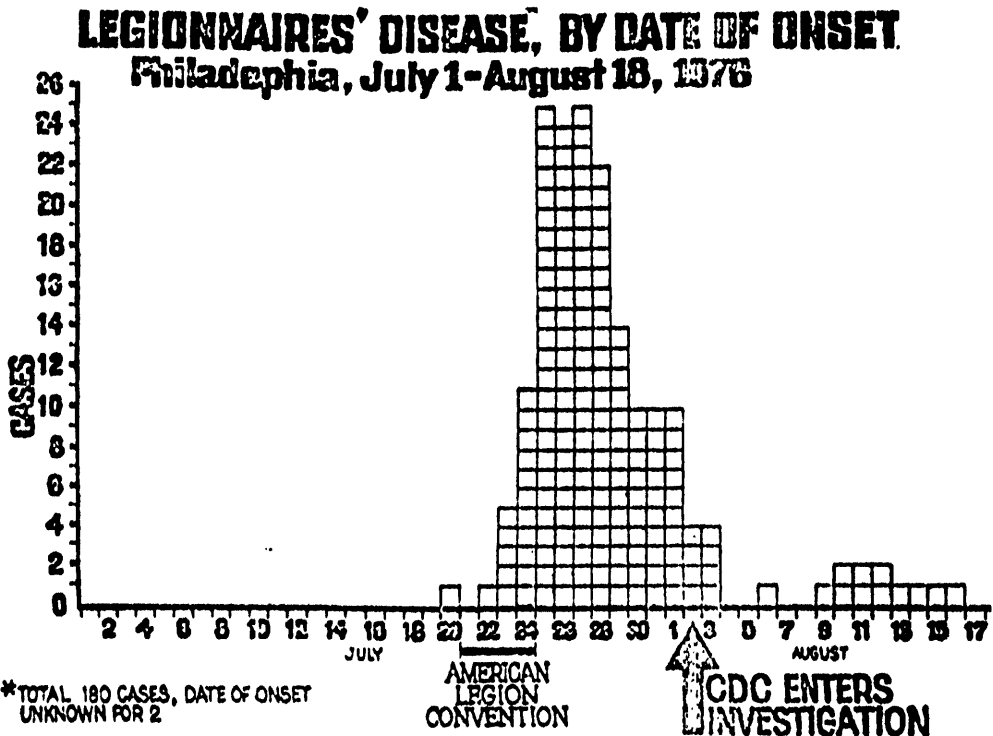
Also, on August 5, we were able to harvest the eggs and confirm our original diagnosis that it was not influenza. The field people by that time had characterized the illness and confirmed the existence of an epidemic.

On the fifth day of our investigation they began an extensive look at activities that might have exposed the cases but not exposed those who stayed healthy.

Also, on that day, a broad range of environmental samples that had been collected from the Bellevue Stratford were dispatched to CDC for toxicologic analysis. Questionnaires were distributed with a great deal of help from the American Legion, to all legionnaires who had attended the convention. A sampling of guests who had registered at four hotels over a period of 2 weeks before the convention and 2 weeks after the convention were contacted by telephone about illness.

Hotel employees and convention officials were queried about illness and activities during the convention. Hospital admission and emergency records and death certificates were reviewed to see if the disease occurred as an epidemic outside of the Legionnaire group.

If you would hold up the chart—I am sorry that you cannot see through it.



This demonstrates when the cases first became ill. You can see that the convention was between the 21st and the 24th—

Senator SCHWEIKER. Doctor, when you say "when they first became ill," that means when they first reported into some medical facility? It is not when they actually—

Dr. SENCER. No, sir it would be going back into the history of "when did you first feel bad."

As you can see, the convention was here from the 21st to the 24th. There was one case of illness which met our definition that occurred before that on July 20. Since this earliest case had a sore throat and did not have a chest X-ray, we felt that this was probably not typical, however, she does meet our definition of a case, because she had a temperature and cough and had been in the hotel.

As illustrated by this case, the actual symptoms that characterized Legionnaires' disease are not specific and can be mimicked by many infections and toxic agents.

As you can see, the bulk of the cases occurred with onset before the health department or CDC was notified of the outbreak and 18 of the deaths had occurred prior to this time.

Senator SCHWEIKER. Prior to the 2d of August?

Dr. SENCER. Yes, sir; on or before August 2. As I said before, about 180 cases have been identified of which 29 cases were fatal; 149 of those cases were in conventioners and in that group the rate of illness was highest among voting delegates, older males, and those who stayed at the Bellevue Stratford. Cases, as you have seen, which were distributed in time as though they were exposed to a common source of infection or other cause during the convention are also indicated here.

The typical interval between a possible source of exposure at the convention and illness was 5 to 6 days. No spread occurred to case contacts. As I said, 18 deaths from the disease had occurred before we became involved.

The next four deaths in the outbreak after we had been informed occurred on days 3 and 4; that is, Wednesday and Thursday.

Under instructions from our toxicology program, our physicians attended three of the four autopsies in these next four deaths and got a collection of specimens from all four of them.

The specimens were hand-carried by air courier to the center for laboratory processing, and as additional requirements for types and sizes of specimens were generated by the various laboratories, our instructions were modified and updated.

The investigation of the disease has been a coordinated effort of the State, Federal, and city health agencies and involved specialized consultation with governmental, university, and private persons and institutions.

Fifty-three consultants have been utilized in one way or another by CDC to review field investigation and laboratory analyses and to suggest additional areas of study.

On August 13, about 10 days after the investigation began, CDC convened a panel of toxicology consultants including representatives of the HEW Toxicology Coordinating Committee and expert toxicologists from several universities. I would be glad to supply a list of names for the record.

[The list referred to follows:]

Name and title	Affiliation	Area of expertise
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INITIAL ADVISORY PANEL, AUGUST 13, 1976

Paul F. Wehrle, M.D., chief physician, Pediatric and Communicable Disease Division.	Los Angeles County, USC Medical Center.	Infectious disease.
Wayland J. Hayes, M.D., Ph. D., professor of biochemistry, Center for Environmental Toxicology, Department of Biochemistry.	Vanderbilt University School of Medicine.	Toxicology.
Peter Jattow, M.D., professor of laboratory medicine.	Yale University School of Medicine.	Clinical toxicology.
Kurt Dubowsky, M.D., professor of medicine.	University of Oklahoma Health Sciences Center.	Forensic toxicology.
Morris Crammer, Ph. D., Director.	National Center for Toxicology Research.	Biochemistry toxicology.
John F. Finklea, M.D., Director.	National Institute of Occupational Safety and Health.	Environmental and occupational health.
Hans L. Falk, M.D., Associate Director, Office of Programs.	National Institute of Environmental Health Sciences.	Environmental toxicology.
Raymond Shapiro, M.D., Assistant Director for Toxicology Coordination.	National Institute of Environmental Health Sciences.	Environmental toxicology.
Alfred P. Fishman, M.D., William Maul Measey, professor of medicine, director, Cardiovascular Pulmonary Division.	University of Pennsylvania, School of Medicine.	Pulmonary medicine.

LABORATORY CONSULTANTS

Jerrold L. Abraham, M.D., fellow in pulmonary pathology.	University of California Medical School at San Diego.	Electron microprobe analysis.
Dr. James R. Chen, assistant professor of physics.	State University of New York at Geneseo.	Nuclear physics X-ray fluorescence in heavy metal analysis.
Philip B. deNee, Ph. D. (biophysics), Acting Chief, Pathology Section, Laboratory Investigations Branch.	Appalachian Lab for Occupational Safety and Health, NIOSH.	Electron microprobe analysis.
Martin Goldfield, M.D., assistant commissioner.	New Jersey State Department of Health.	Virology.
Paul Horowitz, Ph. D., professor of physics.	Jefferson Physical Laboratory, Harvard University.	Physics, heavy metal analysis.
Dr. William Mathews, director of anatomical pathology, professor of pathology.	Emory School of Medicine.	Surgical pathology.
Andrew Salavino, M.D., chief, laboratory services.	Baltimore Veterans' Administration Hospital.	X-ray diffraction analysis, electron microprobe analysis.
F. William Sunderman, Jr., M.D., professor and head, Department of Laboratory Medicine.	University of Connecticut School of Medicine.	Toxicology.
Barry A. Weavers, clinical scientist.	Baltimore VA Hospital.	Electron microprobe analysis.
W. M. Schakelford.	Environmental Protection Agency.	Analysis of water for organic compounds.
Stanley Brown, chief, Toxicology Branch.	Harrow, England.	WHO toxicology laboratory consultant.

MULTIDISCIPLINARY PANEL, OCTOBER 7, 1976

Jay Sanford, M.D., dean, School of Medicine.	Uniformed Services University of the Health Sciences.	Infectious disease.
Raymond R. Suskind, M.D., director, Department of Environmental Health.	University of Cincinnati Medical Center.	Toxicology.
Louis Weinstein, M.D., physician, visiting professor of Medicine.	Peter Bent Brigham Hospital, Harvard Medical School.	Infectious disease.
David R. Finn, M.D., director, Cardiopulmonary Unit.	WillamSPORT Hospital.	Pulmonary medicine consultant to six legionnaire cases.
Marvin Kuschner, M.D., dean, School of Medicine and Health Sciences Center.	State University of New York at Stonybrook.	Pulmonary medicine
Morton Schwartz, M.D., chief, Infectious Disease Unit, professor of medicine.	Massachusetts General Hospital, Harvard Medical School.	Infectious disease.
Alexander D. Langmuir, M.D., visiting professor, Epidemiology Department of Preventive and Social Medicine.	Harvard Medical School.	Epidemiology.

NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH PERSONNEL INVOLVED

Date first consulted	Name and title	Area of expertise
	John F. Finklea, M.D., Director, NIOSH.	Environmental and occupational health.
Aug. 17	David P. Brown, epidemiologist, biometry section, industrywide studies branch, division of surveillance, hazard evaluation, and field studies.	Industrial epidemiology.
17	R. J. Dobbin, chief, industrial hygiene section, industrywide studies branch, division of surveillance, hazard evaluation, and field studies.	Industrial hygiene.
17	Shiro Tanaka, M.D., medical officer, surveillance branch, division of surveillance, hazard evaluation, and field studies.	Occupational health.
17	Wes Straub, industrial hygienist, Region III Office—NIOSH.	Industrial hygiene.

GENERAL CONSULTANTS AND CONTRIBUTORS

Date first consulted	Name and title	Affiliation	Area of expertise
Aug. 23, 1976.....	Don Rosenberg, M.D., lieutenant colonel, U.S. Army, director, occupational medicine.	Edgewood Arsenal.....	Occupational medicine.
August 23.....	Philip Russell, M.D., colonel, MC, U.S. Army, deputy commander.	WRAIR, Walter Reed Army Medical Center.	Virology.
September 16.. ..	Irving J. Selikoff, M.D., director, environmental sciences laboratory, professor of community medicine, professor of medicine.	Mount Sinai Medical School.....	Occupational and pulmonary disease. Epidemiology.
September 9.....	Neal Nathanson, M.D., professor of epidemiology; chairman, division of infectious disease, editor, American Journal of Epidemiology.	School of Hygiene and Public Health, Johns Hopkins University.	Virology, epidemiology.
September 8.....	Jonas Salk, M.D., founding director and resident fellow.	The Salk Institute for Biological Studies.	Virology, immunology.
September 3.....	Jordan N. Fink, M.D., professor of medicine, chief, allergy section.	Medical College of Wisconsin....	Pulmonary medicine allergy.
September 13.....	R. T. Ravenholt, M.D., director, office of population.	Agency for International Development.	Epidemiology demography.
September 17.....	Albert Kolbye, M.D., J.D., associate director for sciences.	Bureau of Foods, FDA.....	Toxicology, medical jurisprudence.
Do.....	Edward Ragelis, Ph. D., research chemist.	.....do.....	Biochemistry, toxicology.
Do.....	Frank Cordle, Ph. D., epidemiologist, offices of sciences.	.....do.....	Epidemiology.

FIELD CONSULTANTS

Date first consulted	Name and title	Affiliation	Area of expertise
Aug. 3	Robert C. Aber, M.D., assistant professor of medicine.	Hershey Medical Center.....	Infectious disease.
6	Baruch Blumberg, M.D., Ph. D. associate director of clinical research, professor of medicine, professor of anthropology.	(Nobel laureate), Institute of Cancer Research, University of Pennsylvania.	Epidemiology, virology, anthropology.
6	Harvey Friedman, M.D., director, diagnostic virology laboratory.	The Joseph Stokes Research Institute, Children's Hospital of Philadelphia.	Virology.
6	Stanley A. Plotkin, M.D., director, infectious disease division and virus laboratory.	.....do.....	Do.
17	Ahmed N. M. Nasr, M.D., Ph. D., supervisor, occupational health services.	Health, Safety, and Human Factors Laboratory, Eastman Kodak Co.	Toxicology.
16	Wallace W. Rhodes, Jr., professional engineer.	Rhodes Consultants, Inc.....	Air conditioning systems.
4	Gary Lattimer, M.D., chief, infectious disease.	Allentown Sacred Heart Hospital.....	Infectious disease.

The status of the investigation was reviewed and recommendations were sought. Members of the panel suggested botulinum toxin and psittacosis as possible causes, but these have since been eliminated.

They discussed other agents like nickel carbonyl and paraquat but indicated they did not typically cause the same illness as Legionnaires' disease. They suggested that the amount of tissue collected for toxicologic analysis be increased.

On August 16, a private ventilation consultant for CDC reviewed the airhandling system in the Bellevue Stratford, but no new sources of potential air contamination were found.

On August 17, the CDC field staff was joined for consultation by industrial hygienists and epidemiologists from the National Institute for Occupational Safety and Health, one of the organizations within CDC, as well as an industry specialist in occupational medicine.

The group made an inspection of the convention premises and hypothesized five possible toxic causes of the outbreak: paraquat, phosgene, nickel carbonyl, cadmium, and ozone. They recommended

analysis of additional environmental samples, review of the hotel plumbing and ventilation systems, and check of nearby incinerator stacks for potential cross-contamination. Analysis of environmental samples is continuing at CDC and the other recommendations have been followed.

After the intensive phase of the field investigation was completed on August 20, consultation with outside agencies continued. On August 28, representatives of the U.S. Army from Edgewood Arsenal and Walter Reed Army Institute for Research visited the center and reviewed available clinical, epidemiologic, and laboratory information. They indicated that they found no evidence to implicate an agent of chemical or biological warfare.

In early September an outside pathology panel was convened at CDC to review specimens from cases of Legionnaires' disease. It included specialists from the Armed Forces Institute of Pathology, from the Medical Examiners' offices of Pittsburgh and Philadelphia, and from universities throughout the United States. We also have that list which we will supply for the record.

[The list referred to follows:]

PATHOLOGY PANEL—SEPT. 8-9, 1976

Name and title	Affiliation	Area of expertise
Charles Carrington, M.D., associate professor of pathology.	Stanford University School of Medicine.	Pulmonary pathology.
Cyril H. Wecht, M.D., J.D., FCAP, coroner, county of Allegheny.	Commonwealth of Pennsylvania.....	Forensic pathology.
Marvin E. Aronson, M.D., medical examiner.....	City of Philadelphia.....	Do.
Horatio T. Enterline, M.D., director of surgical pathology, professor of pathology.	Hospital of the University of Pennsylvania.	General pathology.
Walter H. Sheldon, M.D., emeritus professor of pathology.	Johns Hopkins University School of Medicine.	Do.
Gordon R. Hennigar, M.D., professor and chairman, department of pathology.	Medical University of South Carolina.....	Do.
Russell A. Harley, M.D., associate professor of pathology.	.....do.....	Pulmonary pathology.
Charles S. Petty, M.D., director and chief medical examiner.	County of Dallas.....	Forensic pathology.
Nelson Irey, M.D., chief, division of tissue reactions to drugs.	Armed Forces Institute of Pathology.....	Pathology of toxic substances.
Liselette Hochholzer, M.D., chief, department of pulmonary and mediastinal pathology.	.....do.....	Pulmonary pathology.
Kamal Ishak, M.D., chief, department of liver pathology.	.....do.....	Hepatic pathology.

Special emphasis was placed on the pathology of the liver and the lungs. They found that 5 of 8 cases of Legionnaires' disease had in their lungs evidence of acute alveolar damage, a nonspecific pattern that can be seen with a variety of infectious and toxic agents but which is not consistent with nickel carbonyl, paraquat, or phosgene.

Studies of heavy metals in tissue specimens are being carried out by NIOSH and consultants from the Veterans' Administration and several universities. They have access to laboratory techniques not otherwise available at CDC, including electron microprobe and proton X-ray fluorescence.

An additional panel of consultants was convened at CDC on October 7 for overall review of clinical, epidemiologic, and toxicologic investigations and for making specific suggestions for future work. It was composed of university scientists and clinicians with special interests in toxicology and pulmonary and infectious diseases. The con-

sultants concluded that conventional infectious agents and known toxic agents are unlikely to have caused the disease.

We do not know the cause of Legionnaires' disease. Although many agents may produce temperature and cough, there are few agents known that could produce an illness like Legionnaires' disease with its characteristically long incubation period averaging 5 to 6 days, no symptoms at the time of exposure, and a serious, acute illness characterized by high fever and pneumonia and evidence of involvement of the gastrointestinal tract and liver. Infectious diseases like Q fever and psittacosis can give a comparable picture, but all laboratory findings have given no evidence of a known infectious disease.

No toxins are known that characteristically mimic the clinical, epidemiologic, and pathologic findings. Suspected classes of toxic compounds have been heavy metals like nickel carbonyl, cadmium, and zinc; alkylating agents of the same class as phosgene and bischloroethyl ether; and the herbicide, paraquat.

None of the proposed agents fits with Legionnaires' disease perfectly. Nickel carbonyl typically has a much shorter incubation period, rarely causes high fever, and as described in the scientific literature has pathologic characteristics different from Legionnaires' disease.

The alkylating agents typically give symptoms immediately on exposure and often are associated with a depressed white blood cell count, which was not seen in Legionnaires' disease.

As mentioned previously, the first tests after the outbreak on August 2, occurred on August 4. An investigation of toxins or toxic substances began on August 5 when we had ruled out many highly infectious agents and was divided into six areas: organic soluble toxins; water soluble toxins; metals; amino acid-protein profiles; nucleic acid profiles; environmental samples.

Techniques used have included neutron activation, gas liquid chromatography, mass spectrometry, ultraviolet spectroscopy, high pressure liquid chromatography, atomic absorption, thin layer chromatography, and electrophoresis. In addition, tissues are being examined for minute particles by new procedures by collaborative studies in four different laboratories using electron and proton induced X-ray fluorescence.

These studies are in progress and incomplete. At this time, the studies of environmental samples have so far not been helpful.

Recognizing the concerted and coordinated efforts brought to bear on Legionnaires' disease by the staffs of the Pennsylvania State and Philadelphia City Health Departments and the Center for Disease Control along with literally scores of consulting and contributing scientists, one must adopt a certain sense of rational objectivity and scientific humility in acknowledging our failure to date to solve the question of etiology.

Legionnaires' disease appears to have been a self-limited epidemic of a respiratory disease with comparatively high lethality. But whether its causative agent is a microbiological entity of a yet undescribed characteristics or an environmental chemical, our best scientific capabilities have been unable to determine.

However disappointing this may be, particularly for those persons afflicted by the disease and for their families and friends and for the hundreds of persons who labored exhaustively to uncover the cause,

we must admit that there are diseases and conditions of ill health with which we are not familiar and which, as yet, we are unable fully to understand. This is not so much an admission of human failure as a recognition of how medical and biological science and knowledge evolve.

We are continuing epidemiologic work as well as that in the laboratory. Analysis for heavy metals and alkylating agents involves development of new techniques.

Specimens from cases of fatal pneumonia in Philadelphia unrelated to Legionnaires' disease are being collected to compare pathologically with cases of Legionnaires' disease. Investigation of environmental samples, collected early, continues.

I think "continues" is a good word on which to end, because we are continuing the investigation.

I will be glad to try to answer your questions or any questions that any member of your panel may have.

[Dr. Sencer's prepared statement follows:]

STATEMENT OF DAVID J. SENCER, M.D. DIRECTOR, CENTER FOR DISEASE CONTROL

INTRODUCTION

Mr. Chairman and members of the subcommittee, I am accompanied by Dr. Joseph Boutwell, Deputy Director of our Bureau of Laboratories at the Center for Disease Control (CDC), and by Dr. David Fraser, Chief of the Special Pathogens Section in our Bureau of Epidemiology. We shall provide testimony and answer questions concerning investigations into the etiology of Legionnaires' disease that during the summer of 1976 afflicted 180 persons and resulted in 20 deaths. The outbreak has presented a number of unusual and complex features which I will try to describe, and it has run counter to our expectation that contemporary science is infallible and can solve all the problems that we confront.

I will describe briefly for you that part of the overall investigation in which the Center for Disease Control (CDC) played a major supportive role to the Pennsylvania and Philadelphia Health Departments and the current status of our efforts. Let me, however, begin with a description of the Center, its capabilities, and its programmatic resources.

THE CENTER FOR DISEASE CONTROL

The Center for Disease Control, now more than 30 years old, is one of 6 health agencies of the Public Health Service in the Department of Health, Education, and Welfare. The others are the National Institutes of Health, the Food and Drug Administration, Health Resources Administration, Health Services Administration, and the Alcohol, Drug Abuse, and Mental Health Administration. CDC represent the Department's principal focus of preventive medicine and acute disease control.

With respect to its functions, the Center provides technical assistance in widely ranging aspects of preventive medicine, including field epidemiology, laboratory reference diagnosis, and consultations on many topics relevant to disease control. It conducts and collaborates in studies oriented to improving the diagnosis and identification of disease, to developing the surveillance of a wide range of important conditions, to studying the ecology of many diseases in this country and elsewhere, and to determining the role of certain environmental factors in the causation of disease. Becoming a part of the Center in 1973, the National Institute for Occupational Safety and Health has extended the scope of CDC's preventive medical responsibilities into the workplace.

CDC is the principal Federal agency supporting the practice of public health in State and local health departments. For the most part, CDC's assistance is provided directly to or through State and local health agencies. In essence, the Center extends the competency and the resources of these health agencies by providing supplementary professional manpower and technical capabilities to help them fulfill their statutory responsibilities for disease investigation and control. The Center does not act as an independent investigative body.

In addition to providing technical assistance and consultation, the Center assists State and local health departments with programs of tuberculosis control, venereal disease control, immunization, and selected environmental health improvements such as lead-based paint poisoning control.

At the present time, the Center employs approximately 4,000 people, including 1,400 scientific and professional staff representing more than 100 different scientific specialties subspecialties. Approximately half the CDC staff is located in our headquarters in Atlanta, Georgia. Most of the rest are on assignment in State and local health departments, assisting in regular programs of disease prevention and control and contributing to the overall surveillance of acute diseases.

The Center is both a domestic and an international organization. Its international activities are generally related to programs of the World Health Organization for which the Center provides consultative services, laboratory reagents, and field personnel for periodic epidemiologic and laboratory investigations. The Center is widely recognized as an internationally unique organization because of the breadth and depth of its expertise in disease prevention and control and an organization that offers a capacity for immediate response to emergency health needs when its range of special talents become needed. Most countries would be unable to assemble the same range of resources or would find them scattered in a number of different governmental agencies and academic centers.

The epidemiological competency of the Center derives from 285 professional epidemiological staff. The major field team of so called "disease detectives" is its Epidemic Intelligence Service (EIS) formed in 1951 to provide epidemic aid and epidemiologic consultative services to the States and to strengthen the epidemiologic resources of the Nation. The EIS program encompasses all professional disciplines relative to public health and preventive medicine. While physicians make up the largest single component, veterinarians, statisticians, nurses, engineers, microbiologists, dentists, and other scientific specialists have been involved. Since 1951, 948 professional officers altogether have taken part in the EIS program. Currently there are 80 EIS officers on active duty. About half of these are in Atlanta working with a permanent staff of the Center on problems ranging from rabies control to arthropod-borne encephalitis and from birth defect evaluation to environmentally-related disease. The other half of the EIS corps are assigned in various city and State health departments.

Each year the EIS investigates an average of more than 100 outbreaks of disease both in the U.S., at the invitation of State health departments, and abroad. Currently, the much publicized epidemic of hemorrhagic fever in Zaire and Sudan is under investigation, and in recent months the EIS has worked in outbreaks of disease related to cruise ships, hospitals, restaurants, and schools. More and more of the outbreaks investigated by CDC epidemiologists have been proved or suspected to be caused by toxic agents. In the last 12 months, 13 percent (12 of 93) of the epidemics we studied were toxicologic.

The Center has approximately 625 professional laboratory staff covering 17 separate laboratory disciplines and functions. The laboratories serve the "disease control" capability of the Center in being able immediately to apply an exceedingly broad range of coordinated laboratory services for the investigation of disease. The laboratories have a continuing function which involves providing ongoing assistance to State and Federal health agencies and to those of other countries as well.

The laboratories provide reference diagnostic services, epidemic aid support, and training in laboratory methods and management through organized courses and by consultation. The Center administers a national laboratory improvement program including research and development in laboratory methodology, development and evaluation of materials and reagents, and licensure and evaluation of interstate laboratories. It has been given the responsibility of producing, maintaining, and distributing reagents and reference materials not commercially available. It also distributes and maintains experimental and special immune serums to prevent and control unusual and laboratory infections.

The laboratories maintain a competency which is nationally and internationally recognized for its depth in most, if not all, disciplines applicable to the diagnosis and control of disease. For example, the specialty Divisions of the Bureau include bacteriology, clinical chemistry (including toxicology), hematology, mycology, parasitology, virology, vector-borne diseases, and pathology, as well as those with functions which relate across discipline lines, such as laboratory training, licensure, and laboratory management. The Center has been designated as a WHO National Center for 10 diseases or health problems, including some in clinical chemistry.

In the investigation of the Legionnaires' disease, the Bureau's laboratories in virology, bacteriology, mycology, pathology, and toxicology were the ones principally involved.

HISTORY OF THE CDC TOXICOLOGY LABORATORY

CDC had for many years an active toxicology program working primarily in laboratory problems in environmental toxicology such as pesticides (e.g., for malaria control). CDC also initiated a large and long-term program of Community Studies, targeted at the early detection of toxic manifestations of exposure among agricultural and industrial personnel at high risk who were working with pesticides. When the responsibilities for environmental health were reshuffled in 1968, the entire Toxicology Branch was transferred to the Food and Drug Administration. (In 1970 this program was with many others collected into the Environmental Protection Agency.)

In 1971, we re-initiated a program of assistance to clinical and public health laboratories engaged in providing clinical toxicological services. This at first dealt with heavy metals (lead) and drugs of abuse, and was related to proficiency testing in connection with the licensure of interstate laboratories, the lead screening (household and smelter) program, and methadone treatment programs. Early in 1972 a separate toxicology laboratory was organized with 6 chemists and technologists.

Many toxicological investigations have been assisted by this laboratory in addition to the primary responsibilities for which it was originally organized. Since 1973, 44 separate studies have been made, some of them on individual cases, but most made in connection with epidemiologic investigations. These studies involved thousands of separate tests for several hundred different components or constituents. An example is a poisoning episode which occurred in 1971 in Moscow Mills, Missouri, resulting in the deaths of 44 horses and the illness of 6 persons.

The cause of this poisoning outbreak was not discovered until December of 1973 with the detection of trichlorophenol in soil which led to the discovery of tetrachlorodibenzodioxin in the same soil samples. Tetrachlorodibenzodioxin is an extremely toxic substance which recently destroyed a town in Sevesco, Italy, after an industrial accident.

This small laboratory, consisting of 14 employees, 9 of which are chemists or technologists, analyzes literally thousands of specimens of a wide variety, using sophisticated and, in many cases, unique techniques of separation, isolation, comparison and identification; in addition to its defined and regular supportive role in laboratory improvement, in proficiency testing and drug abuse and lead control programs.

DESCRIPTION OF THE INVESTIGATION

Since August 2, 1976, when the Center first became involved in assisting with the investigation of Legionnaires' disease, nearly 100 persons on our staff have been involved in the effort, most of them essentially full time. We estimate that approximately 20,000 person hours are represented, about 60 percent of them in the laboratory effort alone. More or less directly related to our efforts, both in assisting in the field and at our headquarters in Atlanta, approximately 55 additional consultants and significant contributors to the effort can be identified. Their assistance represents the involvement of approximately 9 Federal Government agencies and more than 39 academic or scientific institutions.

Besides these, the Center has had thousands of spontaneous individual public inquiries, many with thoughtful suggestions and offering comments and encouragement. Altogether one must conclude that this investigation reflects one of the most intensive, broadbased, and well publicized health problems of recent years.

To give you some idea of the early phases of the investigation when the problem was being defined and when possible causes were rapidly being supported or ruled out and when strategies for intensive study were being formulated, I would like to give you a day-by-day "replay" of the most prominent events. Then I will attempt to summarize the subsequent course of events and the present status of our thinking.

INITIAL RESPONSE

CDC first learned of cases of fatal pneumonias associated with the American Legion convention in Philadelphia at 9:15 a.m., on August 2, 1976. That morning, a physician working in a Veterans Administration clinic in Philadelphia, after informing the State health department, called CDC to report 26 cases of febrile respiratory disease including 4 deaths that had occurred in persons attending

the American Legion convention held in Philadelphia from July 21 through July 24. Within an hour, additional reports brought the number of known deaths to 11.

The large number of cases concentrated in time suggested a common source of exposure during the convention. The cause of the illness was unknown, but the uniform symptoms of fever, chills, headache, and cough raised the possibility of its being a communicable respiratory disease that would have rapidly spread. CDC's extraordinary response to a request from Pennsylvania for assistance reflected its concern either that, if communicable, the illness might be spreading rapidly or that the source of exposure might still be present in Philadelphia.

After consultation with staff at the Center as well as health department officials of Pennsylvania, Philadelphia, and Pittsburgh, 3 Medical Epidemiologists departed that same day for Pittsburgh, Harrisburg, and Philadelphia to begin work with local and State health officials in the investigation of the outbreak. Arrangements were made the first day for an employee from the Regional Office in Philadelphia to carry specimens from patients to CDC for immediate laboratory processing, and the first specimens arrived that night.

A meeting of CDC epidemiologists and laboratory personnel was held the first evening to discuss the possible causes of the outbreak and plan additional support for the investigation. The first phase of the meeting was a review of all information known about the clinical, epidemiologic, and laboratory characteristics of the illness. Understandably, at that time, information was sketchy, but an attempt was made to construct a preliminary list of etiologic possibilities. Reasonable suggestions included various infectious agents, among them certain bacteria, viruses, fungi, and Chlamydia. It was clear, however, that more information was needed before a precise list of infectious agents could be developed or their role established.

Because of the concern that the epidemic might be spreading and because of the wide geographic distribution of the cases, it was clear that the most intensive field effort would be needed. Accordingly, on the second day of CDC's awareness of the outbreak, 10 additional epidemiologists were dispatched to Pennsylvania, and CDC set up its headquarters of field activities in Harrisburg.

From the beginning, the approach to investigating this outbreak was similar to that of many outbreaks in which the Center participates whether they be infectious or toxic. This investigation was particularly intense, but the pattern of the study followed time-tested lines.

In all investigations the first requirement is to characterize the illness and take steps to confirm the diagnosis. When cases are identified, the second step is to show that there is an epidemic, that is, that cases are occurring with unusual frequency in a certain population. The third stage of the epidemiologic process is to characterize the ill people in terms of their distribution in time, place, and person and to find the activities or exposures which set the ill people apart from those who stayed well. The differences found between sick and well people can be used to discover the manner of spread of the agent, whether it be infectious or toxic.

On the morning of Day 2, the CDC field team integrated with the existing State investigation. Over the next 3 years, 32 CDC personnel (including 25 epidemiologists, 2 industrial hygienists, a specialist in occupational health, 3 statisticians, and an engineer) would be in Pennsylvania working on the investigation with a larger group of health workers from State and local governments, CDC epidemiologists in 3 cities planned with State and city health personnel a coordinated investigation. The State Health Department Laboratory was designated to manage the collection and distribution of clinical specimens.

Early in the morning of Day 2 of CDC's involvement in the investigation, specimens from 20 cases were inoculated into eggs, tissue culture and bacterial media to begin the look for an infectious agent. Specimens from 4 autopsies were immediately prepared for electron microscopy and fluorescent antibody staining. Also on the morning of Day 2 (9 days after the convention and 13 days after the onset of illness in the first case), there was no confirmed evidence of any secondary cases, which was strong preliminary evidence that a common infectious respiratory agent was not the cause of Legionnaires' disease.

At the first of daily meetings, the possible causes of the illness were reviewed including microbiologic and toxic agents. The Chief of the Toxicology Branch was contacted at a meeting in Houston and briefed on the situation. The need for urine specimens, specifically for identification of paraquat, was recognized. On the afternoon of Day 2, and continuing for the next 48 hours, an attempt was made to contact, in person, every case of suspected Legionnaires' disease in Pennsyl-

vania using CDC medical epidemiologists working out of Harrisburg, Pittsburgh and Philadelphia. These officers collected the much needed clinical information in a standardized form, examined patients, and set up liaison with private physicians concerning handling of clinical specimens and pathologic materials and reporting of additional cases.

On Day 3, during a staff meeting at CDC, additional requirements for clinical specimens were specifically discussed including requirements for specimens for electron microscopy, mycology, and toxicology. These needs, and others as they were identified, were passed onto the field staff in daily phone consultations.

The afternoon of Day 3 at press conferences held in Harrisburg and at CDC, it was stated that it was unlikely that the disease was influenza and that toxic substances were under consideration.

On Day 4, a clear composite picture of the Legionnaires' disease had been compiled from cases scattered throughout the State. The similarity to many common respiratory diseases highlighted the need for a precise case definition. In consultation with State officials the first of an evolving set of case definitions was constructed. The progress of the investigation was extensively described on Day 4 in hearings before the Senate Subcommittee on Health, and it was stated that increasing emphasis was being placed on toxicology.

Eighteen deaths from Legionnaires' disease had occurred before CDC began field work. The first 4 deaths in the outbreak after CDC staff began work occurred in Day 3 and Day 4. Under instructions from CDC's Toxicology Branch and others, CDC physicians attended 8 of these 4 autopsies and guided collection of specimens from all 4. Specimens were hand-carried by air courier to CDC for laboratory processing. As additional requirements for types of specimens, their weight, and methods of collection were generated by the various laboratories, the field team was advised and updated their procedure for collection of needed specimens.

On Day 4, an environmental engineer was dispatched from CDC to Philadelphia to join City Health Department environmentalists in a comprehensive investigation of the convention areas for a potential toxic or microbiologic source of exposure.

On Day 4, results of laboratory studies in both the Pennsylvania State Laboratory and at CDC indicated that no viral agent was growing in inoculated eggs, confirming the earlier epidemiologic and laboratory indications that influenza was not the cause of Legionnaires' disease.

The field team had characterized the illness and confirmed the existence of an epidemic. By Day 5, they began an expanded look at activities that might have exposed the cases but not exposed those who stayed healthy. Also on Day 5 a broad range of environmental samples had been collected from the Bellevue-Stratford Hotel were dispatched to CDC for toxicologic analysis.

Questionnaires were distributed to all Legionnaires who had attended the convention. Samples of guests registered at 4 hotels over a period of from 2 weeks before the convention and extending to 2 weeks after the convention were contacted by telephone about illness. Hotel employees and convention officials were queried about illness and activities during the convention. Hospital admission and emergency room records and death certificates were reviewed to discover if the disease occurred as an epidemic outside the Legionnaire group.

From the epidemiologic information collected, a final case definition evolved that had 2 components, one clinical and one epidemiologic. To be counted as a case, a patient had to have become ill between July 1 and August 18, to have either fever and chest X-ray evidence of pneumonia or to have temperature of 102°F or higher and cough, and to have attended the American Legion convention in Philadelphia or to have entered the Bellevue-Stratford since July 1. (Survey of other hotels in Philadelphia showed the disease seemed to be limited to these 2 groups.)

Analysis of the epidemiologic data continues long after the field team ceased operation. In all, 180 cases have been identified, of which 29 were fatal. One hundred forty-nine of the cases were in conventioners, and in that group the rate of illness was highest among voting delegates, older males, and those who stayed at the Bellevue-Stratford. Cases were distributed in time as though they had been exposed to a common source of infection or other cause during the convention. The typical interval between a possible source of exposure at the convention and illness was 5-6 days. No spread occurred to case contacts.

Four activities were found to have some degree of association with illness (time spent in the Bellevue-Stratford, time spent in the hotel lobby, attendance

at hospitality rooms, and drinking water at the hotel) but the mode of spread was not found. The role of the Bellevue-Stratford Hotel was epidemiologically important in that it was the Headquarters of the Convention and visited by essentially all those attending. Its role in causing of Legionnaires' disease has not been established, and there is no evidence that it had more than circumstantial involvement.

COORDINATION WITH OTHER AGENCIES

The investigation of Legionnaires' disease has been a coordinated effort directed by city, State, and Federal health agencies and involving specialized consultation with governmental, university, and private persons and institutions. Fifty-four (54) consultants have been utilized in one way or other by CDC to review field investigation and laboratory analyses and to suggest additional areas of study.

On August 13, about 10 days after the investigation began, CDC convened a panel of toxicology consultants including representatives of the HEW Toxicology Coordinating Committee and expert toxicologists from several universities. The status of the investigation was reviewed and recommendations were sought. Members of the panel suggested botulinum toxin and psittacosis as possible causes, but these have since been eliminated. They discussed other agents like nickel carbonyl and paraquat but indicated they did not typically cause the same illness as Legionnaires' disease. They suggested that the amount of tissue collected for toxicologic analysis be increased.

On August 16, a private ventilation consultant for CDC reviewed the air-handling system in the Bellevue-Stratford, but no new sources of potential air contamination were found.

On August 17, the CDC field staff was joined for consultation by industrial hygienists and epidemiologists from the National Institute for Occupational Safety and Health as well as an industry specialist in occupational medicine. The group made an inspection of the convention premises and hypothesized 5 possible toxic causes of the outbreak: paraquat, phosgene, nickel carbonyl, cadmium, and ozone. They recommended analysis of additional environmental samples, review of the hotel plumbing and ventilation systems and check of nearby incinerator stacks for potential cross-contamination. Analysis of environmental samples is continuing at CDC, and the other recommendations have been followed.

After the intensive phase of the field investigation was completed on August 20, consultation with outside agencies continued. On August 23, representatives of the United States Army from Edgewood Arsenal and Walter Reed Army Institute for Research visited the Center and reviewed available clinical, epidemiologic and laboratory information. They indicated that they found no evidence to implicate an agent of chemical or biological warfare.

In early September an outside pathology panel was convened at CDC to review specimens from cases of Legionnaires' disease. It included specialists from the Armed Forces Institute of Pathology, from the Medical Examiners' offices of Pittsburgh and Philadelphia, and from universities throughout the United States. Special emphasis was placed on the pathology of the liver and the lungs. They found that 5 of 8 cases of Legionnaires' disease had in their lungs evidence of acute diffuse alveolar damage, a non-specific pattern that can be seen with a variety of infectious and toxic agents but which is not consistent with nickel carbonyl, paraquat, or phosgene. Three cases of pneumonia who never entered the Bellevue-Stratford Hotel showed a similar pattern. The absence of bronchiolitis was thought to favor an ingested toxin. They recommended that tissues from other cases be prepared for their review.

Studies of heavy metals in tissue specimens are being carried out by NIOSH and consultants from the Veterans Administration and several universities. They have access to laboratory techniques not otherwise available at CDC, including electron microprobe and proton-X-ray fluorescence.

One additional panel of consultants was convened at CDC on October 7 for overall review of clinical, epidemiologic and toxicologic investigations and for making specific suggestions for future work. It was composed of university scientists and clinicians with special interests in toxicology and pulmonary and infectious diseases. The consultants concluded that conventional infectious agents and known toxic agents are unlikely to have caused the disease.

STATUS OF ETIOLOGIC INVESTIGATION

We do not know the cause of Legionnaires' disease. There are few agents known that could produce an illness like Legionnaires' disease with its characteristically long incubation period averaging 5 to 6 days, no symptoms at the time of exposure, and a serious, acute illness characterized by high fever and pneumonia and evidence of involvement of the gastrointestinal tract and liver. Infectious diseases like Q fever and psittacosis can give a comparable picture, but all laboratory findings have given no evidence of a known infectious disease.

No toxins are known that characteristically mimic the clinical, epidemiologic, and pathologic findings. Suspected classes of toxic compounds have been heavy metals like nickel carbonyl, cadmium, and zinc; halogenated organic compounds, as might be seen in polymer fume fever; alkylating agents of the same class of phosgene and bischloroethyl ether and the herbicide, paraquat. None of the proposed agents fits with Legionnaires' disease perfectly. Nickel carbonyl typically has a much shorter incubation period, rarely causes high fever, and as described in the scientific literature has pathogenic characteristics different from Legionnaires' disease.

Paraquat rarely causes significant fever and shows, as does nickel carbonyl, much more lung fibrosis than was seen in Legionnaires' disease. The alkylating agents typically give symptoms immediately on exposure and often are associated with a depressed white blood cell count, which was not seen in Legionnaires' disease.

TOXICOLOGY STUDIES

The laboratory investigation for toxins began on August 5 and was divided into six areas: organic soluble toxins; water soluble toxins; metals; amine acid-protein profiles; nucleic acid profiles; environmental samples.

Techniques used have included neutron activation, gas liquid chromatography, mass spectrometry, ultraviolet spectroscopy, high pressure liquid chromatography, atomic absorption, thin layer chromatography, and electrophoresis. In addition, tissues are being examined for minute particles by new procedures by collaborative studies in 4 different laboratories using electron and proton induced X-ray fluorescence. These studies are incomplete. The studies of environmental samples have so far not been helpful.

PUBLIC INTEREST

The unprecedented flood of inquiries from the media and the public began almost as soon as health officials became aware of the epidemic of "Legionnaires' disease." By the morning of August 3 the inquiries at CDC had increased the number of telephone calls an hour to 1,500 at which peak they remained until about August 16, when the number was back down to a more normal average of 740 operator-handled calls an hour. During this period it was necessary to set up three separate offices to handle the calls. One was established for the news media, one for the general public, and one for scientists, engineers, physicians, and others who were calling with suggestions about what might have caused the outbreak. By August 6 a special unit was set up to respond to the approximately 2,000 letters and telegrams that have been received.

During the first week (August 2-9) three formal press briefings were held at the Center for Disease Control. Daily telephone briefings were held between the Office of Information, CDC, and the Public Information Office of the Pennsylvania Department of Health in Harrisburg, Pennsylvania. Dozens of individual interviews with representatives of the press, radio, and television added to an ongoing explanation of the investigation and its status.

CONCLUSIONS

Recognizing the concerted and coordinated efforts brought to bear on "Legionnaires' disease" by the staffs of the Pennsylvania State and Philadelphia City Health Departments and the Center for Disease Control along with literally scores of consulting and contributing scientists, one must adopt a certain sense of rational objectivity and scientific humility in acknowledging our failure to date to solve the question of etiology. "Legionnaires' disease" appears to have been a self-limited epidemic of a respiratory disease with comparatively high lethality. But whether its causative agent is a microbiological entity of as yet

undescribed characteristics or an environmental chemical, our best scientific capabilities have been unable to determine.

However disappointing this may be, particularly for those persons afflicted by the disease and for their families and friends and for the hundreds of persons who labored exhaustively to uncover the cause, we must admit that there are diseases and conditions of ill health with which we are not familiar and which, as yet, we are unable fully to understand. This is not so much an admission of human failure as a recognition of how medical and biological science and knowledge evolve.

We are continuing epidemiologic work as well as that in the laboratory. Analysis for heavy metals and alkylating agents involves development of new techniques. Specimens from cases of fetal pneumonia in Philadelphia unrelated to "Legionnaires' disease" are being collected to compare pathologically with cases of "Legionnaires' disease." Investigation of environmental samples, collected early, continues.

Mr. MURPHY. Does Dr. Fraser have any comments?

Dr. FRASER. No.

Mr. MURPHY. Dr. Boutwell?

Dr. BOUTWELL. No.

Mr. MURPHY. Doctor, at the outset you said that "Contemporary science is not infallible."

Of course, there is no group that is probably more aware of the fallibility of people of science and Government than the panel in which we serve.

I recall that back in 1950 hundreds of American soldiers died of a type of hemorrhagic fever. It was not until a few months ago, 26 years later, that a South Korean doctor finally found out the cause of that disease.

I would say that 26 years is a long time to pinpoint what was fairly obvious that the disease was in the feces of a field mouse in South Korea and the soldiers had been digging right through the area. That is how they had become infected.

Also, the question, I think, of the Lassa fever in Africa that killed the scientist in the Yale University Laboratories is also a question the committee and the staff are aware of, that there is danger in laboratories that work in this area, and that the persons who do work in these areas are subject to severe risks under certain conditions, particularly, those in which we are dealing with the unknown.

With those remarks, I will go to Dr. Cyril Wecht who is the coroner of the county of Allegheny. He testified, yesterday, about several aspects of his office's relationship with the CDC. The CDC is the Center for Disease Control. What was its name before it was named the "Center for Disease Control"?

Dr. SENCER. The immediate name before it was the CDC was the National Communicable Disease Center. Before that it was the Communicable Disease Center and before that it was the Malaria Control in War Areas.

Mr. MURPHY. Concerning the 4,000 personnel with the 400 doctoral degrees that you indicated with the change in personnel, was there any significant change in personnel or mission with the change in personnel?

Dr. SENCER. There has been a gradual shift away from almost total concern with infectious diseases into other noninfectious situations utilizing many of the techniques that were used in infectious disease control.

In the laboratory, for example, when I first joined CDC in 1960, the biggest single laboratory in virology was then devoted to poliomyelitis. Today, I think we have only two people devoted to the field of enteric viral diseases.

In 1956, we had five people working in chemistry. Today, almost one-third of the laboratory is devoted to clinical chemistry of one sort or another.

In epidemiology, we do not have a full-time person working on poliomyelitis any more but we do have full-time people working in non-infectious diseases epidemiology so there has been a considerable shift in emphasis over the years.

Mr. MURPHY. Dr. Wecht, and I will quote, said :

Our office collected various body tissues and fluids in the three death cases that we investigated and voluntarily submitted them to the Center for Disease Control in Atlanta.

On Monday, August 16, I had two key members of my staff * * * fly to Atlanta where they met for much of the day with various pathologists and toxicologists at the CDC * * * During the course of that consultation, which had been requested by the CDC, Dr. Perper and Dr. Winek, of my staff, reviewed our findings in great detail and also studied materials available at the CDC in other American Legionnaire death cases. At that time, August 16, there were a total of nine cases with autopsy materials available for study at CDC, and that number included three from our office.

On August 27, 1976, I received a phone call from Dr. Renate Kimbrough, a pathologist on the CDC staff * * * inviting me to participate in a special pathology panel that was being established jointly by the CDC and the Pennsylvania State Health Department. Their panel was to convene in Atlanta on Wednesday and Thursday, September 8-9, to review autopsy materials in the various death cases.

I went to Atlanta on those two days and I reviewed autopsy materials in 10 cases which had been attributed to the American Legionnaires' disease and three others which had occurred around that same time period but which had not been considered as American Legionnaire deaths.

Extensive discussion was conducted by members of the special pathology panel along with many professional members of the CDC staff. It was agreed by everyone present that it would be necessary to have autopsy materials from other death cases as well as the opportunity to study additional materials from the ten cases already at hand.

At that time, it was also agreed by everyone present that we were dealing with a toxic chemical substance of some kind rather than an infectious organism.

On October 15, I did receive microscopic autopsy tissue slides from the same 13 cases that had been reviewed on September 8-9, in Atlanta. No materials from other cases were submitted then, and to this date, I have not received slides or any other autopsy materials from the other 19 death cases.

We were told that 5 deaths did not have autopsies, but 24 did. Therefore, there were 14 other American Legionnaire deaths, supposedly with autopsy materials, that were to be collected, prepared, and distributed to members of the pathology panel.

It should be noted that an additional medical panel had also been convened by the CDC in Atlanta, Ga., subsequent to the meeting of the pathology panel on September 8-9. This was a group of clinicians, epidemiologists, and other physicians convened for the purpose of reviewing the medical data. I have not received any information concerning the deliberations, conclusions, or suggestions of that panel.

Is that your recollection of the events?

Dr. SENNER. Yes: Dr. Wecht was on the panel that reviewed slides at CDC. He is correct in that he has not received all of the remaining material. We do not have it all in hand, as yet, either.

One of the problems in this has been trying to make sure that all of the specimens are processed in an identical way so that they will not be

biased from the use of different laboratory techniques, different cell blocks, and different staining techniques.

We have sections and slides prepared on all but five of the autopsied cases. Limited tissue from two others are available but are not sufficient to supply to all members of the panel.

The other panel that he referred to of toxicologists and clinicians is one that I mentioned met on October 7. We do not have their final report, as yet. Dr. Weinstein, the chairman of that group, has prepared a report and is circulating it through the other members of the panel. One member of the panel is out of the country.

I mentioned that his preliminary report indicated that the agent probably was not any known infectious agent or any specific known chemical.

Mr. MURPHY. Dr. Wecht went further. He said that the "Pathologists and other experts from CDC were available in Pennsylvania throughout those weeks of August and could have traveled to any community upon request.

"If that had been done, then a 100-percent autopsy rate could have been obtained and ample specimens of body tissues and fluids in all death cases could have been collected."

Would you comment on that?

Dr. SENCER. Dr. Fraser was there. I will let him comment.

Dr. FRASER. Of the 29 deaths that occurred, 18, as Dr. Sencer mentioned, had died on or before the first day that the epidemic was recognized. Of the remaining 11 cases, 2 died outside of the State of Pennsylvania, 9 died within the State. Of those 9, we do have good specimens, by and large, on 8.

Of the first four deaths that occurred after CDC was aware of the outbreak—two deaths on the 4th of August and two on the 5th of August—officers were present at two of those four autopsies and directed the collection of specimens. Those specimens were hand-carried to Atlanta by air courier for immediate processing.

Mr. MURPHY. It seems there was quite a gap in the number of specimens that CDC had and the number of deaths and autopsies.

Dr. FRASER. There was a considerable gap; inadequate toxicological specimens were obtained from those deaths that occurred before the epidemic was recognized, that is true; from the deaths that occurred after the epidemic was recognized, by and large, the specimens were of good quality.

Mr. MURPHY. CDC came in. You were notified on the 2d of August and you sent a team right up to Harrisburg, according to testimony, and some representatives into Philadelphia.

Was any protocol distributed to the county coroners for distribution to the hospitals for the taking of samples and for things to look for in their autopsies?

Dr. SENCER. To my knowledge, no, sir. You have to remember that the most important deaths were the 18 deaths that occurred closest to the outbreak—the deaths that would have been the most valuable from a toxicologic standpoint.

I believe some of those occurred in all parts of the State—Pittsburgh and scattered around the State. These were processed under standard procedures, not suspecting that there was a connection among the cases.

Mr. MURPHY. Who was put in charge of the task force that came up here?

Dr. SENCER. The task force was responsible to the State health department. Dr. Fraser was the principal CDC person in Harrisburg.

Mr. MURPHY. Then, Dr. Fraser was the Federal officer in charge?

Dr. SENCER. Coordinator.

Mr. MURPHY. Who was in charge of this investigation?

Dr. SENCER. When we are asked by the State health department to participate, the director of the State health department is responsible.

Dr. Fraser reported directly to Dr. Bachman.

Mr. MURPHY. Then, the State medical commissioner or Dr. Bachman was specifically charged with the responsibility of this ongoing investigation?

Dr. SENCER. The Constitution, when it was evolved, left health as a responsibility of the State except where it crosses State lines.

Mr. MURPHY. Dr. Bachman does not have 1,200 doctoral scientists on his staff.

Dr. SENCER. But we make these available to him.

Mr. MURPHY. What type of coordination was available with the city of Philadelphia?

Dr. SENCER. On the first day of the investigation, we had one of our epidemiologists assigned to Philadelphia. Actually, we have an epidemiologist from our staff who is assigned on a full-time basis for a 2-year period to the city health department. We augmented him with more senior epidemiologists.

Mr. MURPHY. Were any written instructions given to hospitals and coroners as to the type of samplings and any protocol for tissues and fluids?

Dr. FRASER. We designated on the 5th of August three epidemiologists to be specifically in charge of coordination with pathologists and coroners: In Harrisburg for the central part of the State; in Allegheny County, for the southwestern part of the State; and in Philadelphia for Philadelphia County.

Mr. MURPHY. Were any written instructions given to these people?

Dr. FRASER. Almost all of the communications during this time were by telephone and we were in daily contact with the hospitals who had patients who were critically ill.

After patients had died, we were in close contact with pathologists, by telephone, giving instructions for the collection of specimens.

Mr. MURPHY. Was any technical information or bulletins issued throughout the months of August and September to these county coroners or to these county people or to State people in writing?

Dr. SENCER. Yes, sir; we had almost weekly publication of information in the morbidity and mortality weekly reports of August 6th, August 13th, August 20th, August 27th, September 3rd, October 1st. This is our weekly publication. It goes to all health departments in the country.

Mr. MURPHY. This is ongoing, year in and year out and this is not specifically related to—

Dr. SENCER. This part of it was specifically related to the situation in Pennsylvania. We put into it each week things of importance, happenings around the country. This is the quickest way we have of communicating on a broad basis to the public health community.

Mr. MURPHY. But, for the State of Pennsylvania, despite the fact that you sent 20 scientists in here you did not, in September or October, issue any operation or scientific newsletter or report on the ongoing investigation of respiratory disease in Philadelphia?

Dr. FRASER. The arrangement that we had was to have three officers; specifically, one in the eastern, one in the western, one in the central part of the State, to do precisely what you said.

Those physicians were specifically charged with coordination with the physicians who had been doing the autopsies and with the physicians caring for patients for the obtaining, collection, and shipment to Atlanta of specimens from living patients and from autopsies.

Mr. MURPHY. But there was nothing in writing other than your routine report?

Dr. SENCER. On August 30th, Dr. Fraser sent a quite detailed report to Dr. Bachman summarizing what had been done at that time, what happened, what we did know, and what the ongoing situations were.

On the 7th of October, another summary was provided to the State health department that went through all that we had done, all that we had been able to find.

I think we have communicated a fair amount of writing to the State.

Mr. MURPHY. On the 30th of August? Once.

Dr. SENCER. You will have to recognize up to there we were in sight almost constantly and were having verbal communications with the Secretary of Health of Pennsylvania and the Commissioner of Health of Philadelphia.

Mr. MURPHY. The commissioner of the State testified, yesterday, as to the severe limitations on his staff. His deputy was a veterinarian and his laboratories were closed 2 days of the week.

It just seems to me that the Federal people with their personnel and resources certainly should have done more than "jaw-bone" with the few people in the State.

Dr. FRASER. Mr. Chairman, if I may make one additional statement.

During the third week of the investigation when we had collected a large amount of epidemiological, clinical, and pathologic information, we prepared handwritten reports that were, in aggregate, approximately 60 pages long; these were developed by eight of the officers concerned with the specific areas in the investigation.

They included a report on the collection of pathology specimens and described the specific techniques that should be used in collecting specimens. That report was given to both city and State health officials on the 20th of August.

Mr. MURPHY. Senator Schweiker?

Senator SCHWEIKER. Thank you, Mr. Chairman.

Dr. Sencer, do you feel as a result of the experience you went through that you or your constituent parts need more legal Federal authority for investigations of this kind in the future?

Dr. SENCER. Senator, I really do not think so. I think that the Public Health Service Act which says that we may assist States in the control of communicable and other preventable conditions is a very adequate authority under which we can do our work.

Senator SCHWEIKER. Specifically, one the of things that came up yesterday was that, after you had been invited in to take over the investi-

gation, apparently, samples were still being prepared in ways which resulted in contamination by stainless steel or other equipment.

Obviously, given how you were operating then, the question arises: Could you prevent that kind of thing in the future? Here, people were doing their own thing, in their own way even though you, technically, had been invited in?

Dr. SENCER. I think, as we tried to point out, though, Senator, that once there was a recognition of an epidemic, an abnormal situation, the specimen collection became much more regularized and the possibility of contamination decreased.

Most of the contamination—if you wish we should call it that—occurred in those autopsies that occurred prior to the recognition of the outbreak.

If this had been a cluster that happened in one place, as is common in an outbreak such as food poisoning, this would have come to light almost immediately.

Because this was one case here and one case there and there was no central mechanism for identifying it until the American Legionnaires themselves identified it as something that was abnormal.

I am not sure that anything in the law should have prevented what happened before there was a recognition of the situation.

We do have, across the country, quite well-accepted standards of collecting materials for infectious disease, determinations, looking for infectious etiologic agents.

We have a manual on how to collect whatever appropriate specimens are needed. I think that one of the first things we are going to do is update that manual to contain a section on appropriate specimens for noninfectious agents and how to collect them, if we can get an agreement on that among scientists. This has not been done, but it will be done.

Senator SCHWEIKER. One of the key areas, of course, that we know about now, albeit in hindsight, is the need to insure high quality toxicology work and toxicological expertise.

My question to you is, Is the chief of your toxicology department a Board certified toxicologist?

Dr. SENCER. No; he is a Ph. D. in chemical toxicology. He reports to Dr. Bayse who is the chief of the chemistry section. Dr. Boutwell is the next in line. He is the past president of the American Society of Clinical Chemists.

Senator SCHWEIKER. I hate to bring up the next question. But, in view of what happened, I think it is an appropriate question.

I have a serious allegation to the effect that your chief of toxicology actually failed to pass the Board examination for toxicologists?

Dr. SENCER. I do not know about that. As far as I know, Dr. Liddle has not attempted, has not applied for membership in the Board.

Senator SCHWEIKER. I would like to pursue that further, privately, because information that I have is contradictory. Someone in the section, and I thought it was the head, actually failed their Toxicology Board examination accreditation.

Dr. SENCER. I do not know. We will certainly look into it and report back to you, sir.

Senator SCHWEIKER. Why would not your department have a Board certified toxicologist as the head of the department, forgetting the personalities?

Dr. SENCER. I did not dwell on this in my prepared statement but let me just recap what has happened in the field of toxicology at the Center.

We first began to develop toxicologic competency back in 1943 and 1944 when we were in a malaria-control program. At that time, DDT was becoming available although very little was known about the effects of pesticides on people who were spraying insecticides. At that time, we were developing a toxicology program specifically to look into DDT. This program was augmented in the 1960's when there was more concern about pesticides.

The pesticide program of the Public Health Service was transferred to CDC and headed up by Dr. Simmons who was one of the internationally recognized chemists in the field of pesticide chemistry.

One of the reorganizations of the Public Health Service in 1968 resulted in this program being transferred to the Food and Drug Administration. This was a program that included in-house toxicology and support of toxicological studies in a number of communities around the country.

This was transferred to the Food and Drug Administration in 1968 with out staff and with our money. In 1970 it was transferred from the Food and Drug Administration to the Environmental Protection Administration.

We were left with really no toxicological activity of our own. Recognizing the need that we had for helping the State in this area, particularly in terms of proficiency testing and in other areas, we once again began to develop and bring together a group of chemists and pathologists who are concerned with toxicology.

Senator SCHWEIKER. Let me go back to this question, again, about qualified toxicologists.

The person who conducted your toxic substance work on the legionnaires' disease for the CDC, is it not true that the person who did that failed the Board exams for toxicology?

I am not talking about the chief, now. I am talking about the person you assigned to head up the toxicological section of the investigation. Is it not true that that person failed to pass the Board examinations and gain accreditation?

Dr. SENCER. I'm sorry—Dr. John Liddle is the person to whom we assigned the responsibility.

Senator SCHWEIKER. Liddle, as I understand it, was not basically on the scene.

Dr. BOUTWELL. Dr. Liddle is the Chief of the Toxicology Branch.

Senator SCHWEIKER. That. I understand. But who actually did the work and who conducted the investigation?

Dr. BOUTWELL. Dr. Liddle was in charge of the entire investigation using the resources of the Toxicology Branch.

Dr. David Bayes, who is Director of the Clinical Chemistry Division, Dr. Liddle's superior, was involved in the investigation rather heavily at the same time.

Senator SCHWEIKER. Was Dr. Kimbrough involved in the investigation?

Dr. SENCER. Dr. Kimbrough was involved. She is a pathologist in the toxicology branch.

Senator SCHWEIKER. Did she pass her Board exams for accrediting toxicologist?

Dr. BOUTWELL. I have no knowledge.

Dr. SENCER. I can find out. We just do not know, sir.

Dr. BOUTWELL. There are two boards.

Mr. MURPHY. Would you supply that information for the record directly to the committee, please? [See p. 133.]

Dr. BOUTWELL. You must recognize there are two boards. There is the Board of Forensic Toxicology and there is the American Board of Clinical Chemistry, the Toxicology Board, also.

Senator SCHWEIKER. The information I have indicates that she has not been accredited and has actually failed. If this is wrong I will want to set the record straight, but I got this information from a pretty good source.

It just seems to me that this points up some of the deficiencies we have here. First, we had toxicology coming in late to the investigation.

Second, we did not use the resources of other Government agencies, EPA for example, that did have the body of expertise which you admit had been taken from your group and been put into a separate section. Also, that we used people who had not had a great deal of training, background, and expertise in this area, which turned out to be the critical area.

Was the Environmental Protection Agency called into that meeting you referred to on page 13 of your testimony?

Dr. SENCER. We consulted with EPA in August on trying to find the chemical companies around this area.

Senator SCHWEIKER. You said that on August 13—on page 13—10 days after the investigation began, CDC convened a panel of toxicology consultants, including representatives of HEW. Was EPA included in that panel?

Dr. SENCER. There was no one from EPA. They were from the National Institute of Environmental Health Sciences, the National Institute of Occupational Safety and Health, the National Center for Toxicological Research, Vanderbilt, Yale, Oklahoma, University of California, Los Angeles, University of Southern California. There was no one there from EPA, no, sir.

Senator SCHWEIKER. Was there any particular reason why there was no one there from EPA, given all the work that the EPA has done?

Dr. SENCER. I think an awful lot of work has been done in the Public Health Service, the National Institute of Environmental Health Sciences, and the National Center for Toxicological Research at Pine Bluff.

The Public Health Service has a committee on coordination of toxicology. This toxicology consultant panel included those representatives that the committee suggested come.

Senator SCHWEIKER. On page 9, you indicate from the very beginning the approach to investigating this outbreak was similar to the approach used in the investigation of other outbreaks in which the Center has participated, whether they be infectious or toxic.

As I understand it from the newspaper accounts of the events, your experts on toxicology were not physically called into the investigation until 2 days later; that is, on Wednesday. The toxicology experts were not physically present here in the city of Philadelphia until 2 days after the main group of your investigators got here?

Dr. SENCER. I am not sure whether we had anyone here, sir, from our toxicology laboratory at all. This is, basically, a laboratory operation.

They were sending instructions on what materials to collect and giving advice on where to go with the investigation rather than being field workers, themselves.

Senator SCHWEIKER. You say you had no one from your toxicology section?

Dr. SENCER. That is not unusual, sir. In many of the other investigations that we have been involved in, there has been no laboratory personnel actually on site. They are busy with the laboratory aspects of it and are unable to do the collection.

Senator SCHWEIKER. You have bacteriologists and virologists on site and not a toxicologist?

Dr. SENCER. Sir, we had an epidemiologist on site, not a bacteriologist. They were in Atlanta.

Senator SCHWEIKER. We had what we felt was some expert testimony here, yesterday, from Dr. Sunderman and his son. They seemed to take some issue with your conclusion in your statement here on the symptoms of nickel carbonyl poisoning compared to the symptoms of the disease that actually occurred in Philadelphia.

What is it that your group takes issue with in their findings? From knowledge that I have, they are experts in the field, probably among the top experts in the field and have actually worked with people who have lived and died with nickel carbonyl poisoning as a disease?

Dr. SENCER. The descriptions of nickel carbonyl poisoning, the classic descriptions, are those of Dr. Sunderman. The initial symptoms are usually mild and not specific and disappear quickly upon removal of the subjects from uncontaminated air. The initial symptoms usually include frontal headache, nausea, and vomiting.

In order of frequency of symptoms, 56 percent complained of frontal headache, 42 percent of dizziness, et cetera, and only 15 percent coughed. This does not fit the clinical picture of legionnaires' disease.

Dr. BOUTWELL. If I can say something; that is, we simply have no laboratory evidence which would confirm the suspicion that nickel played a role in the outbreak.

Laboratory evidence is not all conclusive but the clinical findings together with the lack of laboratory evidence does not allow us to say that nickel is the cause. It is simply not scientifically possible to say that nickel is the cause.

Senator SCHWEIKER. If there had been—this is, strictly, a hypothetical, speculative case—but if there had been a case of some kind of nickel carbonyl poisoning and if there had been some kind of an incineration process or trash fire or some smoke or something, would it not have been rather likely that there were other ingredients involved besides just nickel?

Would not the other ingredients have mitigated the disease's symptoms?

I am saying that I am not sure I can concur with what you are saying. Just because there is not an exact match, it does not mean that nickel carbonyl was not involved; does it?

If there were any other heavy metals involved with nickel, it may well have given rise to a different syndrome. In that case, we don't just rule nickel carbonyl out because the disease symptoms do not fit, exactly, the classic case; do we?

We had two experts, yesterday, that said it was close enough for them to believe it was the classic case. There seems to be a vast difference between their view and your experts' view which is pretty crucial to this investigation.

Dr. SENCER. The other heavy metals have pretty well been ruled out. Senator. I think another thing that is against the nickel carbonyl theory, clinically—and Dr. Boutwell says you have to put the clinical situation together with the laboratory aspects—is the fact that the Sunderman paper on nickel carbonyl poisoning, says that fever is not a prominent symptom, and that even in critically ill patients the temperature was rarely above 101°. In the legionnaires group, the average temperature was about 104°.

Therefore, I think that you have to put all the things together; it just does not hold, either clinically or in the laboratory.

Senator SCHWEIKER. Did these victims have complicating factors; that is, diabetes, heart disease, other metabolic problems?

Mr. MURPHY. There were liver breakdowns; there were older people.

Dr. SENCER. But these are not the causes of fever.

Senator SCHWEIKER. Could they have complicated the profile that came through on the diseases?

Dr. SENCER. Of course, this is one of the problems that we are facing, that so many of the people had been ill so long before any specimens came to the attention of anyone; that things could have been excreted from the body and left no trace.

The reason that we need fresh specimens is that the toxins are likely to be there at that time, but at autopsy, when there has been a considerable period of time between exposure and death, quite likely the body has excreted many of the things that we would be interested in finding or has changed them, metabolically.

Senator SCHWEIKER. Dr. Sunderman suggested, yesterday, that if the victims had pneumonia plus nickel carbonyl poisoning, that could very well explain the high fever, so that just about any slight alteration of nickel carbonyl with some complication, such as pneumonia, could very well explain the symptoms we found here.

Dr. SENCER. We had no evidence that there was pneumonia of bacterial or viral origin.

Senator SCHWEIKER. At first, everybody was reporting pneumonia, Doctor. Everyone said pneumonia was on the loose. That is exactly what everyone was telling us on the news media.

Dr. SENCER. I am trying to differentiate between the types of pneumonia that cause fever and the types of pneumonia that we saw here.

The types of secondary pneumonia that would cause fever are the types of bacterial pneumonia caused by pneumococci and other bacteria. Pneumonias are caused by a wide variety of agents.

Legionnaires' disease includes a pneumonia that was seen by X-ray and from which there were no bacteria or viral agents recovered that would explain the presence of fever early in the disease.

Senator SCHWEIKER. Did you consult during your investigating process with the Chemical and Bacteriological Warfare people on CBW possibilities?

Dr. SENCER. Yes, sir.

Senator SCHWEIKER. Who was your point of contact there?

Dr. SENCER. Colonel Russell and Colonel Rosenberg.

Senator SCHWEIKER. There has been a news report that Colonel Russell's background includes absolutely no involvement of any kind with CBW; that, essentially, he is a doctor of internal medicine who specializes in virology, so we are back to viruses and bacteria.

Dr. SENCER. He and the institute that he is attached to are equipped to handle normal communicable disease problems within the Army.

We requested from the Army R. & D. command consultation and Colonel Russell and Colonel Rosenberg were sent to consult with us. We have also supplied Colonel Russell with additional material that he was to circulate to other people who might be able to help.

Senator SCHWEIKER. Can you tell us what the status is of some of the tests you have been conducting? When I last talked to you, you told me—you or Dr. Fraser, it might have been Dr. Fraser—that you had some mice being tested to see if anything from the water system cooling tower on top of the Bellevue could have been connected with the disease. Have those mice died? What is the status of the samples?

Dr. FRASER. We have set up the study that you have just described. It involves three groups of mice. One group was fed water from the air-conditioner chilled water system which we knew to contain certain concentrations of chromates and, although we had analyzed it through a number of tests, we assumed there would be additional substances in that water.

The second group was exposed to water that was distilled and pure to which we added the same concentration of chromates. This served as one control group.

The third group was exposed to distilled water. These three groups of mice were exposed during a 2-week period and the animals appeared perfectly healthy throughout the experiment.

They have been sacrificed and we are now in the process of looking at them pathologically. There is no evidence that chilled water was toxic to the mice.

Senator SCHWEIKER. You are saying that in all three instances the findings are negative?

Dr. FRASER. That is correct, from the examination of the mice, grossly. We are now in the process of preparing the tissue to look at it, microscopically, to see if there are some changes that we did not identify just looking at the animals.

Senator SCHWEIKER. Yesterday, Dr. Sunderman referred to some work which I think you mentioned, Dr. Sencer, in your testimony, some patient tissue analysis for metals? What is the status of that investigation?

Dr. SENCER. I think Dr. Chen who is doing some of that work is going to testify. I prefer that, since he is going to testify; he tell it in his own words.

It is my understanding that there has been an attempt to see if there are differences in nickel levels between cases and controls, and they cannot identify any significant differences between the level of nickel

in typical cases in those people who had no connection with the convention.

Senator SCHWEIKER. What other tests, then, do you have outstanding, either undetermined or continuing presently, that still might possibly shed some light on the Legionnaires' disease?

Dr. SENCER. In the toxicology laboratory, we are analyzing some tissue specimens for volatile organic compounds. We are working with Dr. Sunderman's techniques to see if we can duplicate his work.

Dr. Chen and Dr. Abraham are continuing the work on heavy metal analysis using the electron probe and proton beam. Dr. Fraser has described our experiment with mice.

In microbiology, we have designed our experiments to look for bacteria in tissues in environmental samples that live in cold environments rather than in warm environments, thinking there may have been something living in the air-conditioning system.

In the pathology laboratories, as I described to the chairman, we are preparing tissues from the last autopsies so that we can distribute the remaining specimens to the advisory panel.

We are continuing to go over clinical records of an additional 30 hospitalized patients to see if there is anything that we could have missed in our epidemiologic investigation.

Senator SCHWEIKER. There was a point brought up, yesterday, that the Bellevue Stratford had reinstated the use of an incinerator that was out of function because it did not meet pollution standards. Because of the trash strike here in Philadelphia apparently, it had been started up again over the summer and was, in fact, operating at the time of this outbreak.

As I understand it, this incinerator is physically located under the lobby of the Bellevue.

First, have you investigated that incinerator? Second, have you conducted atmospheric integrity tests to determine whether, in fact, there was leakage of contaminants from that incinerator?

Dr. SENCER. The incinerator has been examined by our environmental engineers and specimens of ash have been taken from the residual ash from that incinerator and are among the large number of environmental samples that we have at CDC for toxicologic analysis.

Senator SCHWEIKER. I take it you have not conducted an atmospheric integrity test on the incinerator as yet?

Dr. SENCER. Not to my knowledge.

Mr. MURPHY. What did the ash show? You took ash samples, what did they show?

Dr. BOUTWELL. It has not been analyzed.

Senator SCHWEIKER. Since the Bellevue has been closed, now, would it not be possible to determine whether, in fact, the incinerator was leaking and, if so, where it leaks to just by simple smoking of the incinerator? Would not this be a logical test to make in view of possible contamination?

Would this not be a simple thing to do, a logical thing to do, given that the incinerator may have been out of function for 20 years? It was a pollution baby. They canned it. They opened it up, and it operated under the Bellevue lobby.

Obviously, it is a source of contaminating agents; otherwise it would not have been shut down.

They relaxed the standards to let the incinerator burn because of the strike. Would it not be a logical thing to check out whether there was integrity in the system when, in fact, some of that stuff might have gotten through the ventilating shaft since it is right under the lobby?

Dr. SENCER. Our environmental engineer has examined the incinerator, specifically. The incinerator was used during the investigation, and smoke would have been detected if the incinerator were leaking.

Senator SCHWEIKER. Would you be able to have them make an actual test? The hotel is shut down. There is no reason why he could not check the atmospheric integrity of the system to see just where the leakage did occur and whether it, in any way, got into the elevator shafts or into the air vents.

Dr. SENCER. We would be glad to talk to them to see if it can be done.

Senator SCHWEIKER. I would appreciate it. I might say that it is very speculative.

Dr. SENCER. So much of this—

Senator SCHWEIKER. Now that we know we had a 20-year-old incinerator that had been declared pollution laden and was operating when the legionnaires were there, it seems that aside from testing ash—which is a good step—we should probably do the atmospheric integrity testing as well.

Mr. MURPHY. Senator, could I interrupt you a moment?

Senator SCHWEIKER. Yes.

Mr. MURPHY. Doctor, on page 13 you state, "On August 16 a private ventilation consultant for CDC reviewed the air handling system in the Bellevue Stratford but no sources of potential contamination were found? Who was that private ventilation consultant?"

Dr. SENCER. Mr. Rhodes, Wallace Rhodes. He is a professional engineer.

Mr. MURPHY. Who hired him?

Dr. SENCER. We hired him as a consultant.

Mr. MURPHY. To do the air-conditioning system?

Dr. SENCER. Yes, sir.

Mr. MURPHY. Why did you not hire someone to do the incinerator system?

Dr. SENCER. I think the incinerator system came up after the air-conditioning system came up—I am not sure.

Dr. FRASER. We had, during that investigation, specific people from the National Institute of Occupational Safety and Health who were specifically trained in industrial hygiene who assisted in the field of investigation and participated in all the investigation of a number of aspects of the hotel, including the incinerator.

Mr. MURPHY. On page 9 at the bottom of the page, "32 CDC personnel including 25 epidemiologists, two industrial hygienists, specialists in occupational health, three statisticians and an engineer came to Philadelphia."

I do not know why you cannot definitively answer Senator Schweiker's question as far as the incinerator is concerned with all of this high-paid manpower coming in here.

Senator SCHWEIKER. We know that the incinerator violates our present air quality standards. It is not as if you do not have a polluting agent. You have a polluting agent.

They made an exception during the trash strike so that the trash would not accumulate. We know that you have a source of contamination, pollution, right in the Bellevue's basement. The part I have trouble understanding is why we did not pursue it further.

It is just a pretty classic case of a possibility that ought to be run down. I have no idea whether or not the incinerator is involved at all.

Dr. Sencer, I'd like to followup Dr. Sunderman's testimony from yesterday and your decision to rule out nickel carbonyl because of the victims' high fever.

I would just like to quote a passage from his statement which I think is relevant here. Apparently, there seems to be a difference of scientific opinion.

I quote. "Where high fevers occur (this is in this specimen)"—maybe I should read the whole paragraph because it gets back to their expertise.

Fever is usually not a prominent finding after acute exposure to nickel carbonyl. Generally, the temperatures range from 101° to 103°, although higher temperatures, at times, have been observed in the more severe cases. Within recent years, since the therapeutic use of the specific antidote dithiocarb, patients with acute nickel poisoning survive, hence the patients do not develop the acute pneumonitis with the attendant high fevers that are observed in patients who had not received the antidote. When high fevers occur, they represent either a superimposed secondary infection or, perhaps, an allergic manifestation of nickel in combination with other metals or other agents such as alcohol.

I was a Legionnaire myself and I have been to a few conventions, and, if you are talking about the last ingredient, that is a highly likely ingredient.

Therefore, just a combination of alcohol and nickel carbonyl poisoning could cause these fevers that you folks are mystified about, according to Dr. Sunderman.

Dr. SENCER. In any field of science you are going to have differences of opinion. The panel of pathologists who have reviewed the slides to date, our consultant group which includes one of the leading pulmonary toxicologists in the country, none of them believed that either the pathologic picture is that of nickel carbonyl intoxication or the clinical situation.

I think we are in a position where there is a very honest difference in scientific opinion over a clinical situation, and we do not have laboratory evidence to support either side at the present time.

In defense of the people attending the convention there were a good number of people who became ill who did not drink. I do not think we should leave the impression that that was the case.

Senator SCHWEIKER. Maybe you can respond to this, then. Many of the cases reviewed by the panel revealed superimposed secondary kinds of pneumonia which, certainly, may account in part for the higher temperatures that were observed in the legionnaires' disease.

Dr. SENCER. There again, this was not substantiated by bacteriologic culturing—although this was attempted—that these pneumonias were not those of superimposed bronchial pneumonia or superimposed lobar pneumonias that usually are associated with secondary fever.

Mr. MURPHY. Doctor, would you provide us with a copy of that air-conditioning report that the private ventilation consultant gave, for our record? We have to subpoena the Franklin Institute—

Dr. SENCER. You do not have to subpoena us.

[The report referred to follows:]

OCTOBER 11, 1976.

Memorandum to: Assistant Director, Bacterial Diseases Division, Bureau of Epidemiology, CDC.

From: Wallace W. Rhodes, P.E., Rhodes Consultants, Inc., 1641 Ponce deLeon Ave., NE, Atlanta.

Subject: Bellevue Stratford Hotel, Philadelphia, PA—Preliminary Summary of an Inspection and Analysis of Ventilating and Air Conditioning Systems for Evidence of any Air Contamination of Unknown Etiology, August 16, 1976.

An inspection was made of some of the air handling units (AHUs) on various floors, the central chillers, and the cooling tower for the subject building.

The chillers were operating normally except for a greater-than-expected loss of refrigerant (Freon 11) from an undetermined source. It was suspected by the writer to be either escaping from around the seals or through a preset diaphragm utilized as a safety device in the event of excessively high internal chiller refrigerant pressures. No specific significance was associated with this and the illnesses and deaths of the Legionnaires.

The AHUs that were inspected all appeared to be functional, and there did not seem to be any evidence of tampering with these units. Filters and chilled-water coils appeared normal. There was a maximum and minimum setting for the outside-air dampers of the AHUs so that at certain times additional outside air (normally 20 percent) could be introduced into the system most likely during the fall and spring to aid in cooling without the central chillers operating. The AHUs also had automatic return-air dampers that could modulate in conjunction with the automatic outside-air dampers. A return-air remote bulb thermostat controlled the space temperature. This type of system for the AHUs was generally typical with only minor variations depending upon the characteristics of the conditioned space being served.

The writer was informed that during the time frame when most of the illnesses apparently were contracted (week of the Legionnaires Convention) there was a temperature inversion for about a day. Also, a new man began to operate the Hotel incinerator just before that time. This incinerator is used normally only for "waste basket" wastes from guest rooms in the Hotel. The incinerator stack and the cooling tower are both in the proximity of the outside-air intakes of some of the AHUs (for the 18th floor of the Hotel). If anything of a highly hazardous nature had inadvertently been burned in the incinerator during this temperature inversion, it seems at least theoretically possible that the "discharge" from the incinerator stack could mix with some of the "drift" from the cooling tower, and in addition to possibly being drawn into the 18th floor area, this "discharge mixture" might have been carried directly down a side of the building (like a waterfall of smoke) depending upon the wind direction. Such an eventuality could then possibly have created a momentarily hazardous condition at street level. The writer has seen a "waterfall of smoke" occur down the side of an actual building under certain meteorologic conditions.

The writer recommends that a closed examination be made of the incinerator to determine, if at all possible, if any unusual items could have been burned during the week when the illnesses occurred.

If additional information is needed or if additional services are required, I will be available to you at any time.

WALLACE W. RHODES, P.E.

Senator SCHWEIKER. I know that.

What kinds of instructions did you give to local hospitals and to coroners as to what specific specimens to take in this particular instance?

Dr. SENCER. As I mentioned before, our manual on specimen collection has been mainly concerned with microbiologic agents. I think one of the first things we must do is to update it. I do think this has pointed up the need for standard operating procedures.

We do not now have standard specimen collection recommendations for the States who, in turn, would put them out to the local health departments.

Senator SCHWEIKER. Why could not three sophisticated hospitals such as those in Allegheny County, each of which had a death, have determined for you through their laboratories that swine flu was not the cause of those deaths?

Dr. SENCER. I do not think the laboratories in those hospitals are equipped for viral isolation. Specimens were sent both to the State health department and to us for viral isolation.

Most, even sophisticated laboratories, are not doing routine viral isolations, sir. This is something that is either on a research basis or by the State health departments.

I think that the network of laboratories doing viral isolations for influenza is about 70 and most of those are State health departments.

Senator SCHWEIKER. It took 2 weeks for you to get away from the swine flu attitude; is that right?

Dr. SENCER. No, sir; on Wednesday, the third day of the investigation, we said it is quite likely not flu. On Friday, we said that the final laboratory tests had been completed, and it was not influenza.

When I testified before Senator Kennedy on Thursday I said that it was highly unlikely that it was influenza.

Senator SCHWEIKER. When did you send in a toxicologist? That first team of 25 epidemiologists, two hygienists, engineers, statisticians—no toxicologists there?

Dr. SENCER. As I said, toxicology is a laboratory discipline. They are needed to do the laboratory work, not the fieldwork.

The epidemiologists are the people who collect the epidemiologic information, oversee the specimen collections, and then the toxicology work is done in the laboratory with a very sophisticated array of chemical and pathologic materials.

Senator SCHWEIKER. You testified to Senator Kennedy, then, on Friday, August 6, was it?

Dr. SENCER. I have the testimony here, sir—the 5th.

Senator SCHWEIKER. When did you begin to focus on the possibility that a toxin could have caused this epidemic?

Dr. SENCER. On Wednesday the 4th. As I mentioned, we had a simultaneous press conference in Harrisburg and then in Atlanta and we said it was highly unlikely that this was influenza and that toxic substances was becoming more and more an area of investigation.

Senator SCHWEIKER. You stated on the 4th that you did not think it was a toxin.

Dr. SENCER. I think that from the beginning I have stated that I do not know what it is.

Senator SCHWEIKER. Some members of the press communicated to us that you stated at that time that you did not feel it was a toxin?

Dr. SENCER. I can submit my testimony, if you like, sir.

Senator SCHWEIKER. In a speech to the American Public Health Association on October 20, Dr. Fraser mentioned that CDC conducted

an extensive onsite investigation of headquarters hotel to look for possible sources of environmental contamination. When was this onsite investigation conducted?

Dr. FRASER. It began on August 5 with the arrival of an engineer from CDC. He began his onsite investigation that day. On the following day, the 6th, he collected a large number of environmental samples. It continued, then, over the subsequent 2 weeks. The engineer stayed with us in the field team in Philadelphia. He consulted with the team from the National Institute of Occupational Safety and Health and assisted them in their field investigation.

Senator SCHWEIKER. Why was not NIOSH called in until August 18, and what were the results of the study?

Dr. SENCER. Actually, NIOSH was involved in this on August 13. We had been in telephonic communication with them before that. Dr. Fraser can tell you what the results were. We had a report from the occupational group that we can supply for the record.

[The report referred to follows:]

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE,
PUBLIC HEALTH SERVICE,
September 3, 1976.

Memorandum to: Director, DSHEFS.

Through: Chief, Biometry Section, DSHEFS.

From: Chief, Industrial Hygiene Section, IWSB, DSHEFS, Epidemiologist, Biometry Section, IWSB, DSHEFS, Industrial Hygienist, Region, III, Medical Officer, Medical Section, HETAB.

Subject: SHEFS I Report: Evaluation of "Legionnaires Disease", Philadelphia, Pa. TA 76.

I. INTRODUCTION

A team of DSHEFS and Regional Office investigators were requested by the office of the Director, NIOSH, to travel to Philadelphia, Pennsylvania City Health Department to assist CDC investigators in the study of the "Legionnaires' Disease".

II. ACTION TAKEN TO DATE

Persons contacted at the Philadelphia Health Department included Dr. David Fraser, CDC physician in charge of the epidemiologic study, John Seggerson, CDC Region III, Dr. Soricelli, Deputy Commissioner of Health, City of Philadelphia, Milton Stanley, representative from the Pennsylvania State Health Department, Mr. George Mallison, CDO Sanitary Engineer, Mr. Chadwick, Executive Director of the Bellevue Stratford Hotel and Mr. Var, Business Manager of the hotel. NIOSH personnel who visited Philadelphia included Denny Dobbin, Dr. Shiro Tanaka, David Brown, DSHEFS and Wesley Straub, Region III. A consultant to NIOSH, Dr. Ahmed Nasr also was present and part of the team.

The NIOSH team traveled to Philadelphia on Tuesday, August 17, 1976, where they met with the study leader, Dr. David Fraser. The outbreak of "Legionnaires' Disease" was discussed and all the epidemiologic data collected and analyzed to date was summarized as follows:

1. An outbreak of unknown etiology and unknown origin began on July 22, peaked around July 26-27 and the last case was observed in August, 1976.

2. The affected group was isolated among those attending a Legionnaires Convention held July 21-24 at several hotels in downtown Philadelphia, with headquarters at the Bellevue Stratford Hotel.

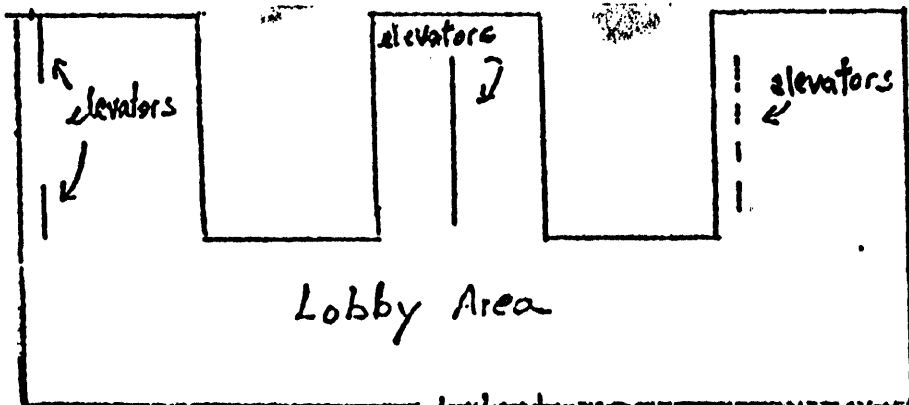
3. The convention was attended by approximately 4,500 persons from Pennsylvania American Legion Posts of which 2,300 were official convention delegates.

4. There has been 172 reported cases of the disease including 28 deaths.

5. The definition of the disease being used for purposes of the study is as follows: (a) fever and chest x-ray showing pneumonia or temperature greater than 102° and cough; and (b) a legion conventionnaire or individuals having been in the Bellevue Stratford Hotel since July 1, 1976.

6. 6.5 percent of all those attending the Legion convention became ill (attack rate of 6.5 percent among conventionnaires).

7. The ratio of men to women cases was 5:1.
8. The age distribution of cases correlates well with the age distribution of the conventionnaires.
9. The incubation period was determined to be 3-8 days with an average of 5.5 days.
10. Description of the clinical illness:
 - a. Onset after 5 days;
 - b. Weakness, tiredness;
 - c. Fever of approximately 104°;
 - d. Chills;
 - e. Cough;
 - f. X-ray evidence of pneumonia;
 - g. Other—shortness of breath, headache, vomiting, diarrhea, abdominal pain;
 - h. Physical examination; (1) liver palpable (2) enlarged spleen (after autopsy) (3) increased mononuclear cells (4) low grade abnormality in liver function (5) WBC count 8,000-15,000; and
 - i. Symptoms correlated with mortality: WBC count greater than 10,000 fever greater than 105°.
11. From laboratory analysis there were no biological agents that could be isolated from deceased or alive cases.
12. There were no secondary cases.
13. Several surveys were conducted by CDC personnel to determine what characteristics or events were common among the cases; as compared to non-cases among the population of conventionnaires. These surveys revealed several risk factors:
 - a. Being a delegate.
 - b. Being registered at the Bellevue Stratford Hotel on July 21 or 24.
 - c. Being present at 12 midnight to 8 a.m.; 10 a.m. to 2 p.m. and 4 p.m. to 6 p.m. on July 23.
 - d. There was a statistically significant association among cases and being present at one of the 13 hospitality rooms (parties) in the Bellevue Stratford, however, only half of those sick were in attendance at any one of these hospitality rooms.
 - e. There was no correlation found with any one restaurant, consumption of ice, elevators, watching a parade which occurred that week.
 - f. There was no clustering of cases in hotel rooms or on any one floor of the hotel.
 - g. Of 700 rooms in the Bellevue Stratford, 620 are for rent and 508 were occupied by Legionnaires during the convention.
14. At a previous convention at the Bellevue Stratford and the Ben Franklin on September 17-24, 1974, there was an outbreak of unknown origin involving 17 cases, with 3 deaths. Symptoms were similar, with x-rays indicating pneumonias.
15. The interval between arrival at the hotel and onset of disease was always constant so it appears that the agent was present for at least several days.
16. Hotel description:



Broad Street
subway

- a. Built in 1904.
- b. 18 numbered floors and 2 floors above 18.
- c. Basement with kitchen and sub-basements.
- d. Central air was added in 1953 and five additional floors were finished in 1964.
- e. Radiators are used in winter.
- f. Cooling towers are located on top of building with their own pump to cool compressors.
- g. Drinking water tanks are on the 19th floor and are not completely enclosed.
- h. Ice machines are on 3rd, 6th, 9th, and 16th floors and 17 others are located within the hotel.
1. Insecticides are applied twice a week.
 1. Friday—9 a.m. to 12 noon, lobby area.
 2. Tuesday—9 p.m. to 12 midnight, kitchen and basements.
17. There is a subway system outside the hotel on Broad Street.

III. FINDINGS

1. Mr. Var along with Mr. Mallison, accompanied the NIOSH team on a walk-through survey of the Bellevue Stratford Hotel. The walk-through survey covered the sub-basement where the main hotel air conditioning unit was located. This unit chills water which is then pumped to other locations introduced to air handling units on each floor where air cooling occurs and is vented to the individual rooms. The walk-through survey also includes the fan rooms which ventilates lower floors, the kitchens, the penthouse including the cooling tower, the auxiliary water tanks, air handling units for the upper floors, the elevator switch and pulley room, typical floor hallways and guest rooms. No overt sources of contamination were observed during the course of our walk-through. Afterward, a verbal report was made to Dr. Fraser.

2. Messrs. Dobbin and Brown stayed in the hotel the evening of August 17, 1976. Nothing suspicious was observed during their stay.

3. On the morning of August 18, 1976, the team met to discuss further action. A summary report of possible contaminants was drafted and discussed with Dr. Fraser (see part IV). It was decided to return to the hotel to find out more information about the ventilation system and to interview a hotel employee who had a reported illness with symptoms similar to the CDC definition of the disease (i.e. in the hotel after July 1, 1976, and exhibiting pulmonary disease symptoms).

4. Mr. Brown returned to Cincinnati on August 18, and the rest of the members returned to the hotel and met with Mr. Chadwick who put the team in contact with Mr. Marrow and the employee who had reported the illness. Mr. Marrow, the hotel's senior engineer, explained further details of the ventilation system. The employee who had reported the illness was interviewed by Dr. Tanaka (see attachment).

IV. FURTHER COURSES OF ACTION

1. Recommend that environmental samples taken by Mr. Mallison be analyzed quickly. If this is not possible, then NIOSH should investigate doing the analysis ourselves (in house or by contract). In any case samples should be split so that at least two separate analyses can be made.

2. NIOSH should assist in collection and analysis of additional environmental samples.

3. Dr. Ahmed Nasr has recommended that he consult Dr. Renate Kimbrough of CDC in Atlanta to review the analyses of tissues for Paraquat poisoning (see attachment).

4. Recommend that NIOSH perform testing on the pyrolysis of carbonless carbon paper to find out how much Nickel Carbonyl is produced.

5. Based on the present data discussed in Section II of this report, the NIOSH team has formulated several hypotheses which merit investigation:

a. Paraquat poisoning:

Supporting information.—Fits the reported symptomatology except for ulcerations in mouth and esophagus. However, all reports of ulceration come from high exposure to oral ingestion. There are no reports on the effects of low dose ingestion.

Possible route of entry.—Contaminated food or drink e.g. restaurant, hospital-ity rooms, or from food brought in.

Follow-up—Check tissue and urine for Paraquat e.g. lung, liver, kidney, GI contents, urine etc. Check literature for effects from low doses.

b. Phosgene poisoning:

Supporting evidence.—Symptomatology is similar, however, reported latency (in literature) is approximately 12 hours. NIOSH team observed chlorinated solvents above elevator shafts, near electric motors (high voltage).

Possible route of entry.—Airborne vapors through elevator shaft. Possible airborne vapors from subway or in nearby construction (e.g. welding near chlorinated solvents).

Follow-up.—Check contents of solvents found above elevator shaft. This is being done by ODC.

c. Nickel Carbonyl:

Supporting evidence.—Fits symptomatology except literature reports a 12-36 hour latency period. Dr. Sunderman of the University of Connecticut, recently reported to NIOSH that nickel was found in tissues of several deceased Legionnaire cases.

Possible route of entry.—Foul-play, by placement of nickel carbonyl in elevator or other common area. Incineration of self-carbonated forms during the week of the convention, in the hotel or nearby the hotel. These forms contain Nickel oleate (impregnated in the paper). Combustion of these forms may produce Nickel Carbonyl. Air intakes may have picked up this contaminant from nearby incinerator or hotel.

Follow-up.—Check to see if there is a manufacturing plant of these forms in Philadelphia. Check to see if anyone incinerated a large number of these forms near the hotel. Check a stack which NIOSH personnel observed to be below air intakes of the hotel.

d. Other delayed response contaminants:

1. Cadmium.
2. Ozone.

e. Other environmental leads:

1. Plumbing, especially installation of new plumbing that could have contaminated the water supply.
2. Check nearby incinerator stacks for potential cross contamination.
3. Check out ventilation system for sub-lobby floors and discharge shaft in relation to reported cases as related to duct work.

DAVID P. BROWN
SHIRO TANAKA, M.D.
RONALD D. DOBBIN
WES STRAUB

Mr. MURPHY. Do you think that your environmental investigation was thorough enough?

Dr. FRASER. I think it was quite a thorough investigation of a number of the systems of the hotel including the water system, the air handling system, the trash collection system, the rodent and insect-control systems of the hotel, the restaurants, purchases of the hotel, the engineering activities at the hotel.

Mr. MURPHY. Dr. Sencer, if there is a similar outbreak or something of an epidemic proportion what coordination would you make today that you did not make with other Federal agencies with expertise in the entire area of medical determination?

Dr. SENCER. I think the first thing we ought to do to facilitate that type of coordination is to catalog where the competencies are in the Federal Government.

This is a highly specialized field. Each toxic substance needs its own particular expert. We really need to catalog for the Federal Government and the Federal establishment as a whole the various capabilities that we have scattered on a wide variety of agencies.

Some of the very excellent toxicologists, for example, are in the Department of Agriculture but we do not have any central focus of information as to where that exists.

I think this investigation points up a need for us to develop such a catalog so we will know who can be called upon for specific help on problems as they arise.

Mr. MURPHY. Have you heard of the Toxic Substances Control Act?

Dr. SENCER. Yes, sir; we have been very much involved with that in recent weeks. PHS has been developing an interagency agreement with the Environmental Protection Agency to coordinate our work.

The Toxic Substances Control Act—I do not have to tell you—involves many agencies in the Public Health Service, including the Food and Drug Administration.

Mr. MURPHY. Mainly, the EPA?

Dr. SENCER. But I meant EPA's involvement impinges upon many parts of the Public Health Service and we are developing through Dr. Cooper's office an interagency agreement so that we can be supportive.

The EPA has been to CDC in recent weeks to ask that we enter into a formal agreement with them, an interagency agreement to provide them with epidemiologic assistance in investigations of exposure to possible toxic substances. They have recognized that epidemiologic capability is hard to come by and that we do have it.

I am not sure if we have signed the agreement yet, or if we are about to sign an interagency agreement to provide them with such assistance.

Mr. MURPHY. You have suggested that CDC be given additional funds to improve its capabilities for identifying toxic-caused outbreaks. What are your resources and what additional resources are necessary?

Dr. SENCER. In our toxicology laboratory, at the present time, I think we have about nine professional laboratorians and a budget around \$400,000.

We have recently had a consultant from the United Kingdom who was provided to us by the World Health Organization to review the toxicology program and come up with recommendations as to what we should do to meet the needs of the future. I have not received his report yet, but I do understand that it would require a fair amount of capital investment in buildings that would be built so that you can guard against any contamination during analysis for trace amounts of elements.

I think that in terms of outbreaks we should have the overall responsibility. This does not mean that we have to do all of the work. I think it means that there has to be a focus in any outbreak situation and I think epidemiology is the first step.

We do have the largest epidemiologic capability in the country. Again, as we did not try to do all of the work in this particular outbreak, it is a question of somebody being there to coordinate and to see that things are being done.

Mr. MURPHY. Dr. Abraham is going to testify later to the fact that there are less than a dozen laboratories in this country with the expertise and the instrumentation to perform the kinds of studies necessary and that there are no funds available for such services within the CDC, and also, that it was a great sort of a problem.

There was no source of money available within CDC to contract for its work and none of the laboratories working on the Legionnaires' disease have not received any compensation. Is that true?

Dr. SENCER. In terms of contracting, that is correct, sir. Our budget is basically one of personal services rather than contracting for research. We do not have any grants except in occupational health, so we do not have this type of funding.

I do not know that anyone has been reimbursed. I do not know that anyone has asked to be reimbursed. I do know that we have provided travel and consultation fees for meetings for people who had to take their own time to come to us.

Mr. MURPHY. What kind of on-going surveillance system is being conducted on the surviving victims?

Dr. SENCER. We discussed this last night. We are planning another survey of those people with the State public health department in December.

I understand that the State has considered establishing an on-going surveillance system for the future.

Mr. MURPHY. Why did you wait until last night?

Dr. SENCER. I just found out last night this was being done; it has been done for some time.

Mr. MURPHY. Our information is that these people are still pretty sick and that they just did not recover from their fever and disease.

Dr. FRASER. We have been in contact with several of the clinicians who have taken care of groups of legionnaires who were sick during the investigation, including in the most recent advisory panel the physician who has cared for the largest number of patients with the disease.

We were very interested in his observations among his patients as to whether or not he had seen any long-term effects of Legionnaires' disease.

We were pleased to hear that at least in his group that there were none. We thought that with the survey in early December that we would be able to expand that observation in the larger group of the cases.

Mr. MURPHY. Have you any written synopsis updating what the prognosis is on the Legionnaires' disease for those 151 souls that have been affected?

Dr. SENCER. We have presented to the American Public Health Association meeting a description of the illness and the recovery from it in as much clinical detail as we have.

Mr. MURPHY. Was it presented down to the hospitals, the doctors, the county medical structures that are caring for these people?

Dr. FRASER. This has not been sent direct to the physicians to date.

Mr. MURPHY. Dr. Abraham has found particles of tin, zinc, aluminum and nickel in lung tissue that he has examined, because those combinations of metals are often associated with soldering.

Dr. Abraham has suggested that the hotel's thermostats be checked to determine whether soldering was used on them. Was this checked?

Dr. FRASER. Yes; there has been no soldering done in the hotel in the several months preceding the Legionnaires disease.

Mr. MURPHY. Have they checked the subways and the airshafts of the adjacent areas?

Dr. FRASER. Yes.

Mr. MURPHY. On October 7, CDC brought together a number of outstanding scientists in the field of environmental toxicology and related areas to review CDC's handling of the Philadelphia outbreak. Has that group published its findings?

Dr. SENCER. No, sir, as I have already mentioned, we have only a preliminary report from Dr. Weinstein who is circulating it to the other members of the panel. It has been delayed because one of the

members of the panel is out of the country and will not be back until December 11.

Mr. MURPHY. What were their conclusions?

Dr. SENCER. Their preliminary conclusions were that the outbreak was not caused by a known microbiological agent or a known toxic agent. There are some recommendations of further things that we may examine.

Mr. MURPHY. Senator Schweiker?

Senator SCHWEIKER. I have nothing else.

Mr. MURPHY. Doctor, we will be in communication with you in the weeks to come. We appreciate your canceling a trip in order to be with us here this morning and the other doctors, as well.

One final statement: In testimony yesterday by Dr. William Sunderman, Jr., he testified, and I am quoting, "In the recent Philadelphia outbreak there was delay and lack of coordination in collecting clinical and post mortem specimens for toxicological analysis."

This appears to be the opinion of many authorities who have reviewed the investigation. For example, Dr. Donald Frederickson, the director of the National Institutes of Health, who was quoted on September 12, as follows: "We have to change our set and be prepared next time to immediately assume that this could be just as much chemical as infectious."

He was also quoted as saying, "Maybe we all thought about toxics just a couple of days too late. I would guess that we lost those key specimens."

Similarly, Dr. Kimbrough, a toxicologist at CDC was quoted on October 12, as saying, "The initial stress of the investigation was to look for a virus such as swine flu that might be causing illness."

Moreover, she indicated that the chance of identifying the cause would be improved if toxicology had been involved, earlier, with greater stress.

I think it is clear to me and to other people on the staff that the team in the investigation was oriented in a rather narrow area when it first came to Pennsylvania and that in the future possibilities of toxins as well as viral or bacteriological infections should be looked at.

Of course, hindsight is 20-20. When we look behind we always see with greater clarity.

I would think that in the future if the resources are not there you had better recommend to this committee because we have the authorization for public health in our overall committee responsibilities and that you do address those to us.

Dr. SENCER. Thank you, sir. If I could respond to Senator Schweiker's question. Your staff has talked to Dr. Kimbrough in Atlanta. She was asked to retake the the examination after she had had more experience in treating patients.

Dr. Kimbrough is a laboratory scientist and pathologist and not a therapeutic one. She is a member of the Society of Toxicologists and, if I may just speak in her behalf, she has been a consultant to the Environmental Protection Agency on their request on hypochlordane and chlordane characteristics. She was the person who picked up the Kepone poisoning in Hopewell, Va., and was a consultant to EPA at the time.

She had been a consultant to the Food and Drug Administration in New York State on interaction potential on synergism and so forth.

She has been a consultant to the New York State Department of Environment and Conservation. She is a consultant to the Jamaican Government on the parathion poisoning.

She designed the cancer experiments for the Eye Research Institute, She was consultant to the Illinois Institute of Technology Research Institute on a study of toxicology.

I could go on and on. Dr. Kimbrough is an expert toxicologist in her field. She did not pass the examination because of her unfamiliarity with the treatment of patients.

She is consulted by the World Health Organization. One of our problems is trying to keep her at home because she is in so much demand as a consultant.

Senator SCHWEIKER. And she is going to take the exam again? Is that what you are saying?

Dr. SENCER. I am not sure that she plans on it because her credentials are in toxicology. The type of toxicology that she is considered an expert in is the laboratory aspect of it, not the clinical treatment aspect. She does not require this examination for her credentials to be of the highest nature.

Senator SCHWEIKER. What is the purpose of board certification, then? Normally, isn't that a standard or a mark that is looked for in other fields?

Dr. SENCER. I think it depends on the type of medicine you are practicing. She practices laboratory medicine and the certification and the recognition that she needs in a circumstance like that is as member of the Society of Toxicologists which is an elective membership.

Senator SCHWEIKER. Thank you.

Mr. MURPHY. Doctor, was there any investigation done on a broad base of hospitals or coroners in the State of Pennsylvania and the counties of New Jersey adjacent to this area of deaths that had the symptoms of the Legionnaires' disease?

Dr. FRASER. There were two approaches to this. One was a system set up by the State health department from the first, having a public health nurse visit every hospital in Pennsylvania every day to find new cases that clinically resembled Legionnaires' disease. This is one of the major ways that we found out about cases.

Mr. MURPHY. Over what period of time?

Dr. FRASER. For about 3 weeks.

Mr. MURPHY. What range of time of cases did that cover; 6 months or a year?

Dr. FRASER. This was for new cases being admitted to the hospital. In terms of going back and finding old cases, we focused in on the Philadelphia County area because this was an area of high interest.

We went to the emergency rooms of 11 hospitals. We took three hospitals that served the center city area of Philadelphia particularly intensely and went back to the 1st of July and forward to the end of August to see whether there were any cases that were missed that were, perhaps, not in the Legionnaire group. We found no evidence of an outbreak.

Mr. MURPHY. Did you go back and investigate the 1974 Oddfellows deaths?

Dr. SENCER. Yes; we did.

Mr. MURPHY. Did you draw any conclusions from those in relation to this epidemic?

Dr. FRASER. Yes; one of the confusing issues with any illness that causes fever, muscular aches, and cough is that there are so many illnesses that can cause those.

Going back to the Oddfellows convention, we can identify 16 cases that fit the clinical pattern and would be difficult to tell from Legionnaires' disease. Of those, three died. Two of those had autopsies. We have reviewed the materials from those autopsies and they do not appear to be the same as Legionnaires' disease.

Mr. MURPHY. Who had the records?

Dr. FRASER. There was no knowledge of this outbreak until the Legionnaires' disease occurred. It was not recognized at the time. It was only recognized when we received a phone call from one of the many interested citizens in the United States who have called into the center reporting their ideas of what might have happened.

We were informed that such an outbreak had occurred. We investigated that as well as several others that did not pan out to be the same illness.

Mr. MURPHY. What caused those deaths in 1974?

Dr. SENCER. Sir, it looked to be a broncho-pneumonia, probably, a bacterial infection.

Mr. MURPHY. Gentlemen, thank you very much.

**STATEMENT OF CAPT. ELGIN C. COWART, JR., MC, U.S. NAVY,
DIRECTOR, ARMED FORCES INSTITUTE OF PATHOLOGY**

Dr. COWART. I am Dr. Elgin C. Cowart, Jr.

Mr. Chairman, members of the committee, it is my understanding that the purpose of this hearing relates to the causative factors of Legionnaires' disease. There is and should be a continuing interest in determining the cause of that outbreak. However, my purpose in appearing here today is to encourage and support the development of a contingency plan for an organized investigation in the event of future similar episodes. Such a plan should establish a central monitor or control center to coordinate the investigative efforts and analyze data.

The plan should incorporate standard procedures for the prompt, appropriate, and adequate specimen collection. Further, it should draw on the experience and capabilities of recognized experts and facilities, be they governmental or otherwise. These should include expertise in epidemiology, clinical medicine, and pathology, including toxicology.

I will make clear that these thoughts are not original with me and I do not have in mind an ultimate plan. Some of these suggestions come from a special pathology panel which met at the Center for Disease Control in September. Others were generated in discussions with members of the Armed Forces Institute of Pathology staff who were members of that panel. Some of the same or similar thoughts have been expressed by Dr. Sunderman.

The most effective approach in an organized investigation would be to utilize existing, established facilities. Any attempt to develop a self-contained single agency for epidemic investigation would be ill conceived.

It will be costly enough to initiate a full-blown investigation making use of existing facilities. This factor must be fully considered and accepted as justifiable even in the face of failure to uncover a cause in the event of some future epidemic.

In the development of a contingency plan I consider it logical that Center for Disease Control should be the focal point. Center for Disease Control should be charged with the responsibility of developing such a plan, consulting with appropriate agencies and institutions in so doing.

The contingency plan should designate one responsible individual to act as a central coordinator who would direct the investigation, analyze and interpret results, and arrive at final conclusions. These conclusions and final evaluations would be derived from a broad data base; including clinical features, epidemiologic and statistical studies, the morphologic changes in biopsy and/or autopsy material, and clinical laboratory findings, including toxicologic, chemical, and microbiological examinations.

Center for Disease Control is equipped to provide a considerable portion of this data, however, interagency agreements and/or contracts should be negotiated with other institutions to conduct those studies for which they are uniquely capable and qualified.

In the field of pathology, for instance, the Armed Forces Institute of Pathology is ideally suited to serve as the center for receipt and study of all pathologic material in the event of some future epidemic. In this one Institute are more than 80 pathologists whose expertise embraces all facets of human and animal disease. One department in the Institute devotes full time to the study of tissue reactions to drugs. It is more than 10 years experience in this field, having studied more than 3,000 alleged adverse drug reaction cases.

Additionally, there are 30 or more other scientists; that is, chemists, toxicologists, radiologists, microbiologists, et cetera, on the Institute staff.

The Division of Toxicology of the Institute has 20 years experience in the medical investigation of "general unknown" cases in which the entire spectrum of acid, basic and neutral, clinical agents, and gasses and volatiles must be considered. The Division, has, in fact, been active in the development of test procedures for determining these agents.

The Toxicology Division is equipped with the most modern instrumentation and is well staffed with experienced personnel who are personally acquainted with leading scientists elsewhere and are aware of their areas of professional expertise.

It must, of course, be realized that a contingency plan cannot be activated unless a problem is recognized. This recognition will be dependent on alert, well-informed physicians, laymen, or paramedical personnel. This calls for widespread educational efforts to increase the awareness to potential problems. At the same time there must be a wide dissemination of information as to the availability of investigative assistance at a national level.

Once recognition is achieved the success of any plan will be dependent on adequate communications and full cooperation and responsiveness on the part of all concerned.

In summary, I urge the development of a contingency plan for in-depth investigation in the event of some future outbreak or epidemic such as occurred in Philadelphia last summer. The Armed Forces Institute of Pathology will welcome the opportunity to participate in the development of such a plan and is prepared to participate in any investigations which may become necessary.

Mr. MURPHY. Thank you, Doctor.

You recommended that a central modular control center be established to coordinate any future investigation. What officer or agency do you feel should serve as this control center?

Dr. COWART. The Center for Disease Control appears to me to be the logical agency.

Mr. MURPHY. You heard the previous witness, Dr. Sencer, indicate when I asked the question, Who was in charge in Atlanta, was one of the problems was that it landed on the State to be in charge, in the State medical commission's office?

Dr. COWART. This, apparently, is how the system is now set up, Mr. Murphy. I am not suggesting that the Federal Government and any agency come in to direct all activities. I think there should be a central monitoring system, however, to coordinate all efforts.

Mr. MURPHY. Has your division of toxicology examined any of the tissue taken from any of the Legionnaire victims?

Dr. COWART. The material which we received had been fixed in formalin or had been preserved in some manner which prevented it from being subjected to adequate toxicological examination.

The Institute did receive a call for consultation from the Center. We were active on the special pathology panel.

Mr. MURPHY. When did you get that call? When were you first contacted by CDC?

Dr. COWART. Our first contact was on the August 4.

Mr. MURPHY. Did you contact them or did they contact you?

Dr. COWART. They contacted us. It was, as is much of our consultation work done on an individual basis, not agency to agency.

The Chief of my Tissue Reaction to Drugs Division whom I mentioned in my statement received a direct call from one of the pathologists at CDC.

Mr. MURPHY. Was there a suspicion in the Armed Services that this might have been a willful introduction in a chemical or biological area?

Dr. COWART. I recall this having been stated as a kind of a remote possibility. As far as any official opinion on the part of the Armed Forces, though, I do not think so.

Mr. MURPHY. Dr. Sunderman commented that you might be able to comment on the comparison slide of lung tissues from the Legionnaires and those who have been known victims of nickel carbonyl poisoning. Could you comment on the poisoning?

Dr. COWART. I have never seen a case of nickel carbonyl poisoning so I could not comment; no, sir.

Mr. MURPHY. Doctor, it is certainly difficult for us to go back and criticize the coordination between the local, State and Federal agen-

cies but there was an absence of guidelines and, to my mind, a continual absence of coordination with those people who were still infected by whatever disease this was, if in fact, it was a disease.

I certainly think your comments are well founded. Whether the Armed Forces should take this on or whether the public should take it on is a question that we shall have to determine after we have examined all of our input.

Dr. COWART. I would agree with that, sir.

Mr. MURPHY. Thank you, Doctor; thank you very much.

In the instance of facilitating some witnesses who are traveling back to the west coast I may deviate from the witness list.

It is also the intention of the Chair to sit right through until 4 o'clock and not break for any lunch. We will proceed on that basis.

We will take Dr. Abraham next. After Dr. Abraham, we will go back to our published list.

Our next witness is Dr. Jerrold L. Abraham, department of pathology, School of Medicine, University of California.

Dr. Abraham's prepared statement will be placed into the record.

STATEMENT OF JERROLD L. ABRAHAM, M.D., DEPARTMENT OF PATHOLOGY, SCHOOL OF MEDICINE, UNIVERSITY OF CALIFORNIA

Dr. ABRAHAM. Thank you, Mr. Chairman.

I will abbreviate my written remarks for the sake of time, here.

Mr. MURPHY. Take your time and give us the benefit of your expertise.

Dr. ABRAHAM. I have a plane to catch. In my report to this committee I will briefly summarize my background in this field, the methods I have been using, the circumstances through which I became involved in the study of these cases, my results to the present time, the possible interpretation of these results, my feelings about the investigation and how it has been handled and, finally, some recommendations for your consideration.

My interest in lung diseases caused by occupational and other environmental exposures developed in the U.S. Public Health Service position where I was in charge of the Pathology Section at the National Institute for Occupational Safety and Health Laboratory in Morgantown, W. Va., from 1972 to 1975. It was in this laboratory that I worked together with a biophysicists, Dr. Phillip deNee to develop techniques for preparing samples of human tissue for the most efficient and sensitive analyses of inhaled inorganic materials.

Basically, the techniques we developed are analogous to those of a detective in that they are letting us search for extremely minute traces of inorganic materials which the person has inhaled at some time before the sample of their tissue was examined, whether it is through biopsy of a living person or from an autopsy.

The method uses the scanning electron microscope which is a sophisticated analytic instrument that enables one to find the particles of inorganic materials within the tissue, to document their location and to analyze them for their elemental composition for most elements.

Perhaps it is somewhat analogous to the detective looking for fingerprints at the scene of the crime in that fingerprints may be found anywhere over a wide area, which takes considerable time to survey,

and that the location of the fingerprints as well as their identification is vitally important for their interpretation.

These methods are not the solution to everything as they are only useful for inorganic agents of a size large enough to identify and analyze. Fortunately, most of the inhaled toxic agents result in the formation of particles of the appropriate size for this type of analysis.

The next major problem confronting such studies is that the body rapidly eliminates most inhaled materials, so that the longer the time after exposure, the less easy it will be to find the inhaled toxic material.

Sometimes one may only find a few particles, which may not represent the entire toxic agent, but may be a clue to discovering it, much as a part of a fingerprint can sometimes help identify the source.

The most commonly used methods of analysis are much easier, more rapid and less expensive than this sort of approach of looking for individual particles in the lung.

However, when the bulk methods are negative or inconclusive, the microanalytical methods may still provide the answer.

This is because the microanalytical methods allow analysis of such tiny particles that may weigh as little as a millionth of a billionth of a gram, (10^{-15} g) and allow localization in the tissue to specific sites, which may be where the recognizable damage has occurred.

Since the analysis is correlated with the location, contamination by knives and such is easily recognized and separated from real agents. Another major type of information not available in the bulk tissue analytical methods is the association of one element with another.

These associations, such as the nickel and aluminum that I will mention later, which are readily seen with microanalysis of single particles, often provide much stronger clues than the finding of each separately.

I did not get involved in the investigation of the legionnaires' cases until September 1976. When I first heard of the outbreak I immediately thought that the symptoms resembled toxic exposure to fumes as much as they resembled influenza.

I mistakenly assumed that the CDC would initiate the appropriate chemical and microanalytical studies as soon as dangerous infectious agents had been ruled out.

It was only on hearing in the media of the report by Dr. Sunderman, Jr., on the findings of nickel in these cases that I contacted him and then my friend at the CDC, Dr. Martin Hicklin, the chief of their Pathology Division.

A few years earlier, Dr. deNee and I had analyzed lung tissue from a case of known nickel fume exposure in an industrial accident.

In that case it was relatively easy to identify tiny fume-sized particles in the patient's lung in the appropriate locations. The analyses of the particles revealed the presence of nickel and aluminum in the same particles, which further documented the exposure source which had a known mixture of nickel and aluminum.

I explained this previous success to Dr. Hicklin and sent a copy of the report on that case.

He responded immediately that he would gladly provide me with samples of legionnaires' disease victims and control cases for analysis. I received samples of four cases on Labor Day and began studying them immediately.

The preliminary results on these four cases indicated that there might be some unusual elements present, and that analysis of several more cases and controls would be a good idea.

It took several weeks to prepare and send the next series of samples during which time I continued the study of the first few cases. Since receipt of the second group of samples, which brought the total number of cases to 12, I have been working on this nearly full time through last week.

You should realize that the time involved in these studies is considerable, with the average case requiring perhaps 20 to 50 hours.

You are probably also aware that there are at present less than a dozen laboratories in this country with the expertise and the sophisticated instrumentation to perform these studies.

Furthermore, most of these laboratories are heavily committed to ongoing federally funded research of their own. There are no funds available for such services within the CDC and it is a great hardship for these other labs to drop everything to work on this sort of a problem.

There was no source of money available within the CDC to contract for this sort of work, and none of the laboratories working on this legionnaires' material have received any compensation, as far as I am aware.

I was able to get involved in it myself only because my research at present is mainly concerned with analysis of lung tissues for known or suspected occupational or environmental toxic agents, and I was able to interrupt the series of cases I was planning to analyze because of the importance of this problem.

My results to date in the 12 cases I have analyzed indicated that five of seven legionnaires' disease victims (70 percent) and two of the five control cases (40 percent) have evidence of metal fume exposure to the elements tin and/or zinc.

Using the presence of these elements, somewhat arbitrarily, as a criteria I have been able to distinguish the tissues of the victims from those of the controls in 8 of 12 attempts.

While this is better than chance, the number of cases analyzed is unfortunately too small to be definitive. Another complicating factor in interpreting these results is that the patient's occupations contribute strongly to the findings of metal particles in the lungs.

For example, a person who worked as a welder would have many particles in the lung whether or not they were related to his final illness.

The elements tin and zinc are widely used and the source would have to be identified before a direct cause-and-effect relationship could be confirmed. It is certainly possible that some other as yet undetected elements which may be used together with zinc or tin could have been inhaled but have been dissolved or removed from the lung by the normal defense mechanisms prior to the death of these patients.

Tin and zinc were not the only elements found in the lungs of these cases I have examined, but they are the only two which seemed to put victims and controls into two groups, namely those with tin and/or zinc and those without it.

Neither of these elements is thought to be lethally toxic, although zinc oxide fumes are widely recognized, as are many other metal

oxide fumes, to be responsible for so-called zinc (or metal) fume fever.

The one thing in common for all of the particles I have been examining in the lung samples from these cases is their size and shape. I have confined the analysis to those particles of appropriate size to get into the lungs' smallest passageways.

The particles range in size from 5 micrometers down to a 20th of a micrometer. A micrometer is one-millionth of a meter, or one-thousandth of a millimeter.

Particles smaller than these may be present but are not detectable with the instrumentation I have been using. The fact that most of the metal particulates appear spherical suggest their formation by some process involving heat.

An example of this could be soldering or welding but it is by no means confined to this. These fume-sized particles could be released from an overheated galvanized metal surface such as steel plated with zinc or tin, or any other surface which had been soldered. Examples could be pipes or fans or bearings of motors which have overheated. Special candles or lanterns such as kerosene lamps may have unusual metals used in their construction which can be released when they are burned.

I think the data I have accumulated make nickel carbonyl poisoning unlikely, since I have found no particles containing nickel only. All the particles I have found that had nickel had other elements present as well as the nickel was usually the minor component of the particle. The possibility that metal fume exposure was responsible for the legionnaires' disease has not been excluded, certainly, by my data, but unfortunately, the results are not conclusive at this time.

Regarding the manner in which the investigation of legionnaires' disease has been handled, I can only comment on those aspects which have come to my attention, personally.

Most of the information I have received has been indirect as I got involved in the study only around Labor Day and am located, physically, at the opposite end of the country.

I think the CDC has done everything it could to make this as thorough an investigation as possible. Certainly they have been very open in any discussions with me and have given me whatever information I requested as rapidly as possible.

Perhaps the sense of disorganization of the investigation that has been popularized in the press is not the fault of any one agency but is the result of a lack of authority being vested in any one agency to oversee an investigation of this scale.

As a result of the lack of overall authority, each agency, and some subgroups within the various agencies, duplicate efforts, and to a degree are forced to compete with each other for Federal budgetary allocations. This also applies at the State level.

It is certainly a problem that will have to be dealt with on a legislative level. This situation at present is so complex that any individual agency could not step aside and redistribute the authority and research tasks objectively.

I think the expertise and technology to properly study certain kinds of environmental diseases already exists. It is not realistic at present to expect each agency within the Government to have its own labora-

tories and experts in each field, as there are simply not enough to go around.

From my own experience I think the tissue collection was adequate for the detection of most toxic agents.

Mr. MURPHY. Was it timely enough collection?

Dr. ABRAHAM. I think so. There are minute traces that would not be detected by the methods used by Dr. Sunderman and the CDC but small particles could still be found which would give clues to the origin of the exposure.

In the case of nickel fume poisoning we studied 2 years ago similar methods of collection allowed proper study for both influenza and other viral diseases and for our microanalytical studies.

I wanted to say a word about the report of the subcommittee which was written by somebody who got carried away—it sounds like that to me—and took liberties of paraphrasing some of the scientists mentioned. I was misquoted as having told the subcommittee that the CDC had told me to give them nothing. What I discussed with the CDC, and this was after I had discussed it with the subcommittee, was only my own request to keep the preliminary results from being released to the press until they were more definitive. At no time did the CDC make any attempt to have me withhold results from the subcommittee. This misstatement from the subcommittee's report was leaked to the press and it caused considerable embarrassment to myself, CDC, and to some of the other investigators mentioned in it.

While I think the subcommittee investigation has done a commendable job in perhaps being the only governmental agency which has attempted to bridge all of the other little groups that are working on this problem, I think the report which had been leaked to the press was just an unfortunate event.

It is my understanding that the analysis of the environmental samples collected by the group at CDC has been deferred until clues as to possible toxic substances have been revealed from analysis of the biological samples. I understand that the collection of these samples was done days or weeks after the epidemic and may not help to identify that source if it is not still present in the environment. This is analogous to removal from the body of the toxic substances during a short period of time or the breakdown into nontoxic substances which could not be usefully analyzed. Depending on how and when the samples were collected, it may be possible that significant information could result from analysis of these in the future.

I would also like to add that the technology to examine the various suspected sources of the fumes such as the motors and bearings in units in that hotel is readily available according to experts in this field that I have consulted. I have given their names to the CDC.

[Dr. Abraham's prepared statement follows:]

STATEMENT OF JERROLD L. ABRAHAM, M.D.

My name is Jerrold L. Abraham and I am an Assistant Professor of Pathology at the University of California San Diego School of Medicine. In my report to this Committee I will briefly summarize my background in this field, the methods I have been using, the circumstances through which I became involved in the study of these cases, my results to the present time, the possible interpretations of these results, my feelings about the way the investigation has been handled, and finally some recommendations for your consideration.

I attended the Massachusetts Institute of Technology as an undergraduate and received a Bachelor's Degree in Life Sciences, after which I attended the University of California, San Francisco Medical School. I had my postgraduate training in pathology at the Children's Hospital and Beth Israel Hospital in Boston, and then entered the U.S. Public Health Service where I worked in Morgantown, West Virginia with the National Institute for Occupational Safety and Health for three years prior to my joining the faculty at the University of California, San Diego in the Fall of 1975.

My interest in lung diseases caused by occupational and other environmental exposures developed in the Public Health Service position where I was in charge of the Pathology Section at the Laboratory in Morgantown during my last year there. It was in this laboratory that I worked together with Dr. Phillip DeNee, a biophysicist, to develop techniques for preparing samples of human tissues for the most efficient analysis of inhaled inorganic materials. These methods and the results of their application in certain cases have been presented at several scientific meetings and published in several papers and a book chapter.

Basically, the methods are analogous to those of a detective in that they are letting us search for extremely minute traces of inorganic materials which the person has inhaled at some time before the sample of their tissue was examined, whether it is through a biopsy of a living person or from an autopsy. The method uses the scanning electron microscope which is a sophisticated analytic instrument that enables one to find the particles of inorganic materials within the tissue, to document their location and to analyze them for their elemental composition for most elements.

Perhaps it is somewhat analogous to the detective looking for fingerprints at the scene of the crime in that fingerprints may be found anywhere over a wide area, which takes considerable time to survey, and that the location of the fingerprints as well as their identification is vitally important for their interpretation. These methods are not the solution to everything as they are only useful for inorganic agents of a size large enough to identify and analyze. Fortunately most of the inhaled toxic agents result in the formation of particles of the appropriate size for this type of analysis.

The next major problem confronting such studies is that the body rapidly eliminates most inhaled materials, so that the longer the time after exposure, the less easy it will be to find the inhaled toxic material. Sometimes one may only find a few particles, which may not represent the entire toxic agent, but may be a clue to discovering it, much as a part of a fingerprint can sometimes help identify the source.

The most commonly used methods of analysis are much easier, more rapid, and less expensive than this sort of approach of looking for individual particles in the lung. However, when the bulk methods are negative or inconclusive the microanalytical methods may still provide the answer. This is because the microanalytical methods allow analysis of such tiny particles that may weigh as little as a millionth of a billionth of a gram (10^{-12} g), and allow localization in the tissue to specific sites which may be where the recognizable damage has occurred. Since the analysis is correlated with the location, contamination by knives and such is easily recognized and separated from real agents.

Another major type of information not available in the bulk tissue analytical methods is the association of one element with another. These associations, such as the nickel and aluminum that I will mention later, which are readily seen with microanalysis of single particles, often provide much stronger clues than the finding of each element separately.

I did not get involved in the investigation of the "Legionnaire's" cases until September, 1976. When I first heard of the outbreak I immediately thought that the symptoms resembled toxic exposure to fumes as much as they resembled influenza. I mistakenly assumed that the CDC would initiate the appropriate chemical and microanalytical studies as soon as dangerous infectious agents had been ruled out. It was only on hearing in the media of Dr. Sunderman, Jr.'s report on the findings of nickel in these cases that I contacted him and then my friend at the CDC, Dr. Martin Hicklin, the Chief of their Pathology Division. A few years earlier, Dr. DeNee and I had analyzed lung tissue from a case of known nickel fume exposure in an industrial accident. In that case it was relatively easy to identify tiny fume-sized particles in the patient's lung in the appropriate locations.

The analyses of the particles revealed the presence of nickel and aluminum in the same particles, which further documented the exposure source which had

a known mixture of nickel and aluminum. I explained this previous success to Dr. Hicklin and sent a copy of the report on that case. He responded immediately that he would gladly provide me with samples of "Legionnaire's Disease" victims and control cases for analysis. I received samples of four cases on Labor Day and began studying them immediately. The preliminary results on these four cases indicated that there might be some unusual elements present, and that analysis of several more cases and controls would be a good idea. It took several weeks to prepare and send the next series of samples during which time I continued the study of the first few cases. Since receipt of the second group of samples, which brought the total number of cases to twelve, I have been working on this nearly fulltime through last week.

You should realize that the time involved in these studies is considerable, with the average case requiring perhaps twenty to fifty hours. You are probably also aware that there are at present less than a dozen laboratories in this country with the expertise and the sophisticated instrumentation to perform these studies. Furthermore, most of these laboratories are heavily committed to ongoing Federally funded research of their own. There are no funds available for such services within the CDC and it is a great hardship for these other labs to "drop everything" to work on this sort of a problem.

There was no source of money available within the CDC to contract for this sort of work, and none of the laboratories working on this "Legionnaire's" material have received any compensation, as far as I am aware. I was able to get involved in it myself only because my research at present is mainly concerned with analysis of lung tissues for known or suspected occupational or environmental toxic agents, and I was able to interrupt the series of cases I was planning to analyze because of the importance of this problem.

My results to date in the twelve cases I have analyzed indicated that five of seven "Legionnaire's Disease" victims (70 percent) and two of the five control cases (40 percent) have evidence of metal fume exposure to the elements tin and/or zinc. Using the presence of these elements somewhat arbitrarily as a criteria I have been able to distinguish the tissues of the victims from those of the controls in eight of twelve attempts. While this is better than chance, the number of cases analyzed is unfortunately too small to be definitive. Another complicating factor in interpreting these results is that the patient's occupations contribute strongly to the findings of metal particles in the lungs. For example, a person who worked as a welder would have many particles in the lung whether or not they were related to his final illness.

The elements tin and zinc are widely used and the source would have to be identified before a direct cause and effect relationship could be confirmed. It is certainly possible that some other as yet undetected elements which may be used together with zinc or tin could have been inhaled but have been dissolved or removed from the lung by the normal defense mechanism prior to the death of these patients.

Tin and zinc were not the only elements found in the lungs of these cases I have examined, but they are the only two which seemed to put victims and controls into two groups, namely those with tin and/or zinc and those without it. Neither of these elements is thought to be lethally toxic, although zinc oxide fumes are widely recognized as are many other oxide fumes responsible for so-called "zinc fume fever".

The one thing in common for all of the particulates I have been examining in the lung samples from these cases is their size and shape. I have confined the analysis to those particles of appropriate size to get into the lungs' smallest passageways. The particles range in size from 5 micrometers down to a twentieth of a micrometer. A micrometer is a millionth of a meter, or a thousandth of a millimeter. Particles smaller than these may be present but are not detectable with the instrumentation I have been using. The fact that most of the metal particulates appear spherical suggest their formation by some process involving heat.

An example could be soldering or welding but it is by no means confined to this. These fume sized particles could be released from an overheated galvanized metal surface such as steel plated with zinc or tin, or any other surface which had been soldered. Examples could be pipes or fans or bearing of motors which have overheated. Special candles or lanterns such as kerosene lamps may have unusual metals used in their construction which can be released when they are burned.

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found that had nickel had other elements present as well, and the nickel was usually the minor component of the particle. The possibility that metal fume exposure was responsible for the "Legionnaire's" illness has not been excluded, certainly, by my data, but unfortunately the results are not conclusive at this time.

Regarding the manner in which the investigation of "Legionnaire's Disease" has been handled, I can only comment on those aspects which have come to my attention personally. Most of the information I have received has been indirect as I got involved in the study only around Labor Day and am located physically at the opposite end of the country.

I think the CDC has done everything it could to make this as thorough an investigation as possible. Certainly they have been very open in any discussions with me and have given me whatever information I requested as rapidly as possible. Perhaps the sense of disorganization of the investigation that has been popularized in the Press is not the fault of any one agency but is the result of a lack of authority being vested in any one agency to oversee an investigation of this scale. As a result of the lack of overall authority, each agency, and some subgroups within the various agencies, duplicate efforts, and to a degree, are forced to compete with each other for Federal budgetary allocations. This also applies at the State level.

It is certainly a problem that will have to be dealt with on a legislative level. This situation at present is so complex that any individual agency could not step aside and redistribute the authority and research tasks objectively.

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From my own experience I think the tissue collection was adequate for the detection of most toxic agents.

In the case of nickel fume poisoning we studied two years ago similar methods of collection allowed proper study for both influenza and other viral diseases and for our microanalytical studies.

If nothing else comes out of this investigation other than the realization that there is a need for a more organized approach and increased support for research and service work in this field I will not be disappointed.

I must say a word about the report of the Subcommittee which I feel was written by someone who got carried away and took liberties of paraphrasing some of the scientists mentioned. I was misquoted as having told the Subcommittee that the CDC had told me to "give them nothing". What I discussed with the CDC, and this was after I had discussed it with the Subcommittee, was only my own request to keep the preliminary results from being released to the Press until they were more definitive. At no time did the CDC make any attempt to persuade me to withhold results from the Subcommittee.

This mis-statement from the Subcommittee's report which was leaked to the Press caused considerable embarrassment to myself, the CDC, and some of the other investigators mentioned in it. While I think the Subcommittee investigation has done a commendable job in being one governmental agency which has attempted to bridge all the other little groups working on this problem, I think that the report which leaked to the Press is an example of the unfortunate outcome of trying to mix politics and science.

As far as my recommendations one experience I had while working in the National Institute for Occupational Safety and Health, which is a part of the CDC, may be of interest to this Subcommittee. I was impressed during the time I worked with NIOSH by the tremendous potential demand for such microanalysis of tissues from persons with suspected occupational or environmental exposures to toxic materials. I did try while I was in NIOSH to get funding for a program to provide this service, much as the CDC in Atlanta has provided its unique expertise in investigating outbreaks of infectious diseases in the past.

It seemed logical to combine the expertise of the CDC with that of NIOSH to pursue suspected outbreaks of things other than infectious. This should logically be extended to include work being done by the EPA and the National Institute of Environmental Health Sciences. At that time there was a budgetary limit precluding NIOSH's involvement in that sort of a project. More recently during this year another proposal for a similar project within NIOSH was again turned down for budgetary and priority reasons. A preliminary survey done by NIOSH should be of some interest. In May of 1976 a questionnaire was sent out to over ten thousand pulmonary physicians, surgeons and pathologists in the United States asking


whether they would have any interest in submitting lung tissues from patients with suspected occupational diseases related to inhalation of particles.

The response to this was greater than imagined. There were sixteen hundred respondents who estimated they would submit an average of seven cases per year. Thus, the demand for such analytical services could be estimated at approximately ten thousand cases per year. If you realize that the time involved is great it is understandable that most of these potentially significant cases remain uninvestigated at present. I think I would be remiss in not presenting my opinion here that it should be the responsibility of the government to provide this service either directly through its own personnel and laboratories or through a combined program of in house work and grant or contract work. This cannot be solved quickly because it will take many years to recruit and train personnel with expertise in the various specialties required.

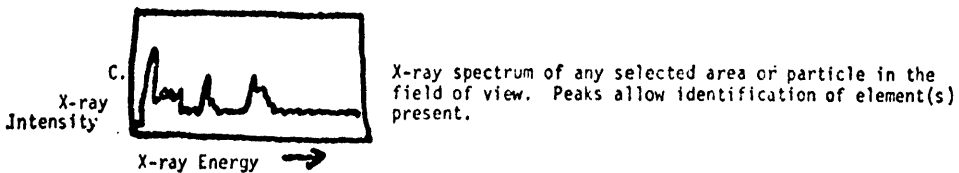
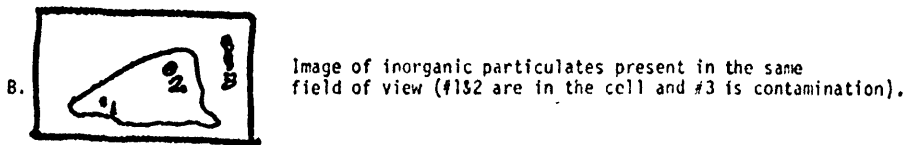
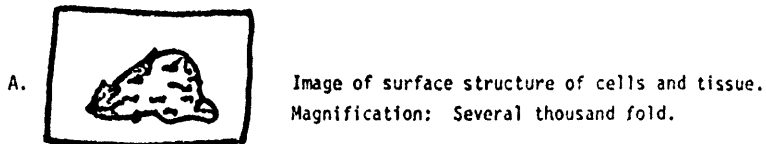
It is my understanding that analysis of the various environmental samples collected by the Industrial Hygiene Group at CDC has been deferred until some clues as to possible toxic substances are revealed from analysis of the biological samples. It is also well understood by the people in charge that collection of samples several days after or weeks after an epidemic may not help to identify the source of the epidemic if it is no longer present in that environment. This is analogous to the problem of removal from the body of toxic substances in a short period of time or their biochemical breakdown into nontoxic common substances which could not be usefully analyzed. I do not know if there has been any analysis to date of the environment samples collected by the CDC, but depending on when and how they were collected it may be possible that significant information could result from analysis of these samples in the future.

Jerrold L. Abraham, M.D.

Diagram of Methods

1.  Thin section of lung tissue placed on carbon supporting surface.

2. Sample examined in Scanning Electron Microscope gives three types of information simultaneously.



3. Several hundred areas may have to be searched to find each foreign particle.

Mr. MURPHY. Doctor, what type of instrumentation is necessary to detect nickel and other metallic substances in tissues that you referred to in your testimony?

Dr. ABRAHAM. The most commonly used techniques—

Mr. MURPHY. I am not talking about the kinds Dr. Sunderman has, the kind that would be necessary to go beyond the techniques of Dr. Sunderman's.

Dr. ABRAHAM. The kind I am using, and there are other similar analytical techniques.

Mr. MURPHY. You said you would have the instrumentation in your laboratory?

Dr. ABRAHAM. In my laboratory plus a couple of others at the university. The CDC has its own laboratories to do this if you consider NIOSH as part of CDC, Morgantown and Cincinnati both have the facility. As you know, neither of these labs were contacted by CDC.

Mr. MURPHY. They did not contact their own labs but they sent you tissues?

Dr. ABRAHAM. I contacted them. Dr. deNee, at NIOSH in Morgantown, contacted CDC. He was also sent tissues about the same time that I was.

Mr. MURPHY. What type of instrumentation is the most sophisticated in this area?

Dr. ABRAHAM. I think, the scanning electron microscope with X-ray analytical attachments to it.

Mr. MURPHY. How many laboratories are there in the country that have that equipment?

Dr. ABRAHAM. Several hundred; most of them are in industry working on metallurgical problems.

Mr. MURPHY. Do you think there should be a contingency fund somewhere, either in CDC or somewhere else to pay lab costs to do this type of sophisticated research?

Dr. ABRAHAM. There certainly should be something to support it. The biggest problem comes in time. Usually these sorts of facilities are heavily committed in order to justify the purchase. The people have to utilize these facilities full time and they would have to interrupt what they are doing.

This becomes a problem even in the Government labs; or else you have a \$100,000 laboratory sitting around waiting for something like this to come in.

Mr. MURPHY. You state that 70 percent of the samples from victims which you had analyzed had had evidence of metal fume exposure of tin or zinc. Could exposure to such metal fumes have caused the symptoms described in the legionnaire victims?

Dr. ABRAHAM. Partially—but I do not think this alone could be responsible for any deaths.

Mr. MURPHY. It would have to be a combination?

Dr. ABRAHAM. I think it might be some other things we are not seeing; for example, phosgene. With an air-conditioner overheating it could produce phosgene as well as these fumes. But all we might see of the traces are the fumes.

There are limitations to these techniques in that you only see inorganic materials.

Mr. MURPHY. You found only a few traces of nickel and no particles containing only nickel? Can you reconcile your findings with Dr. Sunderman showing nickel in five of six victims' tissue?

Dr. ABRAHAM. As he said, he could not eliminate the contamination. All I can conclude is that what he was seeing is contamination.

I would add one thing, I have with me the slides from that one case of nickel poisoning that I studied 2 years ago.

The pathologic picture in that case is quite similar to these Legionnaires' cases but as it was pointed out, it is not specific. I do not think nickel fume poisoning can be excluded by the pathology in the legionnaires' cases.

Mr. MURPHY. Doctor, we will be in touch with you to keep you advised as to what we do and what final legislative recommendations will be made.

We appreciate your taking your time and effort to come here and, also, we appreciate the fact that you were inquisitive enough, on your own, to contact the appropriate Federal people in order to try and assist in finding just what caused this disease and the deaths.

Thank you very much. Have a safe trip home.

I think Dr. Chen is next. He has another plane connection.

Dr. Chen is in the Physics Department of the State University of New York at Geneseo, N.Y. His prepared statement will be placed into the record.

**STATEMENT OF JAMES R. CHEN, PH. D., DEPARTMENT OF PHYSICS,
STATE UNIVERSITY OF NEW YORK COLLEGE AT GENESEO**

Mr. CHEN. Mr. Chairman, I have a report that has been submitted to the Toxicology Branch of the Clinical Chemistry Division, Center for Disease Control which I would like to make a part of my statement.

The report is entitled, Nickel Levels in Lung and Kidney Tissues From Victims of Legionnaires' Disease Using Proton Induced X-Ray Emission.

By way of background I should indicate that I have been on the faculty of the University of Pennsylvania for 5 years, after obtaining my doctorate in physics at Harvard, and since 1973 have been in the Physics Department at the State University of New York, College at Geneseo.

The report states "The method of proton induced X-ray emission has been used to measure the trace concentrations of nickel in lung and kidney tissues from victims of the so-called legionnaires' disease."

Discussions on the application of this technique for the analysis of the tissues began on September 3, 1976, between Dr. Chen and Dr. J. Liddle of the Center for Disease Control in Atlanta. The technique offers two advantages:

One; it provides simultaneous multielement analysis for elements heavier than sodium, including nickel. In comparison, multielement neutron activation analysis, which was also being employed by the CDC, has low sensitivity to nickel. Two; the second advantage is that only small quantities of tissue (0.1 g) were needed per analysis.

The first shipment of samples was received on September 19. Apart from digesting the tissues in "ultra-pure" nitric acid, no chemical

separation of elements was performed on the samples in order to avoid possible contamination. This procedure complemented the work under consideration at the CDC involving chemical separation of nickel followed by atomic absorption analysis.

This report consists of the quantitative results obtained for the nickel concentrations in 17 lung tissues and 20 kidney tissues and an identification of the other elements detected to date using the proton technique.

It should be noted that the authors were not aware of the samples' identities prior to analysis. The code identifying legionnaires' cases versus controls was broken only after the results were presented to the CDC on November 22, 1976.

EXPERIMENTAL PROCEDURE

Samples of the various tissues were weighed in sterile capped plastic test tubes. Concentrated nitric acid (Baker "Ultrex" brand) was added and the samples heated at 60° C to effect digestion.

Ten microliter aliquots of tissue-nitric acid solutions were analyzed directly in the proton beam and the nickel concentration determined.

Each sample was analysed on 3 separate days to establish any systematic variations. Analysis was done in random order and not sequentially by sample number.

As previously described, the protons accelerated by a 2-MeV Van de Graaff were incident on the targets mounted at 45° to the incident beam. The characteristic X-rays were detected in a Si(Li) detector with a resolution of 165 eV fwhm at 5.9 keV.

Lucite absorbers were placed in front of the detector to attenuate low energy X-rays and to peak the detector sensitivity response in the nickel region.

The quantitative calibration and cross-check measurements were performed by analysing samples to which known concentrations of nickel had been added. These measurements were performed at the beginning, during and at the end of each analysis period.

The data were converted to digital format for analysis on a CDC 6400 computer.

RESULTS

(a) Elements detected in lungs include: potassium, calcium, titanium, chromium, manganese, iron, nickel, copper, zinc, arsenic and/or lead, selenium, bromine, and rubidium.

Elements detected in kidneys include: potassium, calcium, titanium, chromium, manganese, iron, nickel, copper, zinc, mercury, arsenic and/or lead, selenium, bromine, rubidium, and cadmium. These elements are present in normal healthy tissue.

See compilation of the published information on elemental concentrations in human organs in both normal and diseased states, UCRL 51013, 1971 to 1973 Report.

(b) Nickel Concentrations. The nickel levels detected in the kidney tissues were less than 15 ug/100g dry weight except in two cases with concentrations between 20 to 30 ug/100g dry weight.

Figure 1 shows the nickel concentrations in the 17 lung tissues analysed to date. Also shown are the identification of the samples accord-

ing to legionnaires' cases versus controls. No obvious grouping of cases versus controls on the basis of the nickel concentrations measured can be seen. However, the average nickel concentration for the Legionnaires' cases is 42 ug/100g dry weight, while the average concentration for the controls is 25 ug/100g (excluding the nonreproducible 150 ug/100g result for lung 37).

The difference between the two averages is not significant considering the small number of samples and the uncertainties in each measurement. The fact that some controls had higher concentrations than some Legionnaires' cases must be taken into account in drawing any conclusions.

It is therefore not possible at this stage to single out nickel toxicity as the cause of the outbreak in Philadelphia.

A case could be argued that some form of contamination may be responsible for the nickel levels detected. During the initial discussions with the CDC, samples were requested in the form of (a) tissue stripped from the exterior of the organ ("external" lung) and (b) tissue taken from the interior of the organ ("internal" lung) which was less susceptible to contamination. Five such pairs exist.

As listed in the table on page 5, they are Internal No. 27, External No. 28, nickel concentration is higher in internal. For 29 and 30, the nickel concentration is higher in "external;" for 32 and 33, the nickel concentration is higher in "external;" for 34 and 35, the nickel concentration is higher in "internal;" for 36 and 37, the nickel concentration is higher in "external."

In three out of the five cases the nickel concentrations in the external lungs exceed the concentrations in the internal lungs by 2 to 3 standard deviations. There is a suggestion that contamination might have occurred in some cases but the evidence is not conclusive.

(c) Comparison with Other Techniques. Here we referred to a recent publication in the Physical Review which compares the systematic uncertainties from one technique to another: Using electrons using X-ray excitation, and using the proton-induced technique.

Such a comparison is made in reference 3. Figure 2 shows the samples for which preliminary results were available for comparisons and the methods of analysis. There are two references, references 4 and 5, that I think you are aware of.

The agreement between the proton induced X-ray emission (PIXE) and the electron microscopy (EM) techniques is good in all instances.

I should explain that "No" means no nickel was detected as far as the electron microscopy was concerned. You will notice, for example, that in lung 36 we detect low nickel concentrations, while the EM technique indicates no nickel particles were detected.

In lung 34, for example, we do see on the order of 45 micrograms per 100 grams dry weight and the electron-microscopy work says, "Yes," they do see nickel particles.

Again, in lung 21 we see nickel levels on the order of 65 micrograms. EM does see nickel particles.

In lung 22, they see no evidence of nickel particles. The triangle points—our data points—are consistent with that result. For lung 23, they do see nickel particles. Our results are indicated by the triangle points and agree with the EM results.

For lung 27 the agreement between PIXE and the nickel extracted followed by the atomic absorption technique is good. There is agreement on the nickel levels between the dot and the two triangular points. For lungs 22 and 23, the agreement between PIXE and NiAA is within the stated errors.

Conclusions: The nickel concentrations in a number of the samples including both Legionnaires cases and controls appear somewhat higher than "normal."

The average concentration for the Legionnaire cases was above that of the controls; however, high and low concentrations appeared in both groups.

It is therefore not possible at this stage to single out nickel toxicity as the cause of the outbreak in Philadelphia. Analysis of other samples is underway.

[The report referred to follows:]

NICKEL LEVELS IN LUNG AND KIDNEY TISSUES FROM VICTIMS OF "LEGIONNAIRES" DISEASE" USING PROTON INDUCED X-RAY EMISSION

I. INTRODUCTION

The method of proton induced x-ray emission has been used to measure the trace concentrations of nickel in lung and kidney tissues from victims of the so-called "Legionnaires' disease."

Discussions on the application of this technique for the analysis of the tissues began on September 3, 1976 between Dr. Chen and Dr. J. Liddle of the Center for Disease Control in Atlanta. The technique offers two advantages:

(1) it provides simultaneous multi-element analysis for elements heavier than sodium, including nickel. In comparison, multi-element neutron activation analysis, which was also being employed by the CDC, has low sensitivity to nickel.

(2) only small quantities of tissue (0.1 g) were needed per analysis.

The first shipment of samples was received on September 19th. Apart from digesting the tissues in "ultra-pure" nitric acid, no chemical separation of elements was performed on the samples in order to avoid possible contamination. This procedure complemented the work under consideration at the CDC involving chemical separation of nickel followed by atomic absorption analysis.

This report consists of the quantitative results obtained for the nickel concentrations in 17 lung tissues and 20 kidney tissues and an identification of the other elements detected to date using the proton technique.

It should be noted that the authors were not aware of the samples' identities prior to analysis. The "code" identifying "Legionnaires' cases" versus "controls" was broken only after the results were presented to the CDC on November 22, 1976.

II. EXPERIMENTAL PROCEDURE

(a) Sample preparation

Samples of the various tissues were weighed in sterile capped plastic test tubes. Concentrated nitric acid (Baker "Ultrex" brand) was added and the samples heated at 60° C to effect digestion. 10 microliter aliquots of tissue-nitric acid solutions were analysed directly in the proton beam and the nickel concentration determined.

Each sample was analysed on three separate days to establish any systematic variations. Analysis was done in random order and not sequentially by sampler number.

(b) Sample analysis

As previously described,¹ the protons accelerated by a 2-MeV Van de Graaff were incident on the targets mounted at 45° to the incident beam. The characteristic x-rays were detected in a Si(Li) detector with a resolution of 165 eV fwhm at 5.9 keV. Lucite absorbers were placed in front of the detector to attenuate low energy x-rays and to peak the detector sensitivity response in the nickel region.

¹ Chen, J. R.: Ionization Cross Sections for L-Subshell X-rays in Pt, Au, and Hg Using Proton Bombardment. Paper presented at the Particle Induced X-Ray Emission Lund Conference sponsored by the Nobel Committee for Physics of the Royal Academy of Sciences and by the Swedish Atomic Research Council, Lund, Sweden, Aug. 23-26, 1976.

The quantitative calibration and cross-check measurements were performed by analysing samples to which known concentrations of nickel had been added. These measurements were performed at the beginning, during and at the end of each analysis period.

The data were converted to digital format for analysis on a CDC 6400 computer.

III. RESULTS

(a) Elements detected in lungs include: potassium, calcium, titanium, chromium, manganese, iron, nickel, copper, zinc, arsenic and/or lead, selenium, bromine, and rubidium.

Elements detected in kidneys include: potassium, calcium, titanium, chromium, manganese, iron, nickel, copper, zinc, mercury, arsenic and/or lead, selenium, bromine, rubidium, and cadmium.

These elements are present in normal healthy tissue.²

(b) Nickel concentrations

The nickel levels detected in the kidney tissues were less than 15 ug/100g dry weight except in two cases with concentrations between 20-30 ug/100g dry weight.

Figure 1 shows the nickel concentrations in the 17 lung tissues analysed to date. Also shown are the identification of the samples according to "Legionnaires' cases" versus "controls." No obvious grouping of cases versus controls on the basis of the nickel concentrations measured can be seen. However the average nickel concentration for the Legionnaires' cases is 42ug/100g dry weight, while the average concentration for the control is 25 ug/100g (excluding the non-reproducible 150 ug/100g result for lung 37). The difference between the two averages is not significant considering the small number of samples and the uncertainties in each measurement. The fact that some controls had higher concentrations than some Legionnaires' cases must be taken into account in drawing any conclusions.

It is therefore not possible at this stage to single out nickel toxicity as the cause of the outbreak in Philadelphia.

A case could be argued that some form of contamination may be responsible for the nickel levels detected. During the initial discussions with the CDC, samples were requested in the form of (a) tissue stripped from the exterior of the organ ("external" lung) and (b) tissue taken from the interior of the organ ("internal" lung) which was less susceptible to contamination. Five such pairs exist.

Nickel concentration higher in—	Internal	External
Internal.....	27	28
External.....	29	30
External.....	32	33
Internal.....	34	35
External.....	36	37

In 3 out of 5 cases the nickel concentrations in the external lungs exceed the concentrations in the internal lungs by 2-3 standard deviations. There is a suggestion that contamination might have occurred in some cases but the evidence is not conclusive.

(c) Comparison with other techniques³

Figure 2 shows the samples for which preliminary results were available for comparisons and the methods of analysis.^{4,5} The agreement between the proton induced x-ray emission (PIXE) and the electron microscopy (EM) techniques is good in all instances. For lung 27 the agreement between PIXE and the nickel extracted followed by atomic absorption technique is good. For lungs 22 and 23 the agreement between PIXE and NIAA is within the stated errors.

² Anspaugh, L. R., Robison, W. L., Martin, W. H., and Lowe, O. A.: Compilation of published information on Elemental Concentrations in Human Organs in Both Normal and Diseased States. No. UCRL 51013, Pt. 1-4 (1971-1973).

³ Chen, J. R., Reber, J. D., Ellis, D. J., and Miller, T. E.: "Study of the L-Shell X-Rays of Ta, Pt, Au, Hg, and Pb by Proton Bombardment." Physical Review 13A, 941 (1976).

⁴ See Toxicology Branch, Clinical Chemistry Division, Bureau of Laboratories, A Preliminary Report of the Toxicological Findings Connected with the Illnesses Linked to Philadelphia, Pa. of July, August, 1976, Sept. 10, 1976.

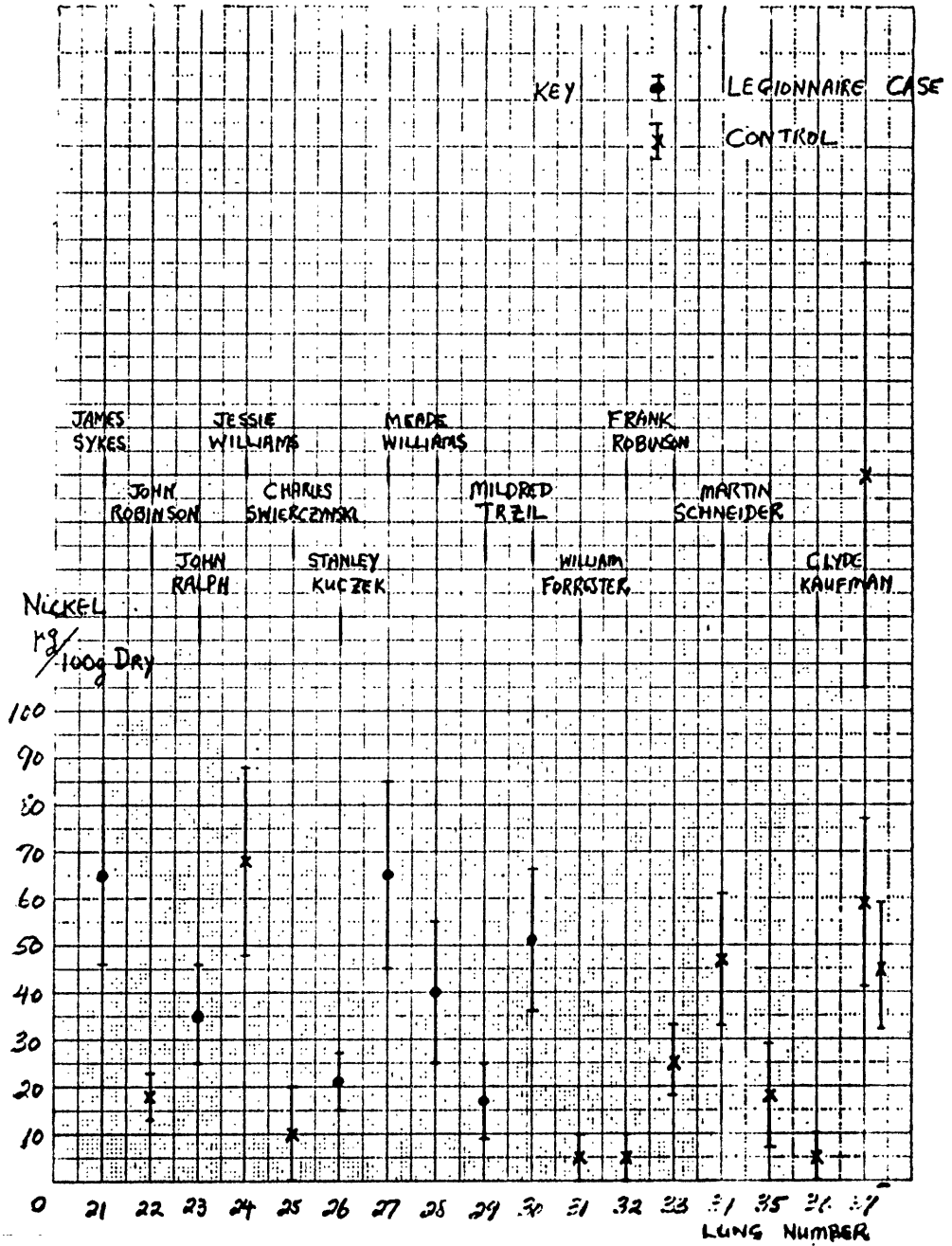


FIGURE 1

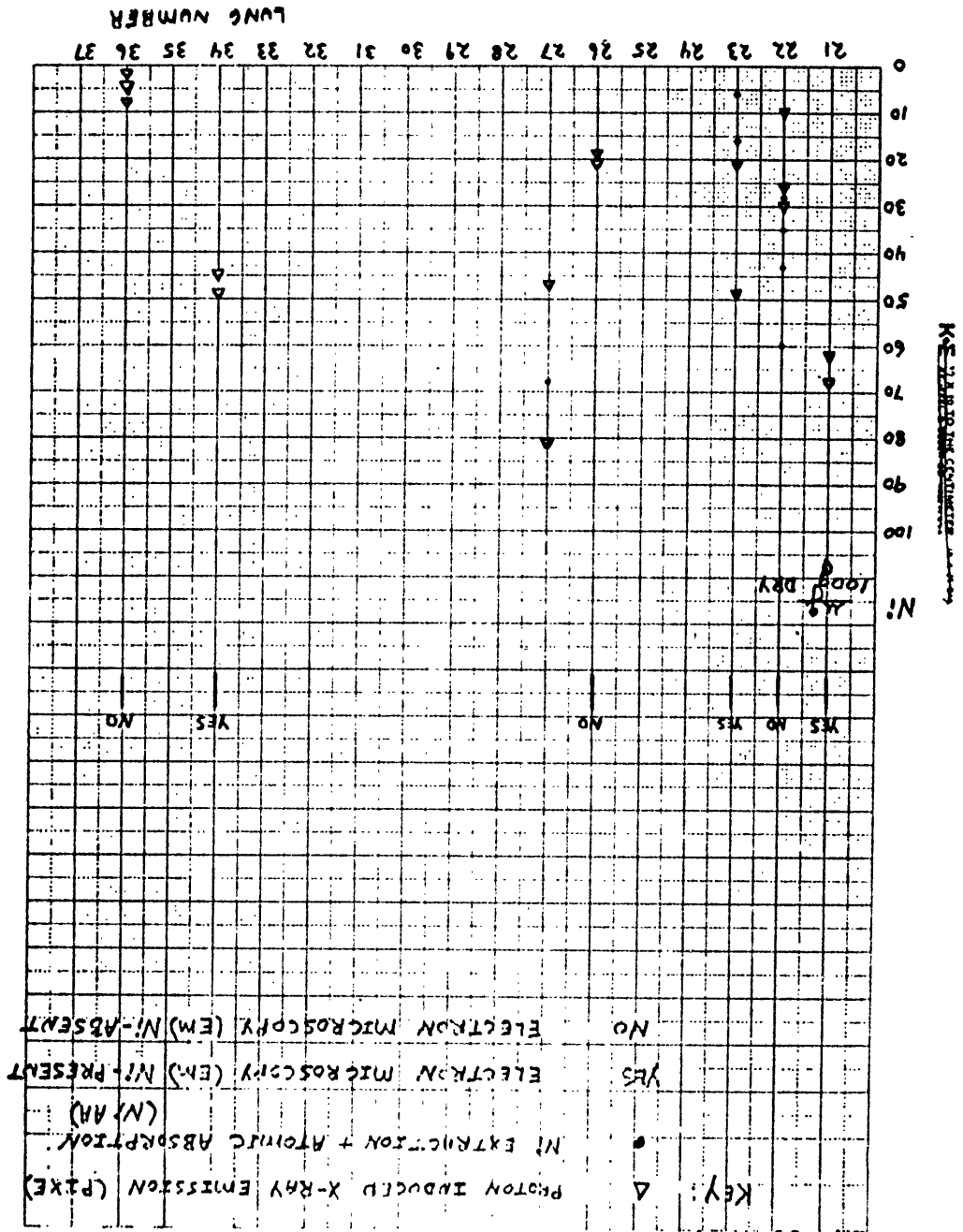


FIGURE 2

IV. CONCLUSIONS

The nickel concentrations in a number of the samples including both Legionnaires' cases and controls appear somewhat higher than "normal".⁶ The average concentrations for the Legionnaires' cases was above that of the controls, however high and low concentrations appeared in both groups. It is therefore not possible at this stage to single out nickel toxicity as the cause of the outbreak in Philadelphia. Analysis of other samples is underway.

⁶ Sunderman, F. W., Jr. and Baselt, R. C.: Measurement of Nickel Concentrations in Tissue and Urine Specimens from Victims of "Legionnaires' Disease." Final Report submitted to Bureau of Laboratories, Department of Health, Commonwealth of Pennsylvania, Sept. 20, 1976.

The authors would like to express their gratitude to Dr. Francis T. Wang, analytic chemist, and to Dr. Allen Reid, pathologist, for their helpful discussions.

Mr. MURPHY. Thank you, Doctor, for a very fascinating paper.

The proton-induced emission, is that the type of sophisticated method to detect all metallic substances in tissues or are there more sophisticated equipment?

Dr. CHEN. I think it depends upon the region of the periodic table what elements you are trying to detect.

Mr. MURPHY. I notice you said it provided some of the multianalysis of elements heavier than sodium; in other words, you were just going after nickel. Is that why you used this method?

Dr. CHEN. No; the technique is sensitive to elements from sodium to uranium. By way of background, we are concerned with the 92 naturally occurring elements. The first 11 are not of immediate interest using this technique.

Elements 11 to 92 can be detected by this method. However, it is with varying degrees of sensitivity for the different elements. This technique is particularly sensitive in the region that nickel resides. Other techniques are not as sensitive.

Therefore, depending on what region of the periodic table you are attempting to check you choose your technique accordingly.

Mr. MURPHY. Did you pick up the halogens in this test?

Dr. CHEN. We did pick up bromine. Chlorine, for example, we can detect, but it is not of particular interest in this case.

We have intentionally reduced the signal from chlorine because we are not analyzing for chlorine concentrations. In this particular series of tests we have concentrated on the nickel concentrations.

Mr. MURPHY. That was the purpose and the mission of this particular undertaking?

Dr. CHEN. There was another underlying purpose. Because one of the major advantages of this technique is its multielement capability, we were looking around every corner that we could find.

We turned on the apparatus and we analyzed what we saw, since the technique is sensitive from sodium to uranium approximately 80 elements. However, I should indicate the sensitivity varies depending on what region one is talking about. It is an all-inclusive system; you get a signal from all the various elements as they exist in the target tissues you are bombarding. It is quite a sophisticated technique.

Mr. MURPHY. What else did you find other than your conclusion here on nickel? You told me you were looking around a few corners. What did you find?

Dr. CHEN. At this stage, I think I should refer you to page 4, to the elements we detected in the analysis. As you heard in testimony earlier today, there is the question of, for example, zinc oxide toxicity. We certainly do see zinc.

However, zinc is present in normal tissues, at normal levels. One must now go back to the various cases and establish, quantitatively, how much zinc is present in the tissues.

In addition, one has to establish a baseline for normal healthy individuals and compare those with concentrations in the various cases.

Of course, that is an ongoing analysis. At this stage, I cannot make and further statement than what is stated here.

Mr. MURPHY. Did CDC contact you to do this study?

Dr. CHEN. No; I contacted the CDC.

Mr. MURPHY. Did they pay for the study?

Dr. CHEN. No; they have not.

Mr. MURPHY. What would be the cost of a study such as this if you were doing it for industry, let say say?

Dr. CHEN. At present, I have a special grant to work on this particular problem which, based on the traveling that is involved and on the supplies that are required, would run anywhere from \$5,000 to, maybe, \$15,000.

As far as the instrumentation goes, one of our major advantages, of course, is that we are ongoing. We could take samples and analyze them, directly. We had acquired on the order of 100,000 to 200,000 dollars' worth of equipment prior to this for this ongoing program. That is the scale of moneys involved.

Mr. MURPHY. Thank you, Doctor. We appreciate your testimony.

Our next witnesses will be a panel consisting of Mr. Edward T. Hoak, State adjutant of Pennsylvania, and Joseph V. Adams, State commander, Pennsylvania, The American Legion.

Adjutant Hoak, would you like to lead off?

STATEMENT OF EDWARD T. HOAK, STATE ADJUTANT, DEPARTMENT OF PENNSYLVANIA, THE AMERICAN LEGION, ACCOMPANIED BY JOSEPH V. ADAMS, STATE COMMANDER

Mr. HOAK. I appear before this subcommittee feeling great sorrow for the families of the 20 Legionnaires and women who lost their lives as a result of the tragedy that struck following the Pennsylvania American Legion State Convention held here in Philadelphia last July.

We also know of the suffering and great hardships borne by some 180 Legionnaires and women and their families who were hospitalized by this terrible illness. Now, there is another "casualty"—the closing of the Bellevue Stratford Hotel.

The Department of Pennsylvania, The American Legion, does not accuse anyone of having caused this disaster. Nor, do we exonerate anyone from blame. We believe that the city, State, and Federal authorities, which includes doctors, scientists, engineers, environmentalists, and many others, are best qualified to come up with a cause of the illness, if, indeed, it will ever be known.

I personally believe, however, that the investigation should continue indefinitely, since it is important to our entire Nation that no stone be left unturned in finding the cause, due to the possibility of future similar outbreaks.

I do not believe that we can be certain that similar illnesses have occurred before in other cities and hotels. May I use an imaginary example? Suppose there was a national meeting of salesmen in a major hotel somewhere in the United States and after the meeting they returned to their homes throughout the country and some of them died. Would it have been possible to tie in the deaths of a few—say, perhaps five or six—who had the common experience of having attended a meeting in a far-off city?

I believe that the principal reason that this so-called legion illness was brought to the attention of the public was because of the good communications system we enjoy in our organization. Only through the constant contact between our members and they with our State headquarters, via the telephone and personal visits, was it possible for us to be aware so quickly of what was happening and, undoubtedly, prevented the death of many more.

Once we learned of the symptoms of the illness we were able, through the news media, to alert our entire membership of 260,000 and warn them that if they had a severe headache, chest pains and a high temperature, they should seek medical assistance immediately.

The news media deserves a lot of credit for spreading the word and undoubtedly saving the lives of many of our members or members of their families. Through the news that appeared in newspapers and on radio and television, our people were encouraged to seek immediate aid if they developed the aforementioned symptoms. I certainly would not like to even think of the numbers that might have died had they not been alerted on Monday, August 2, 1976.

I first learned of several illnesses in western Pennsylvania on Saturday, July 31, 1976, while visiting in the vicinity of my hometown, Manor in Westmoreland County, Pa. It was on that date that, at a meeting at my home post, I learned of the illness of six Legionnaires and that one, a Frank Harvey of McKeesport, had died. I was not, however, yet alarmed since it is not uncommon for Legionnaires to get ill and even die following a State convention.

On Sunday morning, August 1, 1976, I returned to my home in Camp Hill. When I went to the State headquarters that evening at about 6 p.m., I found a letter on my desk from Mrs. Elmer Hafer, informing me of her husband's illness and that he had pneumonia, and wasn't responding to treatment. Elmer Hafer was a very good friend of mine and he often visited me in headquarters as 18th district commander, an office he had just vacated at the close of the convention.

Mr. Hafer was also a past State vice commander.

At about 7 p.m. the same evening, my secretary, Mrs. Anne Ludlam, phoned me and informed me that she received word from Lewisburg that Elmer Hafer had died. The individual calling was unable to reach my home, since I have an unlisted number. At this point I knew of two deaths and six people who were hospitalized.

I then called the home of my assistant adjutant, Charles E. Neubaum, in Chambersburg, concerning another matter. His wife informed me that Charlie wasn't home and that he was attending the viewing of Charles Chamberlain, post commander-elect, of St. Thomas Post 612, who had died suddenly following the convention. I asked Mrs. Neubaum to have Charlie call me when he returned.

Charlie called me at about 9:30 p.m., and at that time informed me that two or three other Legionnaires who had attended the convention were seriously ill in hospitals in that area.

I then called Richard Snyder, past State commander, of Williamsport, Pa., to inform him of Elmer Hafer's and Charlie Chamberlain's death, whereupon he informed me that six people from Williamsport who had attended the convention were hospitalized.

Following my talk with Snyder I really became alarmed and called the State commander, Joseph V. Adams, of Cheltenham, to inform him

of the happenings. At the same time he informed me that several people he knew, who had likewise attended the convention, were ill. I told Commander Adams that I would inform the State health department first thing Monday morning.

I then, that same evening—Sunday, August 1—called some of the people that I knew were ill to urge them that they report to a hospital immediately. Among those I called were: John Toskey of Patton, Pa.; Mario Maloberti of Jeannette, Pa.; and James Flowers of Latrobe, Pa.

Finally, I spoke with Bud Coldren of State College and he informed me that an Avenio and a man named Kline from his area were in the hospital. It now being after 11 p.m., I went home.

On Monday, August 2, 1976, I arrived at State headquarters about 8:20 a.m., and immediately asked the receptionist, Mrs. Betty Olsen, to place a call to the Pennsylvania Department of Health for me. However, before she could find the number, a call came in from a Dr. Schrack of the Department of Health. Dr. Schrack told me he had been informed the previous evening of a number of people in Williamsport who were hospitalized, all of whom had attended the State convention. At the same time, I told Dr. Schrack of what I had learned, that at least three were known to have died and many more were ill. Dr. Schrack then said that he would come to my office.

Dr. Schrack arrived in about 10 minutes and until he arrived, I had learned of 5 additional deaths and about 30 more who were seriously ill. He was apparently not aware of any illnesses other than those in Williamsport hospital until he spoke to me.

A bit later, Doctors Beacham and Gens of the State department of health came to our office for the convention agenda and other data regarding the event, which were furnished. They advised that a command post was being established in the State capitol and furnished me with the number, asking that we relay details of any additional illnesses to them immediately.

I worked until after midnight for approximately 10 days, during which time I had many contacts with both the State and national health authorities, but none whatsoever with the Philadelphia Department of Health.

At about 10:30 a.m., Monday, August 2, I telephoned State Commander Adam and informed him of my intentions to release the story to the news media, since I felt it was in the best interests of the safety of other Legionnaires. At about 11 a.m., I called the Associated Press Office in the State capitol newsroom, Harrisburg, and told them the story as I knew it up to that time.

At this point I would like to answer the employees of the Bellevue Stratford in one word—hunbug—when they state that the Legionnaires brought the illness to the hotel with their own food, liquor, and ice. Who are they kidding? Are they trying to be so ridiculous as to infer that our convention was the first group that ever did such a thing? I am sure that you and I have been to a lot of conventions and we know this is a common practice of which the hotel management is aware and if they attempted to curtail it, it would be the end of their convention business.

I might add that our State headquarters has cooperated fully with all health authorities and the news media and provided them with whatever information we had concerning activities at the convention.

and the illness. The Pennsylvania American Legion has, also, suffered severely, both financially and in our programs, from this catastrophe.

I sincerely hope that this subcommittee can come up with some answers regarding what happened to our Pennsylvania Legionnaires who attended the State convention in Philadelphia. We hope and pray that the cause is identified and the stigma of the so-called Legionnaires' disease can be removed from a group of wartime veterans who have served their country well and who are now enrolled in The American Legion to serve their communities in time of peace.

One must realize that a so-called cream of the crop of our Legionnaires attended this convention, as State officers and delegates of the 911 posts, who send the best, most active members to represent them. It is 29 such people that we have lost, and our posts and districts have lost the services for many months—some have not yet recovered—of their finest Legionnaires.

I would like to add one more remark for the record. In regard to the surveillance of the people who have been reported to be sick, yesterday afternoon I had a phone call from a friend of one of our men who was sick and was listed at one time, erroneously, on the death-list, Frank Tucci, from Farrell, Pa., but his name was removed later.

He has now had several relapses. He is off work sick, now. He will not be able to work anymore this year and he is waiting for admittance to a hospital. He claims that this disease has affected him a great deal.

I know of another man who was an amputee who lost his leg in World War II—from Jeannette, who has been off work since July and will not be able to go back to his employment until after January.

I do hope that these people will keep up their surveillance on these people who have been sick because we keep getting reports of their being tired in the afternoon, not able to perform their duties of employment, not able to function as a husband and as a father in the home.

Mr. MURPHY. Commander Adams?

STATEMENT OF JOSEPH V. ADAMS

Mr. ADAMS. I am Joseph V. Adams of Cheltenham, Pa., State Commander of the Pennsylvania American Legion.

My primary purpose in appearing here today is to seek assurance that the investigations conducted thus far have been as extensive as possible, and solicit your help in continuing the investigation indefinitely, in an effort to determine the cause of the illness that killed 29 Legionnaires and women, and from which some 200 became seriously ill.

I feel that the procedures for handling notifications of medical emergencies in the city of Philadelphia are inadequate, since I experienced considerable difficulty in reporting the illness on Sunday, August 1, 1976.

My questions are: One, will more specific results of tests by the Center for Disease Control, Atlanta, Ga., ever be released? Thus far, we have heard nothing except that all results are negative.

Two, what has been done or can be done to determine whether or not there was excessive use of refrigeration gas in the Bellevue Stratford Hotel during the American Legion Convention?

Three, has anyone checked the air-conditioning service company or with the hotel engineers to determine the amount of gas used?

I do not feel that the investigations conducted thus far have exhausted all possibilities, and I urge that this committee engage the best possible minds in all fields—medicine, chemistry, engineering, or whatever may be appropriate—to insure that no stone is left unturned in an effort to determine the cause of this terrible catastrophe.

Mr. MURPHY. Thank you, Commander Adams.

You were here yesterday, or I am sure that your representatives were here. You know that we are getting the information on the air conditioning and on the other systems in the Bellevue Stratford Hotel and related areas. Did you notify the VA of this situation?

Mr. ADAMS. My rehabilitation director works for the American Legion, in the Veterans Administration office and I contacted him on Sunday night.

Mr. MURPHY. On Sunday night, August 1?

Mr. ADAMS. That is correct. When I told him what happened, he told me that he had the same symptoms. The next morning he reported to the Veterans Administration's clinic on Broad Street. That is where the alert came through—the Veterans Administration.

Mr. MURPHY. Did the persons who became ill go to VA hospitals?

Mr. HOAK. Not too many of them went to VA hospitals. Not too many of them were in VA hospitals.

Because I would imagine that the areas they were in had no VA hospitals in that immediate area.

Mr. MURPHY. Eighty-two VA hospitals?

Mr. HOAK. I mean in the areas where the diseases were. Like the ones in Jeannette, they went to the Emergency Hospital, right away. That is what most all of them did.

I cannot think of—well, offhand, maybe just five or six were in a VA facility.

Mr. MURPHY. We intend to have the VA in to question in this regard.

What followups have the city and State medical authorities made with the persons who were infected and survived?

Mr. HOAK. The only followup that we know of, there has been nothing to my knowledge in the last month or two to find out what their status is, at the present time.

Mr. MURPHY. There are on the phone?

Mr. HOAK. I have gotten phone calls from some of them telling me of their conditions.

Mr. MURPHY. Was a survey or questionnaire sent out to the legionnaires who attended the convention?

Mr. HOAK. Dr. Beecham and several of the doctors from the State health department contacted me with regard to a formulation of a questionnaire.

These questionnaires were distributed to all of the posts for completion at the post level. There was quite an extensive campaign on to get these questionnaires completed. I think they did a pretty good job in it.

Mr. MURPHY. How many people other than legionnaires were affected?

Let me rephrase that, please. How many people other than legionnaires and those attending the convention with the legionnaires were affected by this illness?

Mr. HOAK. I think there were several wives that came down with it. Some of them were victims of it. They were also ill.

Mr. MURPHY. They were associated?

Mr. HOAK. Associated with the legion.

Mr. MURPHY. Any other persons?

Mr. HOAK. I understand from the reports that I got that at the Eucharist Convention there were some deaths. But, I am talking about our particular group that met, to our knowledge we know of wives. We heard of one young child of a legionnaire that had it. Our associations are within our own association, however, you understand.

Mr. MURPHY. Why were there no Philadelphia Health Department contacts?

Mr. HOAK. I cannot understand it. We had no calls, whatsoever, from doctors in the Philadelphia area at all and from their department of health.

Mr. MURPHY. Could that be because they were working with the State health officials?

Mr. HOAK. It could very easily have been.

Mr. MURPHY. What do you think of the statement that many people made that there was a willful introduction of a toxin or some causative agent of this disease?

Mr. HOAK. I personally do not believe that it was sabotage. That is my personal belief. That is only based on the idea that at no time did I or any of our State officials of the American Legion receive any kind of threats against our health or against our organization or did the national organization of the American Legion ever have any kind of threats of any physical harm to them. That is why I believe that.

That does not mean that it is not a possibility; but I am afraid that the longer we do not know the cause the more reason there is for speculation on this theory.

Mr. MURPHY. It is just fortunate that you and the legion of Pennsylvania communicated with each other or, as you said in your statement, if this had been a looser organization, I can imagine with people scattered to many States, it may have gone undetected. Maybe, it has?

Mr. HOAK. This is a question that I think is very important. How do we know that this has not happened before. I do not know.

It was only because of the closeness in the organization and our contact with each other that we were able to determine this, with the great help of the news media, in getting the message across to all of our people or it could have gone past us. I was not instructed to go to the news media otherwise I might have done that.

Mr. MURPHY. Without the news media, I think there might have been more deaths.

Mr. HOAK. Correct.

Mr. MURPHY. Mr. Hoak, would you detail what you did on the 1st of August in relation to the disease?

Mr. HOAK. As far as the disease itself is concerned, as I said in my statement, I had been out in western Pennsylvania Saturday night. I learned of the six illnesses, the one death.

I then came back to my home in Camp Hill, Pa. After that, I went to the office which is seldom normal for me to do at night and I started to make phone calls.

I learned of Elmer Hafer's illness, then I learned of his death. I then learned of Chamberlain's death in St. Thomas. I talked to the commander which is not written there, in the statement.

I talked to Commander Adams three or four times. I talked to past State Commander Tom Cammarota. I made many phone calls back and forth.

Then, as I accumulated a vast amount of information of more illnesses, I became more and more alarmed. What really got me alarmed was when I learned of the illnesses at Williamsport, of the six cases.

Up until that time I was concerned but not greatly concerned. It was then I knew that it really was something. After that phone call, I started to make phone calls to areas of—well, John Toskey who is sitting here with us.

I knew that John had been sick in Patton, Pa. I called his home. I remember the conversation very well. His son answered the phone. I asked, "Is your dad there?" He answered, "Yes, he is here. He checked himself out of the hospital."

I asked him, "Let me talk to him." He came to the phone and I said, "John, get your fanny to the hospital because something is wrong. I do not know what it is but the Legionnaires who went to the convention are very sick." He said, "I will go in." I was not very convinced that he would go in, so I asked if his wife was there. When he said "Yes," I said, "Let me talk to Gloria." I told her, "Gloria, I do not want to scare you but three or four people have died. There is something wrong. Get John to the hospital tomorrow—right away."

I called Posey Flowers out in Latrobe. His wife answered the phone. She said that Jim was going to check himself out tomorrow. He had been in the hospital but he did not think there was anything wrong with him. I told her what had happened. I said, "It is something bad because there are some people who have died." I said, "You make him stay in the hospital and you tell the doctor."

I then called Mario Maloberti and Steve Micosky. I called everybody I could think of that I thought was sick. I went home that night at 11:30 but I never thought there was any place nor did I know of any place that I could have called the State health authority to report it.

Mr. MURPHY. How about today?

Mr. HOAK. Today, I would call the Governor's office, because I understand there is somebody on duty there all the time.

Mr. ADAMS. We had difficulty here in Philadelphia. I called Sunday night. I did not know who to talk to so I talked to some of the people in the county organization here in the American Legion. Then I grabbed the phone book, looked up under "Emergency," got a number listed in the book and I got the morgue. I talked to the man in the morgue. He said, "You better call the switchboard and ask for the medical officer in charge for the weekend."

I called. The operator said—I told her who I was and what had happened. She told me to hold on. The next one I got was a lady. She told me that I would have to wait until 9 o'clock in the morning.

I could not tell anybody anything—the place was closed. I said to her, "Do you not realize what is happening? You do not—she replied, "You do not seem to realize, we are not open."

There is something wrong, here, in the city itself, to report something like this—

Mr. MURPHY. Did you call your Congressman?

Mr. ADAMS. My Congressman is in Montgomery County. I would not know where to reach him on a weekend.

Mr. MURPHY. He is in the book.

Mr. ADAMS. There is a possibility that he is in the book, but you must realize that there is a great apathy that goes on on the weekends.

Possibly there might have been more lives saved at Pearl Harbor if there had been somebody available on the weekend.

You know, there does not seem to be anybody available to notify—

VOICE FROM AUDIENCE. Why did you not call Deputy Commissioner Fox who is the chairman of your American Legion Convention Corporation?

Mr. ADAMS. I did call him. He was not home. I asked him to call back and did not get a phone call until the next day. Does that answer your question?

VOICE FROM AUDIENCE. Yes; he was the guy. He was deputy police commissioner and very close to the Legion.

Mr. HOAK. Congressman, I have here—I was requested to furnish you with a biographical sketch of all of the victims and letters from the next-of-kin of these people that I would like to give you.

Mr. MURPHY. Fine; we will accept that for the record.

[The documents referred to follow:]

BIOGRAPHICAL SKETCH OF FRANK L. STRICKER

Born on November 28, 1895 in the Bridesburg section of Philadelphia, Pa. along with his twin sister Catherine. He was educated in the public schools of Philadelphia and attended Pierce School (Now Pierce Jr. College) and the University of Pa. Wharton School of Finance.

At the age of 22 he enlisted on 9-25-1918 in the U.S. Army and served his country until Honorably Discharged on March 31, 1919. While in the Army he served as an accountant and auditor.

On September 9, 1922 he was married to Anna M. Blunt and moved into a new home at 4420 Knorr St. Philadelphia, Pa. in the Tacony section of the city. At the time of his death Mr. Stricker still resided at the same address.

A son Francis Jr. was born to Mr. & Mrs. Stricker on May 19, 1926. He was to be their only child.

Mr. Stricker, a self employed Certified Public Accountant conducted his own accounting practice in the Phila area. His son joined his father in his accounting practice in 1950 after his graduation from college and is continuing the business.

During his life after his discharge from the service. Mr. Stricker served the American Legion in many capacities. He was a Lifetime Member of Wm. D. Oxley Post 133 in the northeast section of Phila. He was a Past Commander of his post and a delegate to Phila. County Council. He was County Finance Officer for many years and also handled the finances of the Phila. Dept. Convention Corp. and at his death still held these offices.

He died on August 2, 1976 one week after his twin sister who succumbed on July 26, 1976.

Closest surviving relatives are a brother, a son, a daughter in law and four grandchildren including twin girls.

FRANK L. STRICKER,
CERTIFIED PUBLIC ACCOUNTANT,
Philadelphia, Pa.

EDWARD T. HOAK,
*Department Adjutant, The American Legion, Department of Pennsylvania,
 Harrisburg, Pa.*

DEAR MR. HOAK: In answer to your letter of September 17, 1976 I am enclosing the attached Biographical Sketch of Frank L. Stricker who was one of the persons who died from the "Legionnaires Disease".

I hope this information is enough for your presentation to the Congressional Committee on October 6th. If you need any additional information please do not hesitate to ask.

Thank you.

Sincerely,

FRANCIS L. STRICKER JR.
 McADOO, PA., *September 23, 1976.*

EDWARD T. HOAK,
State Adjutant, Harrisburg, Pa.

DEAR MR. HOAK: The following is a biographical sketch of my husband, Charles M. Danishefsky requested in your letter of September 17, 1976.

Our surname was shortened from 'Danishefsky' to 'Danish' some time ago so that the correct surname is "Danish."

Charles served with the Coast Guard in WW II in both the Atlantic and Pacific theaters.

He was a member of St. Kunnegunda's R.C. church in McAdoo, Pa. He was formerly employed as a guard at the Eastern States Penitentiary. He was a former special police office in McAdoo and chairman of the Pa. Auxiliary Police of Hazleton, Pa. He was a former councilman of McAdoo and a graduate of the American Detective Training School.

He was the leaser of the Palace Theater in McAdoo and manager of the Valley Drive-In theater. He had a Pa. Motion Picture Projectionist license Class A. and was a member of the Projectionists Local Union 152 in Hazleton.

He was a retired employee of Bethlehem Steel Corp. He was the Police Commissioner of McAdoo, Vice-President of the McAdoo Lions Club, Vice-President of the Pennsylvania Rod & Gun Club at Sugarloaf, Pa., Chairman of the McAdoo Zoning Board. He was a member of the Keystone Fire Co. and a member of the McAdoo Fire Police in McAdoo, Pa. He had served as chairman for United Nations Day in McAdoo.

He was a Past Commander of the McAdoo American Legion Post 276 and formerly twice Past President of the Posts Home Association. He was a Trustée in the American Legion and was extremely active in American Legion affairs. He worked very hard for Post 276 and brought about many changes and improvements.

He is missed dearly not only by myself, his sons and his family but by everyone in the community of McAdoo, Pa. Everyone asks, "What happened to all those people that got sick and all that had died?" "What did happen, I ask myself?" Please, please try to find out what happened. It seems as if no one knows.

I trust that you can help. Someone has to find out the TRUTH.

Thank you for trying

Sincerely yours,

MRS. CHARLES M. DANISH AND SONS

P.S. From the above information, I omitted the following:

Charles was Chairman of the Bicentennial Committee in McAdoo, Pa., organizing various activities, such as, a parade and hosting the Wagon Train that passed through McAdoo, Pa.

PITTSBURGH, PA., *September 21, 1976.*

Re: Biological sketch of my brother, James L. Sykes, Pittsburgh, Penna., Date of Death: August 4, 1976.

Mr. EDWARD T. HOAK,
Department Adjutant, The American Legion, Harrisburg, Pa.

DEAR MR. HOAK: Following is the information you requested:

Date of birth: July 22, 1890.

Honorable discharge from World War I.

Graduate of University of Pittsburgh, Electrical Engineer.

Employee of Duquesne Light Company.
Member of: (1) American Legion; (2) Second Division of 17th Field Artillery; (3) Masonic Lodge—50 year member; (4) Member of W. Penna. Historical Society.

Thank you for your continued interest in this unfortunate situation. I will be interested in hearing the results of the meeting.

Sincerely,

PHOEBE SYKES.

DEAR SIR: My father was a Motor Machinist Mate on a minesweeper during World War II. He worked for the Yellow Cab Co. in Philadelphia after the war until he retired about 3 years ago. He had numerous safe driving awards during his career with Yellow Cab Co. He had been an active member of the John J. Wolpert Post in Philadelphia for as long as I can remember. He held many offices including Commander and District Commander.

JAMES M. DAVIS.

SEPTEMBER 23, 1976.

To: Edward T. Hoak, Office of State Adjutant, The American Legion, Harrisburg, Pa.

From: M. E. Grove (Son), Rochester, Minn.

Subject: Biographical sketch of Francis E. Grove.

Reference: Your letter, dated 9-17-76, to next of kin.

Name: Francis E. Grove (Age 70), Tyrone, Pa., Born: October 6, 1905.

Service Record: Active—28th Infantry Division Band, from 9-50 to 5-51. PNG—110th Infantry Regiment Band and 28th Infantry Division Band from 1936 to 1950.

Civilian Employment—P.R.R. (Pipefitter), 35 years service from 1923 to 1958, Altoona Works.

Civilian Accomplishments:

1. Past Master of Tyrone, Pa. Lodge F. & A.M. #494.
2. Past Commander of the Howard Gardner American Legion Post, Tyrone, Pa.
3. Tiler—P.P.O.E.—Tyrone, Pa.
4. Logan Valley Grange member, Bellwood, Pa.
5. Musician (Clarinet). Jaffa Shrine Band, Altoona, Pa.; German Band, Altoona, Pa.; United Mine Worker's Band; Indiana, Pa.

I hope this information will be helpful for your Congressional appearance. Please contact me at your convenience if you need additional data.

Sincerely yours,

MARLIN E. GROVE.

MRS. DOROTHY A. HARVEY,
McKeesport, Pa., September 21, 1976.

Office of STATE ADJUTANT EDWARD T. HOAK.

DEAR MR. HOAK: Here is the information that you have requested.

Frank Joseph Harvey,
1805 Jenny Lind St., McKeesport, Pa.

Frank Harvey was born September 2, 1921 in Pittsburgh, Pa., the son of the late Frank and Nora (Marshall) Harvey. He attend the Pittsburgh School System and was a graduate of Westinghouse High School.

Mr. Harvey entered the U.S. Army on February 11, 1943, and was honorably discharged on January 17, 1946. He served 18 months in New Guinea with the Headquarter Battery 395th Anti Aircraft Artillery Battalion as a 4th Grade Technician and 16 months of continental service. Also during this time he received a Good Conduct Medal, an American Thr. Service Medal, an As-Pac. Thr. Service Medal with one Bronze Star, and a Victory Medal.

Mr. Harvey was employed as an equipment mechanic at the 911th Military Airlift Group at Greater Pittsburgh Airport. Also, at the time of his death he was serving as Vice President of Local 2316 A.F.G.E.

Mr. Harvey had been a member of the American Legion for 30 years. During this time he had always been active in veteran's affairs and had served a term as President of McKeesport Allied Veterans Association.

Mr. Harvey is survived by his wife Dorothy A. Harvey and daughters Elnora, Gretchen, and Gayle (8).

Yours truly,

DOROTHY A. HARVEY.

BIOGRAPHICAL SKETCH OF MR. ABE RUBEN

Date and place of birth: Aug. 1, 1894; Eyoun, *Syria*.

Parentage: oldest child of Ruben and Mariam Elias (oldest son takes father's first name and makes it his last; other sons follow suit).

Early history: arrived in U.S.A. in 1909, settling with uncle and family in McKeesport, Pa.; served in U.S. Army during W. W. I, achieving rank of Sergeant;

Business career: trucker, tire dealer in Carmichaels, Pa.; became owner of Ruben's Garage, selling Oldsmobiles from 1938-1956, and International Harvester and Goodyear products from 1928-1972, then retired;

Family: married Ethel Gwynne of Carmichaels in 1927; two sons; Rev. John Ruben, of Sedro Woolley, Wash., Abe Ruben, of Houston, Texas; two daughters: Mariam Kashner, of Adrian, Mich., Martha Lumley, of Meadville, Pa. also raised two nephews: George Ruben, of Pittsburgh, Elias Ruben of Kent, Ohio. . . . Mrs. Ruben passed away in 1970.

Memberships: member of Calvary U.P. Church, Donora, Pa. (Elder and building committee chairman).

Cumberland Post 400, American Legion—Carmichaels.

Charter member and founder of many posts in 25th district.

Past Commander of 25th district.

Member of Friends of Barracks 2819.

Member of Forty and Eight.

Member of Society for the Preservation and Encouragement of Barber Shop Quartet Singing in America.

Members of Washington Co. Society for Crippled Children.

Member of Board of Trustees Scotland School for Veterans' Children.

Recipient of D.A.R. Citizenship Award several years ago.

Former Rotarian and Toastmaster.

Misc: Parents died in flu epidemic 1919; brother Michael Ruben, El Paso, Texas; George Ruben, brother, in Riverside, Calif.; sister Haole Jure in Mala-brigo, Argentina.

Address since 1928—102 Tenth St., Donora, Pa.

SATURDAY, SEPTEMBER 23, 1976.

DEAR MR. HOAK: I am truly sorry this information will arrive past the due date, but I just received your request yesterday.

I sincerely hope what I've written will be helpful and please know that our family appreciates anything you do in Father's behalf.

I truly believe he was one of those rare persons and that he died a hero's death.

He would want us all to investigate the cause to prevent more suffering though.

With appreciation, I am

Sincerely yours,

MARTHA RUBEN LUMLEY.

AMERICAN LEGION,

JOHN C. MCILVAINE POST, No. 902,

Houston, Pa., September 23, 1976.

EDWARD HOAK,

Department Adjutant,

American Legion, Harrisburg, Pa.

DEAR MR. HOAK: Submitting information in regards to Earl F. Cox, P.O. Box 54, Muse, Penna. 15350 this deceased member was a victim of the disease occurred at the American Legion Convention held in Philadelphia on July 18 to July 21, 1976. He served in the U.S. Army enlisting in March 1945 and discharged on the 29 January 1946. Camp Atterbury, Ind. He also served in the Asiatic Field as a heavy equipment operator prior to his enlistment. He worked as a coal miner in Muse, Penna. for 21 years. After his enlistment in the U.S.

Army he worked for Mesta Machine Co., Homestead, Penna. for 25 years. He recently retired, he was active in the V.F.W. serving as Post Commander at Post 191, Canonsburg, Penna. He also was a past Governor in the Loyal Order of Moose. A member of Post 902, The American Legion, Houston, Penna. and a member of Voiture 676 of the 40-8.

MINNIE COX.

BIOGRAPHY OF JOHN B. RALPH

Born in Harrisburg, 24 January 1935, John B. Ralph, Jr. was the son of John B. and Mildred Crook Ralph, 136 E. Market Street, Williamstown, Pa.

"J. B.", as he was known, attended public school in Williamstown. After completing tenth grade, he attended Pennsylvania Military Preparatory School, Chester, Pa., from which he was graduated in 1952. At P.M.P.S. he served on the staff of the school publication, "Sound Off."

Mr. Ralph then entered Duke University, Durham, N.C., where he remained for three years, leaving Duke to enter the service. From September, 1955-September, 1958 he served in the U.S. Regular Army. Stationed in Germany with the 2nd Armored Division, he edited the Division paper "Hell on Wheels" and also contributed articles to "The Stars and Stripes". He received the Good Conduct Medal and was honorably discharged from the service.

Mr. Ralph next spent a year at Los Angeles Jr. College in the San Fernando Valley, Cal. Upon returning to Pennsylvania, Mr. Ralph became a reporter for "The Pottsville Republican", Pottsville, Pa. The following year he purchased The Elizabethville, (Pa.) Echo, which he edited for approximately ten years.

Most recently John Ralph had been an employee of Park Publishing Co., New York City.

The following, is a quote from a letter received by J. B.'s mother from Mr. Sam Gordon, National Vice President of Sales from Park:

"As you are aware, at the time of his unusual death, John was involved in many exciting new programs for Park Publishing Company, which are becoming fruitful at the present time. We want you to know that because of John's publishing and writing expertise, his loss to our company as Eastern Regional Sales Manager and Publishing Consultant has been immeasurable. It will be very difficult getting someone to fill his shoes, and as a friend he will never be replaced. I'm constantly using his techniques and concepts, and I am grateful for the two wonderful years that he was associated with our company. He has enriched the lives of those he has touched, and the growth of Park Publishing Company has been twofold."

Mr. Gordon also mentioned that John was always concerned with Americans who never got due publicity, and ended by saying, "I believe that John was an Unsung Hero."

Mr. Ralph was a wide reader. He was keenly interested in music; he belonged to the Williamson Military Band and to the Liberty Hose Company Band, Lykens, Pa.

He was an avid sports fan. In the realm of baseball he was strongly in favor of the Philadelphia Phillies. On many occasions he drove from Williamstown to Veterans Park to witness their games. A number of years ago, along with another Williamstown veteran, J. B. was instrumental in starting Little League Baseball in that community.

He was greatly interested in chess and had recently joined the Marshall Chess Club in New York City. For many years he was a member of the Harrisburg Bridge Club, Camp Hill, Pa.

Mr. Ralph, a member of American Legion Post 239 and of V.F.W. Post 6497, both of Williamstown, was an officer and active member of each organization. He was also a member of Loyal Order of Moose, Millersburg, the Orwin Gun Club and the Dauphin County Volunteer Firemen's Association, all Pennsylvania organizations.

J. B. was "his own man", but was always on the alert to help others.

Two young sons, Bryant and Steven Ralph survive. The boys live in Harrisburg, Pa. Also surviving are a sister, Virginia Hoffman, and his mother, Mildred C. Ralph, both of Williamstown.

MILTON, PA., September 27, 1976.

Re: Harold G. Stump ("Goose")
37 Apple St.
Milton, Pa.

DEAR MR. HOAK,

In answer to your letter of September 17, my brother was born September 22, 1922 and died August 16, 1976. He was inducted February 18, 1941 and discharged December 16, 1945.

33501380 Sgt., Co. E. 355th Engr. Regiment, Army. Normandy, Northern France, Rhineland, Ardennes, Central Europe.

Received Good Conduct Medal, WW II Victory Medal, European-African Middle Eastern Campaign Medal with 5 bronze stars, Meritus Award, American Legion.

He was president, Federation of Clubs, Milton; president, Y Community Post, Inc; president, Post Commanders, Post 71; chairman, Zoning Board, Milton business manager, Calvacade of Champions, Drum & Bugle Corp. (Keystoners). Post 71.

Committeeman, American Legion, Vice Chairman Resolution Assignment 1976 Distinguished guests Committee.

He belonged to the Milton Moose, Elks, Eagles, 40 & 8, Cooties, Milton Fire Co., Shimer Hose Co.

Fifth Ward Fire Co., active in Bloodmobile, American Red Cross. He was employed by Post 71, American Legion as manager and head steward from 1953-1976.

I do know that "Goose" went down the Northeast Extension of the turnpike to Philadelphia to make an 11:00 a.m. meeting Wednesday. Talking to people, and recalling things he mentioned, he attended the memorial service, toured Old Philadelphia, toured some ships (I took it that these had to do with the Bicentennial celebration). He was seen at the 17th and 18th hospitality rooms and watched the parade at least partly from the 17th District hospitality room. He took the elevator to Robert Joe's (R.D., New Columbia, Pa.) room at the Bellevue. Thursday he was at the Ben Franklin Hotel, Kit & Key Room, Friday he was at hospitality rooms. At Bookbinder on Wharf.

He returned home Saturday about 6:00.

His reservation was at the Holiday Inn, Penn Center and shared the room with Rev. Philip Jones, Milton.

He came down Friday, July 30 with what we thought was flu. Aching legs, arms dizziness and cough. He always had cough and phlegm except it seemed to be more phlegm than usual. I kept asking him if he had a cold and pain in chest and he kept telling me, "no." The dizziness seemed to grow worse on exertion of walking to bathroom, etc. (no steps). He would get such facial contortions and when I questioned about pain in head or dizziness, he replied, "dizziness." Although I had not taken his temperature, he was warm but not unusually so. He did gulp water but would throw this up later. He did not keep food down at all from Friday noon on. He would fall backwards when walking unless I told him to lean forward and placed my hand at his back, just touching, not pushing him. Sunday evening he could keep Coke, 7-up and water down and by this time he was ready to go to bed.

He slept for a couple of hours and when he awaked, tried for the bathroom. I couldn't get him to call me to help him and when I heard him stir and ran he was already on the floor beside the bed and could not seem to maneuver his legs and arms to help himself. Yet he stepped over into the chair when the ambulance took him page 6. [He had trouble with balance (but I assumed this was dizziness) Sat. & Sun. & Mon.] when I helped him up, this is the first time he felt burning up with fever and he was conscious on admittance to Geisinger Medical Center 1:30 a.m. Aug. 2, Monday morning. He had bowel movements up to this time I know. He was diagnosed as a very severe pneumonia but an unusual type and I informed them of the fellows at Bloomsburg as soon as I heard about this about 10:00 a.m. Monday morning. That evening he was isolated.

If you had something else in mind instead of the information above, I will be glad to supply it.

He lived 15 days died 4:45 Aug. 16, Monday. His hospital bill was \$23,000 (approximately).

CYNTHIA A. STUMP.

COUNTY OF BRADFORD,
COMMISSIONERS' OFFICE,
Towanda, Pa., September 29, 1976.

Mr. EDWARD T. HOAK,
Adjutant, The American Legion,
Department of Pennsylvania, Harrisburg, Pa.

DEAR MR. HOAK: In reply to your letter of September 17, 1976, to Mazie Travis, the sister and next of kin of Raymond Brennan, I am submitting the following information for you to use at the Congressional hearing to be held in Washington, D.C. on October 6.

Raymond Brennan was born in Towanda, Pa., on May 28, 1915, attended Towanda public schools, and graduated in 1933. He worked at various types of employment before he entered the military service on April 26, 1939. He was discharged November 16, 1943, attaining the rank of First Sergeant. He reenlisted on November 17, 1943, and was discharged on June 11, 1946, having served as First Lieutenant with Company A of the Medical Administrative Corps.

Mr. Brennan operated a diner at Denmark, S.C., until he reenlisted in the Air Force on November 20, 1950. He served until September 30, 1959, attaining the rank of Captain. Records are not available for the period of time between his discharge and November 12, 1963, when he was retired from the military service with the rank of Captain after having served a total of 20 years and 17 days.

During the Korean War, he was in charge of installing military hospital units in South Korea and was so engaged when he suffered a heart attack which forced him to retire from the service. Regaining his health, Ray was employed by the Smithsonian Institute at Washington, D.C., to catalogue its sea shells, on which he was an authority. He was with the Institute for a year when he suffered a second heart seizure and had to retire. At this time, he came back to this area to make his home. The Smithsonian Institute named a shell in his honor, a rare specimen he had located at Myrtle Beach, S.C.

Mr. Brennan was an active member of the following veterans organizations: American Legion, Towanda Post No. 42; at the time of his death, he was an active Deputy Commander of the 15th District traveling with the District Commander to all posts in the 15th District to install officers and to attend various other functions; a member of the Beirne Webster Post No. 1568, VFW of Towanda and the Cootie Borderline PT No. 85 at Sayre, serving in both organizations as quartermaster; Voiture No. 549 of the 40 & 8 in Bradford County; Crash Memorial No. 37 of the Disabled American Veterans of Towanda.

He was also a member of the following social organizations: Towanda Elks Lodge No. 2191; Bradford Lodge of the IOOF; Denmark, S.C., Lodge No. 246 of Free & Accepted Masons; Union Chapter No. 161, Royal Arch Masons, Towanda; Northern Commandery No. 16, Knights Templar, Towanda; Irem Temple Shrine at Wilkes-Barre; the Bradford County Shrine Club; the Bradford County Outboard Motor Club; Lycoming Chapter No. 509 of the National Sojourners; the Towanda Gun Club; the Naiad-Linta Fire Co.; Waverly Lodge No. 1490 of the Loyal Order of Moose.

I trust this information will be helpful.

Sincerely,

ALBERT O. REMSNYDER,
15th District Commander.

THE AMERICAN LEGION
Harrisburg, Pa.

DEAR MR. HOAK: Enclosed you will find the necessary information of my husband.

Name: Mead Howard Williams.

Address: Box 632, Edinboro, Pa.

Employment: Boron Oil Co., (Station Manager), Edinboro, Pa.

Married: Twice: 2 children, 18 & 23 to the first marriage. Divorced. Married again, January 16, 1976. No children.

Born: Union City, Pa., Oct. 18, 1923.

Mead belonged to the Post 285 Waterford, Pa. of the Legion. Also a member & officer of the Edinboro Lodge of the Moose Club. (Trustee) Member of the Lake Pleasant United Methodist Church.

He served 3 years 9 months with the United States Coast Guard. Completed Hemphill Diesel School, Motor Machinists Mate Training Stations: Erie, Pa., Philadelphia, Pa., Camp Bradford, Norfolk, Va., Alameda, Detroit, Mich.

Sincerely,

VIVIAN WILLIAMS.

Frank J. Aveni, 227 Leavy Ave., Clearfield, Pa.

War Record : April 10, 1941 to October 28, 1945.

Employment : J.B.C. Company, Madera, Pa. (Plant Manager).

DEAR MR. HOAK: Thanks to you for recognizing the tragedy that struck the Legionnaires.

Governor Shap gets on T.V. & radio and all he cares about is the business of the Stratford & Philadelphia and not the families of the men and women that died.

I am 52 years old no job & too young for Social Security I have an eight room house to keep up and could not live on 3300 veteran pension. Is Shapp going to find me a job.

Thanks for listening, but does any one really care.

Yours truly,

MRS. FRANK AVENI,

OCTOBER 4, 1976.

MR. HOAK: I'm sorry I'm a little late with my report.

The information you requested is as follows.,

Name: Louis W. Byerly.

Address: 403 Michigan Ave.

War Record : April 27, 1942-November 19, 1945.

Civilian Ace: Post Legion Commander, Baseball committee, Dist. Deputy Comm.

Employment: AS.G. Industries (39 yrs.), Clearfont, Pa.

Death of my husband. My husband was a healthy man, when I admitted him to the hospital, nothing they did helped him, his temp. never came down, he had complete kidney failure and his lungs was completely filled. The doctors did not know what they were dealing with. I still maintain if my husband hadn't gone to Phila. and stayed at the Bellevue Stratford he would still be living today. Admitted temp. 105.4, at time of death 103.

Yours truly,

MRS. BEETTIE BYERLY.

Elmer L. Hafer, Born July 2, 1919, R.D., Lewisburg, Kelly Township, Union County, Pennsylvania. Deceased August 1, 1976, 57 years, 29 days of age.

Educated in Lewisburg schools, graduate from Lewisburg Area High School, 1937.

Employed :

1936-39 American Stores Co., 6th & Market St., Lewisburg, Pa.

1940-43 Railway Express Co., Clerk and driver, Lewisburg, Pa.

1944-45 U.S. Navy, South Pacific Theater, Eligibility to join the American Legion (electrician mate 2nd Class). Victory Medal, American Campaign, Asiatic-Pacific 5 stars, Philippine Liberation 2 stars.

1946-54 Heiser's Sea Food Market, Lewisburg, Pa., Jasper Wood Products, Watsonstown, Pa.

1955-75 U.S. Penitentiary, Lewisburg Pa., retired February 2, 1975, at the rank of Senior Officer Specialist.

September 7, 1975 until date of death, employed at General Interiors, Pennsylvania House Furniture, Lewisburg, Pa.

American Legion :

Joined Kratzer-Dull Post 182, American Legion, Lewisburg, Pa., 1955.

Commander Post 182 Kratzer-Dull 1963-64.

Department Vice Commander, Central Judicial Section American Legion. 1967-68. Had 100% membership in this section.

Department Law & Order Chairman for two years.

Architect of The American Legion State Police Youth Week and was Director of the program for five years.

Served on National Law & Order Committee—two years.

1974 elected 18th District Commander, was a 100% District Commander 1975 and 1976.

Other Activities :

Past Commander of V.F.W. 1665, Milton, Pa.

Member of the Cooties of the Gare De Pas Association, 40 Hommes Et 8 Chevaux, Voiture 13.

Active member of Loyal Order of Moose, Lodge 1396, Mifflinburg, Pa.

Served Scout Troop 600, Kelly Cross Roads as parent advisor and camp counselor for ten years.

Served local Red Cross and Heart Fund Drives for four years.

Active member of P.T.A. serving as Treasurer.

Served on committee for the aged in Union County.

Married in 1940 to the former Anna M. Sylvester of Maine. Three sons, Robert, John, and James, and one daughter, Barbara. Six grandchildren. All of Elmer's children, their mates and their children belong to the American Legion, Auxilliary, Sons of the Legion, and the Junior Auxilliary.

DEAR MR. HOAK: you asked for a biographical sketch of my father to present to the United States Congressional Committee. I am glad that someone is concerned about what has happened to the victims.

My father was a World War I veteran ; being inducted August 15, 1918, and being discharged honorably in 1919. His name is Julius Gaggiani of Republic, Pa., Fayette County. He was an auto mechanic, being self employed and the owner of Standard Garage for almost 45 years. He was a 50 year member of the American Legion Post 590 of Republic, Pa. He was Post commander several times and held numerous other positions with the Post. He was also Post District Commander of District 24. He attended almost every American Legion convention, both State & National. He served on many national committees. As for his civilian accomplishments, he was involved in almost every community affairs and matters. He served several terms as School director, he was chairman of the Fayette County Civillian Defense for 25 years.

He was president of the Emergency District Unit of Republic for 25 years, which is the local Ambulance Unit.

He received the Republic Rotary Clubs First Man of The Year Award for his years of service to the community as "father" of the volunteer ambulance program in the area. What can be said for a man that spent his life working for his community, and more important at this time, that he gave 50 years to his fellow comrades and the American Legion. His every thought was the American Legion. His family and business came Second. It is tragic that he was killed doing what he loved the most—attending these conventions. We his family will not be satisfied or at peace until we know what caused his death. We hope this information is of help to you. We appreciate your concern and we know you are doing your best. Please feel free to call on us for assistance we can give you.

ALFRED GAGGIANI,
(for Wife Louise Gaggiani).

REDSTONE TOWNSHIP COMMUNITY FOUNDATION,
Republic, Pa.

Republic Rotary Honors Julius Gaggiani.—Julius Gaggiani is presented with the Republic Rotary's first "Man of the Year" award for his years of service to the community as "father" of the volunteer ambulance program in the Republic area.

JULIUS GAGGIANI NAMED REPUBLIC'S "MAN OF YEAR"

Julius Gaggiani was recently honored with the Republic Rotary Club's first "Man of the Year," award. Mr. Gaggiani is best known for his connection with the ambulance service in the Republic area. The idea of the ambulance service known as the "Emergency Distaster Unit of Republic and Vicinity" came to Mr. Gaggiani when he was active in civil defense during World War 2. The Civil Defense group Thomas Predergast and the Post 590 of the American Legion in Republic formed a committee consisting of Mr. Gaggiani, John DeGregory, C.E. Hess, Ralph Bill, Paul Benucci, Nicholas Zoretic, Julia Bolas and G. Earl Pedvia. In 1949 an ambulance was purchased.

The service was chartered under its present name in 1954. The group, which is staffed by all volunteer drivers, and for which Mr. Gaggiani and his wife Louise

have been organizers and operated a phone service for many years, recently purchased a new ambulance which exceeds federal regulations for ambulances in its array of modern equipment.

The Rotary citation for Mr. Gaggiani reads in part "It is for the many community services by Julius free of cost that the Rotary Club of Republic honors him as 'Man of the Year' and in recognition of his many years of devoted service . . . his full measure of devotion as a public spirited citizen that we present this certificate of honor."

Mr. Gaggiani came to the Republic area with his family in 1914. He was served in the Army in World War 1, and following his service became active in the American Legion, holding several offices in the local post, including commander. He is also past district commander for Fayette and Somerset Counties. He served two six-year terms as a school director in Redstone Twp.

It was during his service as deputy air raid warden for all townships in Fayette County that Mr. Gaggiani became interested in the ambulance service. The first ambulance was bought through local fund-raising activities.

They are the parents of two boys and one girl and grandparents of five. Mr. Gaggiani operates a garage in Republic in association with his son Alfred.

Also honored by the Rotary Club were the current volunteer ambulance drivers Charles Hopkinson, Andrew Kacijancic, Elmer Croftcheck, Paul Orsog, Kenneth Dillinger, Ronald Shumar, George Meglas and Earl Adams.

CHARLES B. PURSEL,
ATTORNEY AT LAW,
Bloomsburg, Pa., September 20, 1976.

Attn: Edward T. Hoak, Department Adjutant
Re: WILLIAM R. BAIRD
THE AMERICAN LEGION,
Harrisburg, Pa.

DEAR SIR: I am representing the estate of William R. Baird and your letter to his next of kin was forwarded to my office. The following is in answer to your letter of September 17, 1976.

Name: William Ralph Baird.

Born: June 11, 1894 in Pennsylvania.

War: Joined the Quarter Master Corp. of Army in Aug, 1918. Was discharged March of 1919. No injuries and did not serve overseas.

Employed: DL&W Erie-Lackawanna Railroad in Spring of 1920 until 1965. Served as a signal operator. Retired in 1965. Worked as a painter after retirement for Appleman's Paint Store, Bloomsburg, Pa. for three years.

Other: Served as Delegate to American Legion Conventions for 8 or 10 years.

Family: Wife predeceased Mr. Baird. They had three children. Two are still living.

Died: July 30, 1976.

Very truly yours,

CHARLES B. PURSEL.

DRAKE-WEAR POST No. 589,
VETERANS OF FOREIGN WARS OF THE UNITED STATES,
Hazleton, Pa., September 20, 1976.

Subject: Dennis J. Boyle, 9 W. Noble St., Hazleton, Pa.

Deceased.

Born 12-5-1915 Hazleton, Pa. never married.

Machine operator—Dorr Oliver Company, Hazleton, Pa.

Died: 8-8-76

Served 4144 QM Av Co., Army No. 33 140 466 from 2-12-42 to 12-5-45

Eyes Blue Hair Dark Brown 6½' 191 pounds

American Campaign Medal, European African Eastern Campaign Medal with 2 Bronze Stars, World War II Victory Medal.

Death caused by Cardio Renal Failure Viral Pneumonia.

PAUL JOHN BAKER,
Service Officer, American Legion 76.

WILLIAMSTOWN AMERICAN LEGION,
SHUTTLESWORTH-RADELL POST 239,
Williamstown, Pa., September 21, 1976.

DEAR MR. HOAK: My Aunt Mrs. Anna Fritz asked me to answer your letter concerning my cousin James. I'll do the best I can, at the time I can hardly find a minute off trying to take care of his affairs, and helping Mrs. Ralph also.

I don't know exactly what information you want, but I'll list what I know and if you need further information simply call me on the phone at home, 717-647-4335.

James Thomas Dolan, born Oct. 2, 1936, died 1 August 1976.

Graduated from Sacred Heart of Jesus High School, Williamstown, Pa.

Served with the U.S. Navy—Korean Era—USS Yosemite (AD 19).

Memberships in organizations:

James was 1st Vice Commander of American Legion Post 239, Williamstown, Pa.

Social member in the V.F.W. Post 6497.

Liberty Hose Co. No. 1.

Knights of Columbus, Father Mark O'Neill Council No. 2486. Lykens, Pa.

Catholic War Veterans, Post 1051, Pottsville, Pa.

James worked for the Federal Government at Ft. Indiantown Gap from Nov. 12th, 1957 until his death this year. His title was chief of communications and he was supervisor at the communications center.

Mother: Anna T. (Hayden) Dolan, died Jan. 17, 1968.

Father: James F. Dolan, died June 30, 1974.

Sister: Dorothy Ann Dolan, died January 17th, 1957 at age of 21.

Communitywise Jim was involved in so many charitable things I cannot recollect them all.

Every year he was Chairman of the Children's Christmas Party. He was a Committeeman for the Annual World War I Veterans Night. He served on the Hospital Loan (Equipment) Program. He was Chairman of the Sacred Heart of Jesus Centennial Booklet in 1975 when the Church celebrated the 100th Anniversary.

He had so many certificates from the US Army & Civil Service Commission awards that it is difficult to list them all. These were in recognition of his achievements and efficiency at his job at Ft. IGMR.

He was a Member of the Sacred Heart of Jesus Advisory Board. He was also the Memorial Day Parade Co-Marshal for years.

Jim had a very tough life in his early years, his mother was in ill health and his sister died at 21, and his father was unemployed. Through the years Jim always was driving around elderly people, crippled etc. Would drive them to Mass, take them to Stores, and visit them in such places as Rest Haven, for aged in Schuylkill Haven.

If there is anything in particular that I have missed simply call me on the phone some day and I'll jot it down.

R. MICHAEL (DICKO) DOLAN.

Mr. ADAMS. We would hope that any effort in tearing down the building that might contain evidence be delayed until such time as this investigation has concluded.

Mr. MURPHY. We will be sure that a complete investigation of all aspects of that building and its systems will take place before anything happens.

Mr. HOAK. Thank you, Congressman.

Mr. MURPHY. Thank you, gentlemen.

Mr. MURPHY. Is Legionnaire Cammarota here?

Mr. CAMMAROTA. Yes, sir.

Mr. MURPHY. Would you state your full name for the record, please?

Mr. CAMMAROTA. E. Thomas Cammarota, past department commander and past national executive committeeman, the American Legion.

STATEMENT OF E. THOMAS CAMMAROTA, PAST DEPARTMENT COMMANDER AND PAST NATIONAL EXECUTIVE COMMITTEEMAN, THE AMERICAN LEGION

Mr. CAMMAROTA. Let me say for the matter of the record, here, that I do not necessarily speak for the American Legion. I speak as an individual because I do not want any controversy after my individual testimony for whom I speak, for my main interest is the 29 dead and approximately 180 made ill.

Following the convention on the Saturday or Sunday afternoon I received a phone call from Ed Hoak telling me that Elmer Hafer had passed away. I was a little emotional because my mother had passed away at about that time and I said that I would call him back and get further information.

As to the effect of what had transpired I think I, myself, had just written it off that perhaps Elmer was ill and passed away naturally. We had lost a few district commanders at other conventions. We just let it go. But when other calls started to come maybe something was wrong or it was an illness of some nature.

That Sunday following, I received a call from Freddy Crushaur in Jeannette, the Pittsburgh area in Jeannette, Pa., stating the fact that Buzz had passed away. He brought out the fact that some of the other people we were talking about had been made ill and the fact that they had had kidney failure. A phone call then came in from Bloomsburg that Sam Morris was in the hospital. He was diagnosed as a typhoid fever case.

Mr. MURPHY. How do you know that he had the kidney failure?

Mr. CAMMAROTA. This is how they diagnosed him; the doctors out in that area put them on the kidney machines.

Mr. MURPHY. Renal dialysis?

Mr. CAMMAROTA. Definitely.

Mr. MURPHY. Did he have a prior history of kidney problems?

Mr. CAMMAROTA. No, sir; they diagnosed it as a kidney failure and impurities in the blood such as poison, or something of that nature.

After making a few more phone calls finding out that the majority of the Legionnaires in the western part of Pennsylvania had kidney failure, I think it was on that Monday or Tuesday I called Dr. Soricelli where they had the "Hot Line" and said, "Look for something toxic." It was laughed at and they said it was a virus infection.

Being at the convention and being a candidate I was never contacted, that it was nothing toxic and I think, had they looked into something toxic immediately, I think we could have prevented some deaths.

Mr. MURPHY. Who did you tell that to?

Mr. CAMMAROTA. To Dr. Soricelli in Philadelphia.

I think if you sit here and listen to the testimony you really do not have to be an educated individual to know that there is a conflict of interest between the doctors here in Philadelphia and the department of health in Pennsylvania. Their testimony shows that even those who are supposed to be experts show conflict in testimony.

Let the record show that I state that as far as I am concerned the State of Pennsylvania Health Department bungled the whole job, mainly Dr. Bachman, secretary of the department of health.

As we went on we found out that others had suffered kidney ailments and kidney diseases plus the fact that one of our Legionnaires' wives died, Mrs. Charles Tucker. He had an awful time getting a death certificate. They would not put on the death certificate what she had died from. They put, "Viral Pneumonia; cause unknown."

Another individual (John Simone) went to the hospital. They diagnosed it as Legionnaires' disease and sent his hospital report when he came out as, "Legionnaires' disease."

Mr. MURPHY. Why would they put "Viral Pneumonia"?

Mr. CAMMAROTA. I guess that is the only thing they came up with at the time, or perhaps too much Dr. Bachman's insisting in looking for viral germs with his press releases.

Mr. MURPHY. But the doctor signed it?

Mr. CAMMAROTA. That is what was signed.

Mr. MURPHY. Was it viral pneumonia or was it pneumonia?

Mr. CAMMAROTA. I could not answer that. All I am trying to do is provide information and give it before the board here, to make certain it becomes a matter of record. I do think, Congressman Murphy, you should be commended that you yourself took this thing on. I am a little bit disappointed that our own professional people, our elected officials in Pennsylvania did not seem to take this thing on and have just disregarded 29 lives.

Mr. MURPHY. They have all contacted me, all of the Representatives and Senators from the State have contacted me.

Just for the record, when I announced the hearings our Committee on Interstate and Foreign Commerce has the responsibility for public health and, of course, consumer health and toxic substances come before this particular committee to coordinate, directly, with the Public Health Subcommittee.

All members were definitely in contact with me: Congressman Green, Congressman Eilberg. Of course, Congressman Nix was here at the very outset when we said we would try to come to Philadelphia to make a determination.

Mr. CAMMAROTA. I became a little bit disturbed, Mr. Chairman, at the fact that the hearings were postponed and you read the paper where three of your elected officials from Pennsylvania urged the postponement of the hearings. I guess it was pressure from Governor Shapp.

The Governor, who did not even get involved had checked himself. His main concern was the effect it had on the Bellevue Hotel. I think if we had had a truckers' strike he would have applied himself to finding out why the truckers would not let the cargo through.

Here we are talking about 29 human lives. Some 180 people were made ill. It just seems the investigation turned into a three-ring circus where they are more concerned about saving the Bellevue Stratford, "The Grand Old Lady," than they are finding out about what happened to the people here. I detested the phrase that the Legionnaires' illness claimed its 30th victim.

Personally, myself I think they should had padlocked the hotel immediately, gone in there and done some research, with experts, the whole bit, and found out exactly what happened there. If it did happen there then I think they should have explained it and acknowledged that something was wrong.

I am certain that if Campbells Soup had a bad batch of soup they would not have condemned the Campbell Soup Co., they would have recalled the batch of bad soup and still stayed in business.

It is not ironic that the hotel is being closed up and is for sale prior to the hearings here at this subcommittee—the question is, are we valuing the almighty dollar more than we are valuing the human lives?

For instance, when it was said that the veterans had brought in bad booze by Thatcher Longstreth, president of the Chamber of Commerce, I can assure you, being a marine overseas we certainly used natural ingredients to make good booze; certainly not the ingredients found in today's booze the State stores sell today. We are certainly not going to bring in anything that kills ourselves.

Then, when Bellinger, a former newspaper reporter from The Bulletin, who sat at the Bellevue Stratford eating with the judges, to promote the hotel, said that the Legionnaires brought the disease in with them and brought it out with them again—I phoned Mr. Bellinger asking him to retract the statement. He said he would, that we have to live with these things.

I can assure you that when we would come in contact with people or you are self-employed or if you are employed with other people, they sort of shy away from you and ask do you have that legionnaires' disease?

This creates a little bit of a hardship as far as we are concerned. Even at my own mother's viewing my cousin stayed away from me. Jokingly, I presume for fear of catching something from me. The question is, where do we go from here?

There was such a conglomeration of reports. Even the better experts cannot get together. Dr. Bachman's continuous news releases did not help the situation.

Mr. MURPHY. That is the reason we are here, Mr. Cammarota, to bring together this whole situation and the very varied and many-faceted areas that have been investigated, that have been studied and those that have not and should not have; to try and make a determination as to what the cause was.

If we cannot do that, to, certainly have a mechanism to insure that it does not happen again and that the Federal Government and the State—of course, Pennsylvania was the site of this particular incident. It could be New York next. We want to have a mechanism ready to react.

Mr. CAMMAROTA. For the record, Mr. Chairman, when they talk about out-of-State victims, one of my friends who was at the convention was on his way to Disney World after the convention.

He was on his way down South when he became ill. It was either in North Carolina or South Carolina where he entered the hospital. Everyone who could be contacted was contacted but he did die on his way to Disney World. It just occurred. He died in a place outside of the State.

Mr. Chairman, I certainly do want to congratulate you. We need further hearings on this. I am hoping it is not just a "duty" hearing and will fade away. I am hoping it is not a "coverup" for the sake of saving the almighty dollar. We have people who have been made ill. They are still suffering and never recontacted by responsible agencies.

I think the health department should get right back to the individuals who were made ill, to find out how they are coming along and just do not disregard human lives.

Thank you, Mr. Chairman, for allowing me the opportunity to testify.

To think that this country can aid other nations and neglect those who have served. The American Veterans too long have been demoted to the ranks of third-class citizens. Heaven forbid this was a spreading disease, with the experts that handled this crisis we certainly are in trouble.

Please try to refrain from calling this catastrophe Legionnaires' disease as we do not have a disease as such.

Mr. MURPHY. Dr. Harold Runsdorf, assistant professor, Downstate Medical Center, Brooklyn, N. Y.

STATEMENT OF HAROLD NORMAN RUNSDORF, M.D., ASSISTANT PROFESSOR, DOWNSTATE MEDICAL CENTER, BROOKLYN, N. Y.

Dr. RUNSDORF. I am Dr. Runsdorf. I have been a medical doctor for 40 years and an assistant professor down at the Downstate Medical Center for 10 years.

I would first like to say that this is my first attendance at an investigation of this type and I will say that the erudite manner in which you, Senator Schweiker and the other Congressmen, Congressman Nix—I am amazed at your knowledge, ability, and the questions that you asked these people who have overwhelmed me with their profusion of scientific knowledge and, apparently, overlooked some very simple things.

My interest in the Legionnaires' disease arose over the fact that I am across the river in New Jersey in the summer and, usually, every July I go over to Philadelphia with my grandchildren and we could not go this year because of the undiagnosed disease. This started my interest in it.

My first reaction was, don't take the children. We do not know what is going on. My second reaction came when I realized that nobody going home from the Legionnaires convention transmitted the so-called epidemic to anybody in the towns that they had come from.

The beginning of health is to know the disease. The knowledge of Legionnaires' disease which was missing was because of the change of location of the ill who were well enough to take the disease with them away from the original point of contact, the inability of many of the doctors to communicate with each other, and then too late, and the failure by the Pennsylvania Department of Health to receive the information because every medical facility was running on a minimum medical staff over the weekend. This was one of the factors that caused delay.

The convention finished on a Friday. The disease had a delay built into it because it was not a common disease to most physicians.

The original diagnosis of a flu-type malady plus the current media and the press publicity, served simultaneously with swine flu, was sufficient for this idea to come to CDC, being built up into an unknown epidemic as the fear is and was understandable, by the authorities.

Since I was 30 miles from Philadelphia I was far enough away not to be frightened and to be objective. The Legionnaires did not transmit the disease to their relatives or contacts so, in fact, it was not infectious.

It also did not affect anyone instantly. It affected their lungs seriously and, at first, without temperature but, eventually, with temperature. Those who died did so with high final fevers which were usually fatal.

Temperature is usually associated with infection. Know your disease and the answer is usually readily found in the 13th edition of Cecil Loeb's "Textbook of Medicine." It is not a true mystery.

I would like to read a very short summary from the textbook and a photostat which I will submit to you.

There are chemical irritants producing delayed effects primarily on small airways—bronchioles—and lung, oxides of nitrogen and phosgene.

The oxides of nitrogen and phosgene are considered separately because of their unusual but characteristic clinical presentation. The immediate clinical effects may be mild but a severe chemical pulmonary edema, often fatal, may develop after a delay of from several hours to several days.

The physiochemical processes underlying this delay are not fully understood. If the acute event is not immediately fatal, healing by fibrosis may lead to the developing of bronchial lesions for 4 to 8 weeks after initial exposure although often with a fatal result.

Autopsy studies show organization of exudates primarily located in terminal bronchioles. However, presumably because of collateral ventilation which is extensively recognized in clinical manifestations, the immediate effects may include cough, chest irritation, and sputum are often so mild that the victim may even fail to report to the first aid post, as in World War I, only to return within hours to several days later with symptoms and with chest roentgenograms showing acute pulmonary edema which on X-ray resembles pneumonia. By contrast, a mild case of edema, the symptoms may escape attention.

Changes on the chest film may be, at least, equivocal. And that diagnosis depends on the finding of cough rales, sometimes lasting over a short period, only, with a transient hypoxemia—lack of oxygen.

Medical management has been discussed before. Steroid therapy should probably be prolonged from 6 to 8 weeks to cover the period when the acute complication of bronchial lesions could possibly develop.

The complications can be avoided if the steroid therapy is given early enough. This is the reason why I tried to contact Ed Hoak, to no avail.

Large-scale heavy exposure to the oxides of nitrogen have already occurred in epidemics, in the Cleveland Clinic fire in 1929 owing to the burning of stored film, and the Coconut Grove fire in 1943 owing to the burning of nitrogen-containing plastics. Most plastics, many modern plastics no longer contain nitrogen.

However, in most fires involving domestic buildings in which wood is used, circumstances exist in which these fumes are involved and three or four cases, annually, are seen at most city hospitals.

Other circumstances favoring the release of oxides of nitrogen are: Welding in closed spaces, combustion of rocket fuel, and blasting in enclosed areas.

Finally, in rural communities where silos are used for storage, exposure may occur on first entering a silo in which silage was stored. Then, phosgene may be liberated from any chlorinated substances, such as carbon tetrachloride from fire extinguishers, or chloroform in the laboratories.

Since there were no plastics available in this particular instance in the hotel, it occurred to me that they were down to one thing called "phosgene." If it was phosgene, where did it originate from?

We had a delayed action disease. I went in search of knowledge and found that the fluorocarbons are a ready source, and a very possible source of this particular gas. With that in mind, I had my assistants research and find that the trichlorofluoride and the dichlorodifluoride, under heat, could have been converted to phosgenes. They are normal refrigerants.

Subsequently, David H. Slifert and Don E. Hefner contacted me in New York and asked me about my phosgene theory. At the instigation of Ed Hoak, an article appeared in a Philadelphia magazine with my thoughts on the matter. [See p. 182.]

I did not stop there because the one thing that could prove me either right or wrong was the presence of fluoride, which is precipitated by calcium in the blood and in the tissues with low serum calcium immediately and the deposition in teeth and bone, perpetually. My source for that is "Toxicology and Applied Pharmacology," vol. No. 22, 1972, pages 528 to 543.

Therefore, if we could prove a fluoride present we would know that the refrigerant had, in some manner—which I have learned more about since I have been at this meeting than I ever knew—the legionnaires' disease—the phosgene poisoning, for sure, is a good possibility.

I would like to introduce at this point a thought which has not been heard here. I have been present for both days.

The other name for carbonyl is phosgene and nickel plus carbonyl could be nickel carbonyl, if it were around. It could not be present.

Following everything that was printed, since I have no access to the institutions which have already been present, the department of health, I sent letters to Commissioner Polk, to Commissioner Bachman, to Governor Shapp, and to the CDC; to Commissioner Polk I sent one on August 21, figuring that if I knew the answer, they certainly would.

He told me that it had been passed on to the CDC for investigation at the Federal level. There was no more local or State level.

Mr. MURPHY. Dr. Polk told you that in writing?

Dr. RUNSDORF. In writing.

Mr. MURPHY. That letter will be introduced into evidence.

[See p. 197.]

Dr. RUNSDORF. I was still not satisfied. I called the CDC and got where one usually gets in the bureaucracy from people who answer phones. I sat for several days, calling for 1 solid week, and asking that they test for fluoride.

I put it in writing and asked them to test for fluoride. I have a copy of the letter I sent to them. I received, I would suppose, the usual re-

plies to my letter from CDC, that I was anonymous and a patriot and they congratulated me on my interest in the thing; but no answer on the fluoride thing that I had requested.

You almost get to a point where you want to break down, to tell them that every refrigeration man I questioned seemed to know what I did not know or thought I did know, that the fluorocarbons in the presence of heat and water vapor or excessive humidity can be changed by that heat into phosgene.

Irving Sachs had worked with dangerous materials in industrial material. I have a Xerox copy of that for my own use.

It states on page 659, that chlorodifluoromethane (page 639), dichlorodifluoromethane, difluoroethane, another refrigerant and on page 569, trichlorofluoromethane, known in the trade of refrigeration as F-11. All of these exhibit high toxicity and low irritation, colorless, almost odorless gases.

Thus, having established an available toxin which meets the requirement for a chemical irritant producing delayed effects, we have only to find a leak in the air-conditioner for the availability of the heat from the compressor condensers overworked and overheated. It is not my idea alone, but the refrigeration man at the hospital was the one who suggested this.

The electric motors, the sparking of the brushes on the commutators, the failure of the fans could result in another overheated motor.

The heat of burning or lighted cigarettes or cigars and which, in addition, at the convention, as Senator Schweiker suggested, the availability of an incinerator disposal unit in proximity.

Maybe the heat basis was all we needed to have the formation of phosgene from the refrigerant leaks.

Mr. MURPHY. Dr. Fraser testified there was a 300-pound-per-month leak in the freon air-conditioner.

Dr. RUNSDORF. I also, not officially from Dr. Fraser, have it that on July 29, 200 pounds of the F-11 refrigerant was added in the Bellevue Stratford—hearsay evidence, I am sorry.

This is my own method of proving my hypothesis, since I have been unable to get into the closed hotel where I tried to get in, unsuccessfully, last night again; Dr. Bachman, Dr. Polk, and Dr. Fraser of the Center for Disease Control have failed to communicate with me in response to my request for a fluoride test.

I had sent a mailgram to Dr. Polk, and followed it with a letter to test the autopsy material for fluorides, since its presence could only be present in the bones, lungs, and kidneys; if fluoride had been inhaled, it is absorbed into the blood and passed out; the filtration being passed out with urine and in the bile of the liver. Fluorides will still be present in the hair on the head of the Legionnaires present in the ballroom when this calamity took place.

I received an acknowledgment of this from all of these gentlemen but no test for fluoride. I called Dr. Cyril Wecht on the phone and I have a letter from him. He said that he was just about to go to that pathological conference in Atlanta. I asked him to be sure to find out if they had tested for fluoride. He never got back to me.

Dr. Jerrold L. Abraham testified he found traces of tin, zinc, and aluminum, but did not find nickel. My hypothesis is that phosgene coupled with hydrofluoric acid came through the air-conditioning duct linings, whether made of zinc, tin, and aluminum.

I feel that if we still test exhumed bodies—and it is never too late to examine the survivors' hair or the deceased—for an excess of fluoride, we may have an answer to the Legionnaires' disease.

Mr. MURPHY. With your statement you have several diagrams.

Dr. RUNSDORF. I forgot one thing which I had, through Ed Hoak, again. I had asked Ed Hoak for an air-conditioning diagram of the Bellevue Stratford Hotel. He sent this to me.

I then asked him for a list of those who died which is still coming, I think. I said, "Did they take a picture?" They probably do this at most conventions. The ones I have attended they usually have a man standing up on a platform, photographing people present at the convention—one of the things to remember.

He said, "No, the man who was going to take it, I believe, had been taken ill." I asked him if there was any arrangement of the delegates at the convention and I superimposed the position of the men from the posts that these men came from onto the diagram of the Bellevue Stratford. I have some to submit to you because this again, tells you something about the air-conditioning in the Bellevue Stratford.¹

If we had a leak, such as Dr. Fraser said, and it was converted to phosgene and hydrofluoric acid, and it did pick up in the ducts the zinc and the tin and the aluminum, I think we have a case.

If we do exhume some of the people, I feel that in the bones, in the teeth, and in the hair of those who died, there is still enough fluoride to be tested to prove that the fluorocarbons, in some manner unknown, broke down that night from overheated conditions sufficient to kill 29 persons.

Mr. MURPHY. What about the tissues that are presently in laboratories in California and around?

Dr. RUNSDORF. I have asked them. What more can I do? I am just a citizen.

Mr. MURPHY. I just asked Dr. Chen if the halogens were included in his scans. He said, "Certainly; because halogens fall between sodium and heavy metals.

Dr. RUNSDORF. It will precipitate with calcium.

Mr. MURPHY. Would they have washed out when they had washed the tissues in nitric acid and other things—would that have gotten rid of fluorine? Did Agent Gafney contact you about an investigation?

Dr. RUNSDORF. Yes, sir.

Mr. MURPHY. Would you please tell us what he said?

Dr. RUNSDORF. He made a tape of my entire summary.

Mr. MURPHY. Who did he represent?

Dr. RUNSDORF. The city of Philadelphia, as far as I know. I do not know why he came—Dr. Goldblatt's son——

Mr. MURPHY. Did he ask you if you were willing to come to Philadelphia at the grand jury?

Dr. RUNSDORF. Yes.

Mr. MURPHY. And you responded?

Dr. RUNSDORF. That I would. I was not contacted.

Mr. MURPHY. Have you been called?

Dr. RUNSDORF. No; I called your office in Staten Island and in Washington at my own instigation. I thought that my test for fluoride should be attempted if we ever hoped to find out.

¹The diagrams submitted were not suitable for reproduction and may be found in the subcommittee files.

Mr. MURPHY. But after Agent Gafney had spoken with you, did anyone from Philadelphia ask you to come out?

Dr. RUNSDORF. No, sir.

Mr. MURPHY. That was the last contact?

Dr. RUNSDORF. That was the only contact. That is all.

I suppose he only came up because, from the district attorney's office in Philadelphia, Dr. Goldblatt's son is the assistant district attorney and with Gafney they both came.

Mr. MURPHY. Thank you, Dr. Runsdorf. We appreciate your testimony.

Dr. RUNSDORF. I am very thrilled at the questions that you and Senator Schweiker asked.

I do have something that I would like to introduce in evidence. It is from the office of Dr. Bachman, commissioner of health.

It is the summary of what he sent to whomever receives these things, the bulletin from his office given to me by one of my colleagues. How we got it I do not have any idea but there it is.

It is a summary of his knowledge of the Legionnaires' disease on the inside.

Mr. MURPHY. This will be entered right after your testimony, Dr. Runsdorf.

Mr. MURPHY. We wanted that Mailgram that you had sent too. We would like a copy of that.

Dr. RUNSDORF. I have a copy of that.

[The documents referred to follow:]

[From Philadelphia magazine, October 1976]

THE PHOSGENE PROPOSITION

(By David H. Shlifer, Dawn E. Heefner and Art Spikol)

Nobody will listen, but the solution to the Legionnaires' Disease may be as simple as $\text{CCl}_2\text{F} + \text{H}_2\text{O} + \Delta \rightarrow \text{COCl}_2 + \text{HF} + \text{HCl}$.

It was not the first tip we had received, but it was the first real tip. The caller said he knew what caused "Legionnaires' Disease."

His name was Lorne F. Cook, and he is a consulting chemist from Wilmington, Delaware. His laboratory, he said, is in Kaolin, Pennsylvania, a place we'd never heard of. He is an independent consultant in chemistry and hydrometallurgy with 27 years of professional experience. President of one corporation and owner-manager of two others. Cook is an industrial troubleshooter. The last page of his seven-page résumé lists six court cases in which his professional opinion was the deciding factor in determining judgment.

Cook said his uncle had died of what they're now calling Legionnaires' Disease.

His uncle died in January 1916.

The newspapers called it the Legionnaires' Disease because it—whatever it was—seemed to be striking down, discriminately, members of the American Legion. One by one, during the summer of 1976, the reports rolled in until the death toll reached 29. Another 150 were hospitalized. While not all of those stricken were Legionnaires, one fact did emerge: virtually all of them seemed to have been in the Bellevue Stratford hotel during the State American Legion Convention from July 21st to 24th.

The grand old hotel felt the impact almost immediately. Conventions scheduled to take place at the Bellevue through the rest of the summer and beyond were moved out of town. The Miami tourist bureau reported that they had gotten no fewer than seven major groups which decided to switch from Philadelphia. Despite stringent measures designed to quash rumors that were erupting constantly in the local and national press, the Bellevue's occupancy continued to fall off.

The newspapers were criticized for "negative reporting" which, the critics felt, was not helping the situation any. It may be that the newspapers did not know how to report the deaths and hospitalizations of over 175 Legionnaires in a positive manner. Or it may be that the city, suffering badly under what amounts to a national visitors' boycott, would have preferred to see the good aspects emphasized—the once-in-a-lifetime angle, the fact that there was no contagion.

Public relations people were called in in an effort to counter the defections; local civil leaders, businesspeople and shoppers wore "I Love the Bellevue" buttons. Bellevue employees paraded in front of the deserted hotel carrying sandwich boards which read, "We . . . and all employees of the Bellevue Stratford are 'fit as a fiddle.'" Thatcher Longstreth, president of the Chamber of Commerce, wrote a long editorial in support of the Bellevue. Governor Milton Shapp slept there following the outbreak. The Mummies came, strutted and went.

It may seem that a great deal of effort was spent on resurrecting the faltering Philadelphia landmark. And that is because many believe that Philadelphia's fortunes—in terms of business and tourism—are directly linked to those of the Bellevue Stratford. The hotel this summer had an 85 percent occupancy rate before Legionnaires' Disease struck, and most of the people who stay at the Bellevue have a sizable effect on business in nearby department stores, shops, restaurants and theaters.

One prominent restaurateur, owner of a widely known center city restaurant, told Philadelphia Magazine that "up until this thing happened, we were far ahead of our figures for last year. Now we're running 20 percent below. Look at this place," said said, pointing out several empty seats during what is normally the restaurant's prime time, "we're never like this."

The public relations didn't seem to be working. Knight-Ridder Newspapers Inc., for instance, the parent organization of the Inquirer and Daily News, had scheduled a board of directors meeting at the Bellevue. They changed their minds early in August and decided, instead, to hold the meeting at the Inquirer Building. They went back to the Bellevue only after being intensely criticized—one might say hysterically threatened—by Governor Shapp, who said, in part, in a telegram to Knight-Ridder executives, ". . . your action in cancelling these arrangements at the Bellevue Stratford is disgraceful. Perhaps some businesses in Philadelphia may respond by cancelling advertising in your newspapers to show their displeasure. If I were an advertiser . . . this is the action I would take."

The Bellevue, as we went to press, reportedly had an occupancy of about 10 to 20 percent.

There are many in Philadelphia who not only believe that Legionnaires' Disease cannot strike again, but would like to forget that it ever happened at all. As days turn into weeks, the cause has become less and less important; they now concentrate on the cure. And the cure, it seems, is public relations.

Nobody yet knows what caused the deaths and illnesses. That is the one most overwhelming fact that has come out of all the studies. Despite that, the Bellevue and most of the supporters say there is no longer any reason for alarm. Eugene Hosmer, president of the Philadelphia Convention and Visitors Bureau, who attended a September 10th meeting in the Bellevue Stratford, told the 35 hotel representatives and the press who had gathered there that the illness is over, and that it was an isolated incident. There were, after all, 500 employees at the Bellevue and none but a bartender was stricken, with the cause of his death still being disputed.

Hosmer may well be right. The illness may be over, and no one can deny that it was an isolated incident. However, without knowing what caused it, it is difficult for potential visitors to feel secure that it will never happen again.

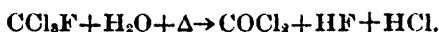
Lorne Cook's uncle died of phosgene gas poisoning while fighting in France during World War I. Several of his uncle's friends had been stricken by it and survived. The Imperial German Army used phosgene against Allied forces on an irregular basis. If it was not used more frequently, it is because phosgene is subject to the vagaries of the weather; a sudden change in wind direction could send the toxic substance back into the faces and lungs of its employer. To combat this wind problem, the Germans usually delivered it in shells—and, used properly, phosgene gas was devastating.

Lorne Cook's theory—and it is only a theory—is based, in part, on the fact that the symptoms displayed by the victims of Legionnaires' Disease were

strikingly similar to the symptoms of phosgene gas poisoning. Further, Cook said, phosgene gas can be a derivative of a refrigerant sold commercially for use in air-conditioning systems. The refrigerant is a fluorocarbon, marketed under various trade names by six different producers in the United States—Du Pont, Allied Chemical, Union Carbide, Kaiser Industries, Raycon and Pennwalt. Three types of fluorocarbon are used in air-conditioning systems, and these are referred to, by those whose day-to-day occupations bring them in constant contact with the substances, as F-11, F-12 or F-22.

The largest of the fluorocarbon manufacturers is E. I. du Pont de Nemours, Inc., headquartered in Wilmington, which reportedly makes about half the total air-conditioning fluorocarbons used in this country. Du Pont calls its product Freon, and it is a trade name—but it is how most people not intimately involved with fluorocarbon seem to refer to refrigerant gas. Du Pont is, of course, fighting to keep the name "Freon" from becoming generic through public misuse, and for good reason: once upon a time they created a material called nylon, a name they eventually lost because it drifted into common usage to describe all products made from the formula.

To know exactly how a seemingly harmless refrigerant can turn into phosgene gas, one must first understand the following equation:



(fluorocarbon + water + heat yields phosgene gas + gaseous hydrogen fluoride + gaseous hydrogen chloride).

In English, this means that the particular fluorocarbon refrigerant described above, in the presence of water and heat, decomposes into hydrogen fluoride, hydrogen chloride and phosgene gas— COCl_2 .

Cook's theory was that this could have happened at the Bellevue: a leak in the air-conditioning system allowed some of the gas to be circulated, somehow, in the ballroom where the Legionnaires held their meetings, in which case a high temperature would have been required to break down the fluorocarbon into phosgene gas.

The tip of a lighted cigar of cigarette, at 1,200°F, Cook says, would have been enough.

Cook was not familiar with the Bellevue's air-conditioning system, but he thought he knew the symptoms and appearance of phosgene gas poisoning well enough. Somewhere, he felt, there had to be a fluorocarbon leak. Maybe it was on the roof, where, he speculated, the Bellevue might well hold its fluorocarbon. With fluorocarbon three times as heavy as air, it might have been able to find its way down to the level of the ballroom. Phosgene's weight was another factor which made it an ideal wartime gas: It would seek out the lowest levels, like trenches.

Fluorocarbon must be subjected to high temperatures to yield phosgene gas. Assuming that it could be broken down by a cigarette or cigar, and assuming that it could enter the body as a combination of the chemical compounds yielded, the body would receive, in addition to phosgene gas, hydrogen chloride and hydrogen fluoride in their gaseous states. The COCl_2 would then combine with the moisture in the body (H_2O) to yield CO_2 (carbon dioxide) and HCl (hydrochloric acid). The acid, including the hydrofluoric acid (which forms when HF is mixed with water), would attack the tissue of the lungs.

While Cook was formulating his theory, which raised more questions than it answered, some of the nation's foremost experts in toxicology and epidemiology were winding down their investigation into the Legionnaire deaths and illnesses. Initially, the scientists suspected that a virus might have been the cause; later, they shifted their focus to a chemical toxin. Eventually the investigation was being conducted, primarily, in two places—the U.S. Center of Disease Control in Atlanta, and the laboratory of Dr. F. William Sunderman of the University of Connecticut Medical School. The CDC was pursuing the cause, supposedly, without preconceptions, while Sunderman, one of the country's leading authorities on nickel poisoning, was looking specifically for something that would indicate that the deaths and illnesses had been caused by nickel carbonyl, a toxic industrial substance which could have caused symptoms similar to those experienced by the Legionnaires.

What the public didn't know at the time, however, was that the nickel carbonyl theory was not even seriously considered by Sunderman; he was merely asked to test for it by the Pennsylvania Department of Health. Sunderman had been contracted to look specifically for nickel carbonyl, nothing more—which is,

Sunderman told Philadelphia Magazine, "why we restricted our examination. We felt from the beginning that nickel carbonyl was not a likely cause of this illness."

Regardless of whether it was or not, Sunderman's tests have, at this time, turned out to be "inconclusive" because of inadequate tissue submissions ("in some cases, less than one gram"), too small a sampling (tissues from a total of only seven victims), and contamination through both a disregard for instructions, and "spiking."

In what can be described either as negligence or incompetence, the office of Philadelphia Medical Examiner Dr. Marvin Aronson on three separate occasions sent Sunderman samples so heavy in nickel content that it was obvious that they had been contaminated through contact with stainless steel instruments or containers. (Stainless steel contains as much as 26 percent nickel, and while it would seem that merely touching a tissue sample would not be adequate to contaminate it, nickel carbonyl poisoning leaves very small traces of nickel, about 1.6 parts per million.) Further, after special guidelines were issued to Aronson's office advising the use of glass and plastic equipment, personnel there apparently continued to use stainless steel. Sunderman feels that some of the tissue was intentionally spiked to test the validity of the results, a common practice. The balance was simply handled improperly.

Aronson has refused to talk to the press, so it is impossible to find out exactly what happened.

In mid-September the search for the probable cause of Legionnaires' Disease was for practical purposes, over. The cause was listed as unknown. Perhaps unknowable. But a number of scientists who have examined the facts are not yet ready to throw in the towel.

The phosgene theory, while considered briefly, was thrown out early in the game. Dr. Leonard H. Bachman, a Philadelphia anesthesiologist now serving as Pennsylvania's secretary of health, who handled the initial search for the mysterious killer, is just as baffled as any of the public officials who worked on the case. He says that "as long as we don't have the answer we can't 100 percent rule out anything." But "phosgene," the theory proposed by chemist Lorne Cook, "just wouldn't cause this picture."

One reason that Bachman was convinced that phosgene was not the culprit was, he said, that "phosgene is a highly irritating gas and it has an immediate effect. These people didn't get sick for three or four days. It would not have been a delayed reaction . . . it causes immediate irritating effects."

The medical literature seems to contradict him in some respects.

The following description of the effects of phosgene gas on humans appears in *Dangerous Properties of Industrial Materials*, third edition, authored by N. Irving Sax and published in 1963 by the Reinhold Book Corporation:

"There is very little irritant effect upon the respiratory tract, and the warning properties are therefore very slight. There may be no immediate warning that dangerous concentrations of the gas are being breathed. After a latent period of 2 to 24 hours, the patient complains of burning in the throat and chest, shortness of breath and increasing dyspnea [difficulty in breathing] . . . Where exposure has been severe, development of pulmonary edema may be so rapid that the patient dies within 36 hours after exposure. In cases where the exposure has been less, pneumonia may develop several days after the occurrence of the accident."

The mild initial effects of phosgene, in short, could very well have been overlooked by conventioners, socializing in smoke-filled rooms. And a low-concentration exposure to phosgene gas can, in essence, produce exactly the same symptoms, along with the characteristic delayed onset, as did Legionnaires' Disease.

Whether Bachman's conclusions were medically informed or not, phosgene could not have been the culprit at the Bellevue unless there was an air-conditioner leak and, according to one federal investigator, there wasn't. On September 1st, Dr. David Fraser, chief of the Special Pathogens Branch, Bacterial Diseases Division, Bureau of Epidemiology at the Center for Disease Control (CDC) in Atlanta and director of the team that spent three weeks in Philadelphia looking for clues, told Philadelphia Magazine that the fluorocarbon would have to "get out into the air to make phosgene, and there's no record of any [fluorocarbon] leaks in the hotel." Fraser also cited the "acute symptoms . . . you know when you've been exposed. There's coughing and tearing . . . immediately."

It's been suggested that maybe if it were a low dose, one wouldn't have that effect. But that, to my knowledge, has not been seen with phosgene exposure."

Fraser also pointed out that the results of the CDC's investigation of the Bellevue Stratford's air-conditioning system showed nothing unusual in the couple of weeks before, during or after the American Legion convention—a statement based on CDC's check of the system, about two weeks after the convention.

July and August are usually quiet, lazy months in Everittstown, a small, out-of-the-way farm village in Hunterdon County, New Jersey, some 20 miles north of Trenton. It's the kind of place where an attorney can go to forget clients and a doctor can go to forget the woes of patients. Dr. H. Norman Runsdorf, a 67-year-old surgeon at the Kings County Hospital in Brooklyn, owns a home in Everittstown and in July he took off to vacation there with his wife.

Runsdorf, who—with white hair, horn-rimmed glasses and a pipe in hand, looks stereotypically like a benevolent, kindly family doctor—has been practicing medicine since 1932. Before that, he spent a year studying engineering. As a result of these two disciplines, much of his time away from his office is spent developing new products. Some of these inventions have been surgical tools for use in hospital work. One, he remembers, was an almost-patented engine.

What made it unique was his suggested use of fluorocarbon as a fuel instead of gasoline. Unfortunately, it never got off the drawing board—a farmer in the Midwest had already acquired a patent on the idea—but it is unlikely that it would have worked out anyway. A chemist friend of Runsdorf warned him about his proposed fuel. It could not be heated, he said, without resulting in the formation of a deadly gas.

Runsdorf is now, in current terminology, a senior citizen. He remembers the reports from the battlefields of World War I. He, like Cook, read about the Legionnaires' Disease, and he put two and two together. Independently, he came up with exactly the same theory.

The surgeon from Brooklyn called the CDC in Atlanta, but these are the days of the bureaucratic shuffle, and he got it. For days he kept trying to get through, to talk to someone. He was transferred, retransferred, put in hold, told to wait, asked to call back, and even disconnected. Everybody, it seemed, "had just stepped out."

With the words of his old chemist friend about the danger of heated fluorocarbon now ringing in his ears, Runsdorf drafted a lengthy letter to the CDC and to Dr. Lewis Polk, Philadelphia's acting health commissioner. He also discussed the theory with his associates, dragging out book after book to support his proposition. As his vacation waned, his obsession grew.

But weeks later, all he had received in reply was a form letter from Polk's Philadelphia office, which promised to consider the theory.

Runsdorf turned to the media. He called broadcast journalist Geraldo Rivera at ABC in New York, but never got past the secretary. The same thing happened with ABC's science correspondent Jules Bergman. Through a patient, Runsdorf struck up a connection with the New York Daily News, an aggressive tabloid which he believed would give the theory some exposure—but he was shocked to hear that the paper would not touch it "unless it comes from Atlanta." The Philadelphia Inquirer told him the same thing. Eventually Runsdorf called The New York Times.

But after about two hours of patient explanation, Runsdorf felt that he was talking to a scientific illiterate, and the Times was dismissing Runsdorf as just another wild-eyed crackpot in a city brimming with them.

Everybody was waiting for the word from Atlanta. And Atlanta was not considering phosgene.

Back at Philadelphia Magazine, however, prompted by Lorne Cook's call, phosgene was getting a close look. Although Dr. John Schmitz, director of Physical and Life Sciences at The Franklin Institute, wasn't personally involved in the disease investigation, he was familiar with some of the theories circulating among his fellow scientists. He did not, in his personal opinion, consider that the phosgene proposition was necessarily science fiction.

"We've speculated on it ourselves," he said. "Any one of the refrigerants—F-11, 12 or 22—can decompose with the help of high temperatures into a series of compounds which are extremely hazardous. If there were a lot of people smoking, you could develop a toxic level of these materials."

Schmitz also remembered that Du Pont, the originator of Teflon, suffered some bad publicity years ago during a national scare linking Teflon with phosgene. Most of the stories turned out to be unfounded, but one danger did exist. It was described in the June 1962 issue of Philadelphia Magazine:

"As it usually does when it launches new products, Du Pont circularized its regular fact sheets about the physical properties of Teflon, including its toxicity.

One interesting, but not unusual, fact was that at high temperatures (over 700° Fahrenheit) the fluorocarbon resin gave off a small amount of fumes which could cause temporary influenza-like symptoms. In most cases it occurred when Teflon dust contaminated tobacco."

The fumes were those of phosgene gas, produced from the fluorocarbon resin, a substance related to the bases found in air conditioning units.

Schmitz also remembered that a friend of his, a consulting chemist, had suggested the possibility of phosgene just a week before in a letter.

Lorne Cook—the chemist, consultant, inventor and engineer—was "absolutely certain" the phosgene gas killed the Legionnaires. A few days earlier he had said as much to a Philadelphia Magazine editor. Now two magazine writers were meeting with him in his laboratory, a one-story white stucco building in the middle of mushroom country, just three miles north of the Pennsylvania-Delaware border. Inside there was little furniture and a lot of books—books with long titles concerning industrial processes, chemicals and reactions which lined shelves on two walls in a small conference room.

With notes scribbled and chemical formulae in hand, Cook related what he believed was much more than a theory: that "the deaths and the illnesses that caused the so-called Legionnaires' Disease were due to leaking of refrigerant out of the air-conditioning system." He drew a scenario where the refrigerant gas in the air-conditioning system somehow escaped from its (presumed) roof-top storage level, floated down through air-conditioning ducts to the Bellevue Stratford ballroom, and flowed out of the ducts onto the Legionnaires who were sitting underneath or very close by. The refrigerant gas, he hypothesized, was then changed into phosgene gas by the cigars and cigarettes of smokers to be inhaled by both smokers and nonsmokers alike. Because of the low concentration level of the phosgene, only those who continuously smoked near a vent, or those who stayed near them, were affected. Hotel employees, constantly on the move, were not affected.

Cook pointed out that the burning end of a cigarette, about 1,200 to 1,400° Fahrenheit, would have been enough to convert fluorocarbon to phosgene. But there was another way it could have happened, he said: "If their cooler wasn't operating.

"Remember, you're taking heat out of the room, you're going through a heat exchanger and then it's going through a cooler. If that cooling water is not operating, or you haven't got sufficient water on that to take care of the heat that it's bringing out of that room, then the stuff starts going up in temperature. You could therefore have a hot spot in the compressor reaching 600, 700, 800°." According to Cook's lab experience, those temperatures would be sufficient to change any leaking fluorocarbon to phosgene.

In this scenario, then, phosgene gas itself would have entered the ballroom through the duct system—and the Legionnaires who were sitting closest to the air-conditioning outlets, or in their draft, would have been gassed.

Would those Legionnaires have noticed anything unusual? Phosgene, in quantities sufficient to smell, has an odor not unlike that of musty hay or freshly cut green corn. There has been no report of anyone describing that specific kind of odor. But Sam Morris, of Post 273 in Bloomsburg, complained of an air-conditioning smell, and ten days later, Morris and his buddies—Howard Twining, David Middleton, Sam Lee and Pat Stemmerich would be hospitalized with the pneumonia-like disease, William Baird would be dead.

But one thing remained constant—any theory relating to the conversion of fluorocarbon to phosgene would have required the presence of a leak. If Dr. David Fraser of the CDC's Bureau of Epidemiology in Atlanta said there "was no record of a leak," and if that statement meant that there was no leak, which it certainly seemed to mean—unless it meant that no record was made available to the CDC—the phosgene proposition would have to be ruled out. Which it was, in the minds of most of the investigators.

Others—particularly those who were proponents of the phosgene theory—insisted that all large refrigeration systems, whether hotel air-conditioning systems or packing company cold storage units, leaked occasionally and required almost routine refills with the refrigerant gas.

A definitive answer, perhaps, could be gotten from one of the big six refrigerant manufacturers themselves. Each of the companies maintains its own research and development staff of scientists and engineers who are familiar with the technical properties of their products, and their uses. For example, the Pennwalt Corporation, headquartered in Philadelphia, can provide chemical

formulas, boiling points and uses of its refrigerant gases—but does not talk as readily about air-conditioning leaks. Pennwalt's Howard Simpson, director of corporate communications, said "We're not air-conditioning experts here, we're chemists." If we wanted to talk to the authority on the subject, Simpson said, we should contact the Air Refrigeration Institute in Arlington, Virginia.

But Institute spokesman Walter Geyson, when queried about refrigerant gas loss and the necessity for frequent maintenance for large systems such as that of the Bellevue, answered, "I haven't the faintest idea, and I don't think anybody here knows that."

It seemed we had an informational blackout, a theory with no place to go, experts who could give no expert advice, and a lot of missing pieces.

On September 2nd we made a routine phone call to State American Legion Adjutant Edward Hoak to discuss the questionnaires sent out to the posts by the Pennsylvania Department of Health—questionnaires which, six weeks after the outbreak, had apparently not been received by some of the posts. Hoak mentioned, in passing, a Brooklyn, New York, doctor with whom he had spoken. The doctor had been frantic. He had mentioned phosgene. Hoak, an MP during World War II, recalled being trained to identify phosgene, but remembered little else about it. He had, however, made a note to the doctor's name and where to contact him.

Dr. H. Norman Runsdorf, who had just emerged from a surgical procedure, almost cried on the phone—to think that a journalist had finally called him, interested. The month had been hell for the doctor, a time of runarounds, of being ignored by authorities, of being chastised by his family for his obsession with the Legionnaires' Disease. Now that he had someone to listen, Runsdorf opened up:

"There's no question in my mind that the air-conditioner in the Bellevue Stratford had a leak. Where? I have no way of knowing. But that leak was in proximity to the fans and it may have been the gas escaping onto the motor of the fan—because the gas, like carbon tetrachloride, changes to phosgene.

"The process is comparable to the way they make phosgene when they want to make phosgene, which is to heat carbon tetrachloride."

Carbon tetrachloride was once used in fire extinguishers. Not anymore. According to the Philadelphia Fire Marshal's Office, firefighters stopped using carbon tet extinguishers more than 10 years ago. It had been determined that when the chemical was sprayed on an intense, enclosed fire, deadly fumes developed. Phosgene fumes.

"My theory," Runsdorf continued, "is that the phosgene came from two sources: the compressor motor on the roof with the sun baking on it, plus the sparking from the commutator of the fan motor—the arc of that particular temperature is close to 1,000°, and if it's running a short there, or a dull brush, it can keep sparking and form this arc continuously as long as there's a supply of fluorocarbon hitting it. Then the fan's only got to blow it down the ventilator."

Conceivable—although the Bellevue's ventilation system arrangement was still an unknown to him, as was the location of the compressor, which two theories now had on the roof. Runsdorf continued:

"If it came down the vents, the ones directly under it would get the greatest amount of it since phosgene is a heavier-than-air gas." The people who died, Runsdorf theorized, would have been the ones with the vents directly over their heads.

Both Runsdorf and Cook, then, thought that there had to be a leak in the air-conditioning—a leak that CDC had not found. While the theory of the doctor and the theory of the chemist differed in how the fluorocarbon was sufficiently heated to turn into phosgene—Cook leaning toward the burning cigarette theory and Runsdorf toward the overheating or faulty machine—the point was moot unless the fluorocarbon was leaking in the first place. And even if a leak could be found, there was still the statements of two medical people associated with the investigation, both Dr. Bachman at the State Department of Health and Dr. Fraser at CDC, who claimed the symptoms of Legionnaires' Disease and those of phosgene poisoning didn't match.

When Runsdorf heard that, he was astonished. He even offered to come to Philadelphia to prove otherwise. And he insisted that it was a matter of life and death: according to his theory, the Legionnaires who were hospitalized and had recovered—and possibly even those who hadn't fallen ill at all—were in danger.

"The disease itself," Runsdorf said, "is the result of parenchymal lung necrosis [destruction of the tissue in the lung], and this is what's frightening me. Accord-

ing to my textbook, if steroids are not continued for eight weeks following the illness, the victims can get a relapse from the condition that develops due to fibrosis, or the scarring, following the necrosis from the phosgene in the lungs. They could die secondarily."

No wonder Runsdorf had been frantic. He had spent the month in a race against the clock, trying to talk to somebody—anybody—in what he thought was an effort that might save lives. If Runsdorf was right, the phosgene poisoning could have caused damage to lung tissue in all who were exposed to it.

"I gave this information to the commissioner of health of Philadelphia. He said thank you very much for your information, but it is being worked on on federal, state and local levels. We thank you for your interest. A form letter, that's all I got.

"I haven't heard from the CDC or Bachman. He's on vacation, they tell me. I called him by phone. The amount of money I spent on phone calls! He never returned my call. Nobody returned my calls."

On September 3rd, Philadelphia Magazine went to see Dr. H. Norman Runsdorf. He had said he could prove that Legionnaires' Disease symptoms matched those of phosgene gas poisoning, and he would finally get someone to listen.

The meeting took place in the office of Runsdorf's brother, Herbert, an attorney in midtown Manhattan, and Runsdorf was prepared for it. He held in front of him his copy of the Emergency War Surgery Handbook, published by NATO at the height of the cold war. He found the part concerning phosgene, and he read, paraphrasing:

"Moderate to severe contamination is manifested by headache, cough, sensation of tightness in the chest, nausea, bradycardia, followed by rapid pulse, and the initial manifestations may be followed—" and Runsdorf emphasized this—"by a symptom-free period lasting from 2 to 20 hours.

"The contamination is manifested by edema of the pulmonary tissues, audible rales, rhonci, hemoconcentration and anoxia, which is the lack of oxygen, followed by weak heart action, shock-like state, high temperature due to the chemical affecting lung tissue and killing the lung tissue."

To further clarify the high fever, which was one of the primary characteristics of the Legionnaires' Disease, Runsdorf added:

"After the tissues are destroyed, the body starts absorbing foreign dead material—it always does—and you get a temperature reaction from that."

Runsdorf was not giving us opinion now. He was quoting from his medical texts. He picked up one called Textbook of Medicine, by Cecil and Loeb, dated 1971.

"This is an older edition. I didn't find what I was looking for in my newest edition in the hospital library, so I went home and dug this one out of the cellar." He turned to page 920, "Chemical Irritants." Runsdorf read again; pointing at each word:

"Chemical Irritants Producing Delayed Effects Primarily on Small Airways and Lung Parenchyma . . . oxides of nitrogen and phosgene are considered separately because of their unusual but characteristic clinical presentation. The immediate clinical effects may be mild, but a severe, chemical pulmonary edema, often fatal, may develop after a *delay of several hours to several days.*" (The italics appear in the text.)

Pulmonary edema, or fluid in the lungs, was evident in all of the Legionnaires' Disease victims. And many of them had been stricken ill after they left Philadelphia . . . a delay of up to several days.

"If the acute event is not immediately fatal." Runsdorf went on, "healing by fibrosis may lead to the development of bronchiolitis fibrosa obliterans, usually four to eight weeks after initial exposure, often with a fatal result.

From a paragraph subtitled "Clinical Manifestations," he then read:

"Immediate effects of exposure, which may include cough, chest irritation, and sputum, are often so mild that the victim may even fail to report to the first-aid post, only to return from hours to several days later with the symptoms, signs and chest roentgenogram, of acute, severe, pulmonary edema. By contrast, in the mild case of edema, symptoms may escape attention. . . .

"Steroid therapy should probably be prolonged for six to eight weeks."

Why didn't everybody at the convention become ill? And why weren't the Bellevue employees affected?

"It depended on where you were sitting in relation to those goddamned things," Runsdorf said, pointing to the air-conditioning ducts on the ceiling in his brother's office. "Phosgene, being heavier than air, comes straight down on the

Legionnaire's sitting underneath. You had to breathe it almost continuously to get sick."

The Bellevue's waiters and waitresses, chambermaids and bellhops were, according to this theory, spared because they spent little time standing still. Aside from the heat source, Runsdorf was saying exactly the same thing Cook had said.

There is a further interesting aside to all this: As we saw earlier, Dr. William Sunderman, in Connecticut, was complaining that the lung tissue samples submitted to him for chemical analysis were too heavy in nickel concentration. Runsdorf maintains that the high nickel levels were caused by hydrofluoric acid in the tissue samples which attacked the stainless steel containers that stored them. "The only thing that will attack stainless steel is something like hydrofluoric acid," Runsdorf said. "It will unite with any metal."

According to Cook's equation, hydrogen fluoride—HF—is one of the compounds created by applying heat in the presence of moisture, to fluorocarbon.

Dr. Runsdorf had already written the toxicologists working for the State of Pennsylvania and at CDC to tell them that. He advised them to use plastic containers. They disregarded his mailgram and his letter. And they failed to deliver viable tissue samples to Sunderman.

The phosgene proposition could have been checked easily if only Runsdorf could have gotten somebody to listen to him. Two methods of testing would have involved a color change in the tissue when either bichloride of mercury or the alizarine complex was added to the tissue. Another method, using magnetic resins, would have proved the presence of fluorides by their weight.

Dr. Runsdorf thinks, perhaps with some justification, that the whole truth about Legionnaires' Disease is yet to be made public. He calls it a cover-up. He points out that there is fluorocarbon in our cars, our refrigerators, our freezers.

It is a big industry out there.

Now it was time to tell Dr. Leonard Bachman a few things about phosgene gas. Unfortunately, it was also September 3rd, and six weeks had elapsed since the ill-fated convention—and with no progress reported on the cause of the disease. Bachman was, his secretary said, on vacation.

She referred the call to Dr. William Parkin, chief state epidemiologist, who listened as we explained why phosgene gas poisoning was likely, and how the Legionnaires' Symptoms supported the theory, and what Dr. Runsdorf's textbooks said about the gas. Then Parkin told us that the phosgene gas was no longer in the picture. No, the state hadn't made any tests; Atlanta was doing that. And that was good enough for Pennsylvania. If Philadelphia Magazine wanted to dig deeper, Parkin said, the man to contact was Dr. Joseph Boutwell of the Toxicology Unit at CDC.

We called Boutwell. "Have you tested for phosgene?" we asked.

"Yep."

"What tests?"

"Gas chromatography and mass spec." Boutwell said. "The tissue is extracted into a number of different fractions and then subjected to gas chromatography, and then the effluence from the columns of gas chromatography were subjected to mass fragmentology to look for specific compounds; and no differences have been detected between patients and control cases."

But couldn't he, as Dr. Runsdorf suggested, test for hydrofluoric acid, or fluorides, in the victims' tissue samples?

"No. Because there isn't any fluoride in phosgene." Boutwell countered. "And if the compound you're considering is phosgene, the symptoms, the epidemiology, the delayed time just don't fit at all."

But they do fit. First of all, fluorides would be present if phosgene and HF were released from a fluorocarbon. And secondly, the medical books indicate the appropriate symptoms and delayed time experienced by the Legionnaires. Boutwell was read the description of the effects of phosgene word for word, from the Textbook of Medicine.

He didn't believe it.

"There is immediate coughing. If you had phosgene widespread through the air, you'd have a lot of people noticing other people coughing. Phosgene just doesn't fit," he repeated.

Boutwell said, further, that the CDC inspected the refrigerant gas storage tanks in the Bellevue-Stratford's basement and top floor, and there were no indications of any leaks—a necessity even to consider any theory involving phosgene.

As far as Lorne Cook was concerned, gas chromatography was "no way" to determine that phosgene couldn't have been involved.

Lorne Cook was talking about pneumonia, a characteristic development in Legionnaires' Disease.

"All you have to do is start working your way back and ask, what causes pneumonia? If you eliminate pathogens, viruses, bacteria and what-have-you, then you run into chemical toxins. There are two that are noted for this sort of thing—nickel carbonyl and phosgene."

Of the two, both of which were possible. Cook leaned toward phosgene. But if phosgene was the answer, why hadn't this kind of disaster ever taken place before?

"It has happened—and nobody has realized what it is. Look at the Pontiac, Michigan, case. The CDC came to the conclusion that it came through the air-conditioner. Now what the hell comes through an air-conditioner? I mean," Cook asked, "what else can come through an air-conditioner?"

Whatever it was that came in through the air-conditioning system of the Pontiac office of the Oakland County, Michigan, Health Department in July and August 1968, will probably never be known. What is known is that a total of 144 people, including 95 out of 100 employees, became ill with chills, fever up to 103°, headache, generalized aches and chest pain. The disease lasted an average of 3 to 4 days, began an average of 36 hours after exposure to the building, and was not contagious. CDC investigators eventually discovered "a shallow pool of water mixed with dirt and debris" in one of the air-conditioning outflow ducts, according to a CDC report dated July 31st, 1969. But CDC never found anything in that water to cause the strange illness.

Finding evidence of phosgene gas poisoning, however, is fairly simple, says Cook. Although phosgene breaks down once inside the lungs into nontraceable elements, the effects of the other gases produced from refrigerant gas are significant.

"Hydrofluoric acid remains in your system," said Cook. "It will chew you up something fierce. The lungs should be completely white in areas because of the HF burn.

"You have to open everything up and take out the full lung—actually incise the lung in a cross section, and look at it that way. You cannot tell by taking out a small piece of a lung and analyzing it. Wherever HF hits first, that's where it stays."

Cook's point was simply this: that it would be possible to extract a small snip of lung tissue without picking up any trace of HF. He also felt fairly confident that CDC researchers hadn't bothered to make at least two simple tests which could have detected the presence of fluoride—and, because his tests require fresh tissue and would be dependent upon the deaths of more Legionnaires, they might never be made.

One of Cook's tests was the specific ion probe—referred to by Runsdorf previously, although not by name—which he claimed could detect one-tenth part per million of fluoride in the tissue.

"The fluids that came out of the lung should have been checked," Cook added. "A lot of the people had bloody sputum, which indicates that the lungs were breaking down. That's what happens when you get a good case of pneumonia—you start coughing blood. The whole surface of your lungs has been stripped off. HCl [hydrochloric acid] will do it. HF is much better at the job, because it goes right through the tissue."

Cook disagreed, however, that the alizarine complex test proposed by Runsdorf would provide conclusive results through a color reaction.

"It won't test for it in the blood because there are about three or four reactions that will give you the same color. Of course, if you have a pure fluoride solution, a water solution, and if you add this material to it, it will go yellow.

"But the specific ion probe is about 99 percent effective at very low levels. This is standard technique for measuring fluoride ions right now."

Cook said that the CDC should have understood this when it learned of his theory. He explained how he had spend over two hours on the phone with an expert from Du Pont in a conversation arranged by the Wilmington News-Journal. After he'd explained his theory fully, Cook said, the Du Pont representative had promised to forward the phosgene proposition to Atlanta.

One inconsistency in the phosgene theory that neither Cook nor Runsdorf could explain was the lack of the refrigerant gas leak without which phosgene gas poisoning couldn't have taken place. There had been no reports in any of the media concerning the existence of a leak. For that matter, there had also been no denials of a leak. The press had simply never asked.

Another hidden assumption was that the supposed leaking refrigerant gas, which is heavier than air, was stored on the roof or the top floor of the Bellevue. These were things we had to know. If we didn't so far, it wasn't because we hadn't tried.

Philadelphia Magazine called William Chadwick, vice president of the hotel, several times. Each time a call was placed we were informed that Chadwick was either out to lunch, in conference, or unavailable. Our calls were never returned.

We then called Gus Amsterdam, chairman of Bankers Securities Corporation, which—in addition to other large real estate holdings in the city—owns the Bellevue. After informing him that we were investigating a theory about the Legionnaires' Disease and needed some information about the hotel's air-conditioner, Amsterdam promised that Jan Lieben, a doctor from Thomas Jefferson University and a consultant to the Bellevue on the disease, would call us the next morning. (He never did.)

The next step was to find out if anyone from CDC had ever checked the air-conditioning system or was familiar with its layout. After a few more telephone calls to CDC, and a few more minutes of "I'll transfer your call," we reached George Mallison, assistant director of the CDC's Bacterial Disease Division, Bureau of Epidemiology. He had personally examined the Bellevue system. In fact, he said that he had found "many empty F-11 cans" near the system. It was our first clue to the specific fluorocarbon used by the Bellevue. Only later would we become aware that this was a significant finding.

For the moment, however, our few minutes of conversation with Mallison seemingly shattered at least two assumptions necessary for the phosgene proposition as presented by Cook and Runsdorf:

Assumption No. 1: The Bellevue system pumps refrigerant throughout the hotel. False. It's a chilled water system, which pumps cold water to coils placed in front of fans throughout the hotel's ventilation system.

Assumption No. 2: The Bellevue stored refrigerant gas for the system on the roof or top floor. False. Mallison said, "The fluorocarbon never leaves the sub-basement of the hotel unless there is a leak in the system or unless there is a leak in the equipment itself."

Had Mallison seen any evidence of a leak?

Yes.

"There was some evidence that there was a leak in the equipment in the sub-basement, because they were buying fluorocarbon from time to time. And when I asked them why they were buying it, they said it was because there was a leak."

Would there be any way for leaking refrigerant to enter the hotel by coming up from the basement?

"There is a huge fan system in the sub-basement of the Bellevue Stratford Hotel because it's hot down there," replied Mallison. "That's where they have all the big machinery. The fan system blows out all of the air from the sub-basement, which would include any gas that might leak or any other odors or whatever down there. It blows it out high above the roof."

"If there were any leak of any toxic chemicals, or gases, or whatever, in the sub-basement, it would get blown out of the hotel," he concluded.

Since there was a leak, according to Mallison, and since a fan was blowing the refrigerant gas, or whatever, up from the sub-basement, could the fumes enter the hotel in any possible way? That would depend on leaks in the duct system, wouldn't it?

"There's a large shaft that leads to the roof from the sub-basement that takes the fumes away. They are blown out almost exactly at the center of the hotel, on the roof. They are blown straight up," Mallison said. He admitted that it was possible for the fluorocarbon to then fall back on the Bellevue's roof.

"There are four or five air handling units, not on the roof, but in the area underneath the roof. There are five air handling units that are used for the 18th floor of the Bellevue Stratford for the Rose Garden and for the other areas."

Could the leaking fluorocarbon, then, blown up from the basement, possibly re-enter the hotel through the fans near the roof? Or could it leak back into the hotel before it even got to the roof?

Mallison could only speculate. To his knowledge, no one had checked the shaft that leads to the roof. But he also mentioned another way leaking refrigerant gas, or sub-basement fumes, could possibly rise to the Bellevue's second-story level, the same level as the ballroom.

"They have a vent pipe from the fluorocarbon compressor itself, in case something goes wrong with the compressor," Mallison discovered. "That vents out on one side of the building about the second story level."

What was he saying? Was there a possibility, however remote, that a gas from the sub-basement could have gotten into the ballroom? That was the proposition Cook and Runsdorf had arrived at, but they'd never imagined anything like this. Why didn't Mallison tell anyone about this? Or did he? Didn't he know about phosgene?

He didn't say anything for two reasons: he believed there was still "no way" for the fluorocarbon to enter the ballroom, and he said the symptoms of phosgene poisoning, the "irritating effects," simply wouldn't fit the symptoms of the Legionnaires' Disease.

If he were wrong, and if Cook and Runsdorf were right about the symptoms, the chances of phosgene poisoning due to an air-conditioner leak were worth some consideration. In fact, since the leak was confirmed, there was a possibility that the phosgene could have been formed down in the basement by overheating machinery, as Runsdorf had first suggested. Then, phosgene gas itself may have been blown out of the basement—to parts unknown.

In any case, Philadelphia health authorities probably didn't know about the air-conditioner leak so we decided to tell them.

Philadelphia Magazine called Dr. David Soricelli, Philadelphia deputy health commissioner, on September 7th, but Miss Eagelson, who answered the phone, said she had no idea where he was, and that we would have to talk to Joseph Goldberger, his administrative assistant. "Hold on, please," she said.

A few minutes later, she informed us that "Mr. Goldberger said he wouldn't be able to talk to you and then walked out of the office." We left a message that we were checking a theory about the Legionnaires' Disease, and that if there was any chance—and its prediction of relapses—were correct, it could possibly save someone's life. Soricelli never called back.

We then tried Dr. Lewis Polk, Philadelphia acting health commissioner, and got basically the same treatment from his secretary, Mrs. Petroni. We left the same message, and got the same reaction.

We fared no better with Dr. Marvin Aronson's office. Since Aronson, Philadelphia medical examiner, would be part of a special CDC panel to discuss the disease in the weeks ahead, we thought it especially important to talk to him. Same message, same response.

On September 7th, a press conference was held in the Bellevue's ballroom to announce the formation of the "friends of the Bellevue," a committee of city businessmen chaired by John Bunting, also chairman of the board of First Pennsylvania Bank. In order to emphasize that "there is nothing to fear by coming to Philadelphia or by attending events at this great hotel," the committee would sponsor a "black-tie gala" in October. More than 1,000 would receive invitations, including Mayor Frank L. Rizzo, Governor Milton J. Shapp, and various business, community and civic leaders. The United Way, while not sponsoring the event, would receive all proceeds.

At the conference, Bunting said that "there is still a lingering, but unfounded, fear which has gripped many Philadelphians and thousands of potential visitors to our city. We hope the gala will help erase that fear."

There was, understandably, no new information from anyone regarding the outbreak of Legionnaires' Disease after the American Legion Convention.

Except, possibly, from an engineer at the hotel. After the conference, with the help of a representative from Spiro and Associates, the Bellevue's advertising agency, we finally did get a chance to talk with William Chadwick, the Bellevue vice president. With a little persuasion from Nelson Fellman, the Spiro representative, Chadwick invited us into his office and phoned a Bellevue engineer who was familiar with the hotel's air-conditioning system. The call was placed on Chadwick's speaker phone system so that anyone could chime in on the conversation.

The engineer reported that one, 150 pounds of refrigerant was added to the system in the beginning of the season, and two, 300 pounds was added by a serviceman from the Carrier Air Conditioning Corporation sometime after the American Legion convention. He also said that some recent work on the system, by Carrier, had included new bearings for the motors.

This was the first we ever heard of any kind of service performed on the system by the Carrier Corporation. Was it in any way indicative of a leak?

Chadwick, though, had quickly grown annoyed with our specific questions to his engineer, and even ad agency representative Fellman had trouble convincing him that good press relations was something the Bellevue needed now more than ever.

Fellman placed the next call—this time outside of Chadwick's office. It was to Gus Amsterdam again, and he, too, was annoyed.

"You're doing something that's quite uncalled for," Amsterdam shouted. "I'm trying to run a hell of a business here. I can't be pushed around."

By the time we left the hotel, however, we knew that the fluorocarbon used in the Bellevue's air-conditioning system was F-11, as described by the CDC's Mallison. Both Chadwick and his engineer had confirmed it.

The Carrier Corporation in Philadelphia was hard to pin down. Peirce-Phelps, the Philadelphia distributor of Carrier products referred us to the district office, who referred us to a salesman, who referred us to Larry Segal, district service manager. He was asked about the Carrier service call at the Bellevue.

"We did do some work in the Bellevue. I'm not sure what we did. Right at this point, we're reviewing what has been done," said Segal.

When asked why it was being reviewed, Segal said, "At this point, I'd prefer not to discuss it any further." He said it would take a few days to get the information out of his files. At press time, we still had not received it.

Richard Morris, vice president of corporate relations for Carrier in Syracuse, New York, worked a lot faster.

On September 10th, the same day he was contacted, Morris responded by reading a prepared statement:

"On July 8th, 1976 at the request of the Bellevue Stratford Hotel, the Carrier Philadelphia branch office serviced centrifugal chiller 17M61 serial number 2870. The service entailed adjustments and repairs. It was not due to an emergency and was completed satisfactorily."

In a later phone conversation with Morris, on Friday, September 10th, we asked him if any work had been done by Carrier during the month of August. He asked what we specifically wanted to know. We told him that we wanted to know if Carrier had added or removed fluorocarbon from any unit at the Bellevue, or if it had performed any repairs. He wrote our question down, word for word, and told us he would get back to us.

Morris called back on Monday, September 13th. He said: "On August 30th, 1976, Carrier removed 25 pounds of refrigerant F-11 from the chiller. It is our understanding that this was requested of the Bellevue Stratford hotel by the Communicable Disease Control Center."

A centrifugal chiller, mentioned in both of Morris's statements, is another name for a condenser—and, in a system like that of the Bellevue, the fluorocarbon would pass through the condenser.

Carrier did not, incidentally, mention the 300 pounds of refrigerant which the Bellevue engineer said was added to the system after the American Legion Convention.

Now we remembered something else that State American Legion Adjutant Edward Hoak had mentioned when he'd told us about Runsdorf. Many of the Legionnaires had been drinking lots of water, he said, since it was "awfully hot and dry" in the ballroom the afternoon and evening of Friday, July 23rd. Several of them had complained about the rancid taste of that water, Hoak had said. If the phosgene proposition were true, that taste would have come from the combining of the phosgene with water to produce HCl—hydrochloric acid.

We contacted Cook, who agreed. Another thing, Cook pointed out: if there was any kind of leak of fluorocarbon into the water circulated through the Bellevue's cold-water air-conditioning system, it could easily have gone from a gaseous to a liquid state and back again. In fact, since F-11 boils at 74.9°, any time the water in the air-conditioning system grew warmer than that, the leaked fluorocarbon would have become a gas and could have escaped through any leak anywhere in the pipes which circulated the water throughout the system.

If this were true—and there is nothing to say that it is—one would not have had to have been in the ballroom to be stricken.

Things were finally beginning to break. Not long after our initial conversation with Morris, we received a call from Du Pont. They had been told that Philadelphia Magazine was doing a story. They were, they said, not going to try to tell us what to write; however, they were properly concerned for two reasons: one, that they make fluorocarbon, and they wanted to insure that we had the benefit of their input on any story we were about to do involving that substance; and two,

they wanted to be sure that we understood that the name of their particular fluorocarbon, Freon, is not a generic, but a brand name.

Du Pont would, they said, like to cooperate with us and discuss our findings, our theory and our sources. Jim Howell, Du Pont's PR chief, would set up a conference call between a couple of his experts, himself and Philadelphia Magazine.

The company seemed eager to cooperate. One Du Pont representative remarked, in effect, "The one way to guarantee negative press is to stonewall." Another said, "If there is something here, we certainly want to find out about it."

Of course, there can be little doubt that what they wanted was a clean bill of health for their product. But they seemed to recognize that this was no time to be evasive. The case they would present would be contrary to the phosgene proposition. But at least they would present a case.

The initial conference call was the first of several calls to and from Du Pont, and Dr. Henry Trochimowicz, of Du Pont's Haskell Laboratories for Toxicological Research, said, "Citing my own work in this area, it's been very difficult to detect phosgene as a decomposition product. In our particular studies, hydrogen chloride and hydrogen fluoride have been the main decomposition products at . . . temperatures above 1,000°."

Further, he pointed out, if there were significant quantities of fluorocarbons in the air, there would be other symptoms observed.

Du Pont admits that they will not discount the phosgene proposition 100 percent. But they also feel that its likelihood is very, very small. For several reasons, outlined in a written report from Jim Howell as follows:

1. Phosgene is a rare gas which is soluble in water. When one works with it in the lab, one keeps the humidity below 20 percent or the phosgene decomposes to HCl and CO₂. It is very difficult to imagine a summer day in this area of the country when the humidity drops below 50 percent; a crowded ballroom would also be somewhat humid.

2. As you say, phosgene is a decomposition product of R-11¹—so are HCl and HF acids. However, a person would "taste" these acids if he were smoking in an atmosphere with above normal concentrations of them. Also, the HCl and HF are present in much greater concentrations than the phosgene.

3. To reach a significant concentration of fluorocarbon (R-11) in that room where a smoker would taste and be irritated by the acids, or the cigarette could create phosgene in detectable quantities, you would have had to have had a major leak. Such a leak would also cause the air-conditioning system either to shut down or at least cease to cool the room.

4. The symptoms of the Legionnaires' Disease appear to discount your scenario. Chemically induced pneumonitis from the acids . . . would not cause the high fever associated with the Legionnaires' Disease. (Note: the conversion of phosgene to HCl in the body is what causes its effects, not the phosgene itself.)

Howell also sent along a copy of a 1955 report which appeared in the British Journal of Industrial Medicine. It dealt with chlorinated hydrocarbon vapors not fluorocarbon, but Du Pont says that they are essentially alike for our purposes. The report indicates that "Phosgene is not found in the vicinity of the glowing tip of a cigarette smoked in the contaminated atmosphere and even when a trace of phosgene is added to the atmosphere it rapidly decomposes in the presence of the evolved smoke." Du Pont did admit that the report is over 20 years old, and that new systems of measuring might alter the findings. But Du Pont did not feel that there would be any significant change in the findings. Trochimowicz mentioned that "those studies were taken as very conclusive evidence that even if phosgene were formed, it does not get through the cigarettes."

As the final thrust in their argument, Du Pont suggested that we might contact someone else—Dr. Seymour Friess, chairman of the Environment Bioscience Department, Naval Research Institute, in Maryland. They described him as a nationally recognized authority in the field of the effects and production of phosgene gas. They also told us that he had examined the speculative connection of refrigerants to Legionnaires' Disease and that he had abandoned the lead as highly improbable.

Du Pont, with that suggestion, was about to help us fill in some missing pieces.

Dr. Seymour Friess was the researcher who first informed CDC that phosgene could be ruled out. CDC had, in fact, come to him as soon as they received suggestions that phosgene might be the cause.

¹ Du Pont apparently uses R and F interchangeably, since the fluorocarbons were referred to both ways.

"We don't know what the refrigerants were at the Bellevue," Friess told Philadelphia Magazine in a telephone interview on Friday, September 10th. "But if they were F-12 or F-22, the possibility would be almost zero of phosgene poisoning. If one, the other, or both, the chances are virtually zero."

On the other hand:

"If it were F-11, it would be dangerous, because F-11 decomposes 100,000 times more completely than F-12 or F-22 per unit at 1,000° Fahrenheit—the temperature of a burning cigarette. I passed this information on to my medical superiors. Since F-11 hasn't been used for a long time, we didn't discuss it any further."

But something was wrong here. Hadn't Friess considered F-11? The Bellevue uses F-11—the Bellevue itself confirms that.

He hadn't. "The people at Du Pont who make these Freons told me what kind are being sold," Friess said. "They said modern compressors use F-22 alone, and somewhat older ones use a combination of F-22 and F-12." Nobody from Du Pont had volunteered CCl_2F , the chemical formula for F-11, a refrigerant gas with more chlorine than either of the other gases, 12 or 22. "The more chlorine, the better decomposition into phosgene," Friess added.

So Friess finally learned the truth about the Bellevue and the hotel's old air-conditioning system that dates back to the '50s, with some parts, according to Chadwick, dating back to 1904.

"Man-o-rooney!" Friess shouted. "You've got something there, CDC must be informed immediately!"

And then the nationally recognized expert recommended by Du Pont contradicted the Du Pont scientists: he claimed that the phosgene that could be produced by F-11 would react very slowly with water vapor, and that much of it would be breathed by smokers and non-smokers alike.

(You had to feel sorry for Du Pont. If they didn't have enough problems, the National Academy of Sciences issued a report on September 13th confirming that aerosol spray propellants were depleting the ozone layer, the earth's protective shield against the rays of the sun. Some might have missed the connection, but aerosol spray cans are "powered" by fluorocarbons. The Academy's committee also urged that Congress require the labeling of spray cans containing what were described in the Inquirer as "the two most worrisome fluorocarbons . . . F-11 and F-12." Some of these cans presently carry warnings against smoking while in use; some do not. The phosgene proposition was entirely overlooked. And not mentioned was what happens to the ozone layer when air-conditioners leak.)

A few nagging problems remain. How about the victims who claimed they were never in the Bellevue? Were they, and had they forgotten? Or could they have been actual pneumonia cases—people do get pneumonia, don't they? Was there any reason for them not to want to admit to being in the Bellevue?

Further, refrigerant leaks are common. There is a slight leak, in fact, in the sub-basement of 1500 Walnut Street, the building in which Philadelphia Magazine is headquartered, according to workers there. What is important, if a leak exists, is the degree of that leak, what happens to the refrigerant which escapes, what temperatures it encounters, and who is there to be affected by it.

Was the leak, or leaks, at the Bellevue sufficient to cause the Legionnaires' Disease?

No one knows.

And did we get any negative feedback from experts regarding the phosgene proposition for reasons other than the symptomology and the leak? Yes. We asked a local registered professional chemical engineer what he thought of the theory, and he decided to check its probability by starting out with our end result, calculating backwards, and determining what would have been required at the beginning of the scenario to result in the release of enough phosgene gas to cause the deaths and illnesses of the Legionnaires. He concluded that there could not have been a leak of the required magnitude, according to his calculations, to do that. He said that because of the water pressure in the pipes, there would have been no way for the refrigerant F-11 to have leaked into the water of the air-conditioning system. He said that even if the refrigerant had leaked into the water, it would have remained a liquid, since the boiling point of F-11 (which would have been necessarily reached before F-11 would turn to a gas) is 74.0° only at atmospheric pressure, and that the more pressure the water was under, the higher the temperature required to turn the refrigerant into gas. He did not believe that those temperatures could have been reached. He further said

that even assuming a hot spot in the compressor, only a small portion of the leaked refrigerant would have turned into phosgene: "After all, the refrigeration machine was built to be an efficient compressor, not an efficient chemical reactor." Further, he said that even if the leaked fluorocarbon could have gotten into the ballroom (or any other room) only a minute fraction of it would have come into contact with the cigars or cigarettes. He pointed out that when someone is drawing in on a cigar or cigarette, the temperatures are quite sufficient to convert the fluorocarbon into phosgene gas, since the air would be drawn into the glowing tip. But if the cigarette or cigar were not being puffed, he said, the ash which forms quickly around the tip acts as an insulator: "You can even touch the ash without burning yourself, and you certainly can't touch anything that would be hot enough to get phosgene out of F-11." He summarized that he felt it was highly unlikely, or even "impossible," that phosgene could have caused the Legionnaires' Disease. "The only way it could have," in his opinion, "was if the phosgene had been introduced in a cylinder by some outside person. But that's James Bond stuff."

Why, then, not throw out the phosgene proposition? Because the above-mentioned chemical engineer based his calculations on the assumption that nothing happened that wasn't supposed to happen—that, for example, a large quantity of fluorocarbon couldn't have been lost during a charging, or refilling, of the unit, and that the water pressure hadn't dropped sufficiently to allow refrigerant to enter the cold water system (something which could have happened months ago, according to Lorne Cook, since "the stuff can stay in the system")—and so on. For every theoretical impossibility he gave us, in short, Cook gave us a theoretical manner in which the impossibility was possible.

And if the phosgene proposition holds up, it must be assumed that something unexpected happened—something went wrong—whether it was mechanical failure or human error. Obviously something did go wrong at the Bellevue, whatever it was, and when one is dealing with a virtually unique occurrence, one must allow for unique possibilities.

While nickel carbonyl was being pursued, for example, no one insisted that a likely scenario be drawn to explain the presence of nickel carbonyl; they had the symptoms, and that was enough to cause them to give nickel carbonyl full consideration. They now have the symptoms of phosgene gas poisoning, and they have those "empty F-11 cans" that the CDC's Mallison saw, and an admission to him of a leak, and even a scenario although disputed, of a way in which phosgene could have reached the Legionnaires.

They have, in short, more reason to pursue phosgene than they ever had for pursuing nickel carbonyl.

Yet, on the same day we spoke to the Naval Research Institute's Friess, the CDC's Dr. David Fraser was quoted in the Daily News following a meeting of 12 pathologists flown in from around the country in an attempt to bring new insights into the investigation. Fraser said, "I rack my brain every day, asking, 'What could we have missed? What might we have overlooked? What can we do now?'" And Dr. David Bayse, director of the clinical chemistry laboratories at CDC, added, "We have done all that can be done with the material available from Philadelphia. Without some evidence or new information, there is no more we can do."

Now it's in the hands of the experts, right where it's been all along. They have the information. But we know what can happen. As Lorne Cook says, "What you're up against all the time is bureaucracy. I have to climb over 15,000 people to get anybody that knows anything."

Cook is used to it. Runsdorf isn't, and the pressure almost drove him up a wall.

We keep thinking about what Runsdorf said when we last spoke to him: The ones who recovered may still die—they're the ones I'm trying to reach. Runsdorf said the medical texts predicted relapses and called for a six-to-eight-week treatment with steroids. And nobody listened.

CITY OF PHILADELPHIA,
DEPARTMENT OF PUBLIC HEALTH,
Philadelphia, Pa., August 24, 1976.

Dr. H. NORMAN RUNSDORF,
Brooklyn, N.Y.

DEAR DR. RUNSDORF: Thank you for your Mailgram of August 22 in which you comment on the health situation that we are investigating.

As you are aware, there is a combined effort at local, State and Federal level to reach a conclusion, and your thoughtful consideration of the matter is greatly appreciated.

Sincerely yours,

LEWIS D. POLK, M.D.,
Acting Health Commissioner.

STATEMENT BY LEONARD BACHMAN, M.D., PENNSYLVANIA SECRETARY OF HEALTH, AT THE JOINT LUNCHEON OF THE PENNSYLVANIA AP ASSOCIATION AND PNPA—"NEW CRISES IN PUBLIC HEALTH"

Public health, historically, has not been a page one story. What we have witnessed throughout 1976, however, is a dramatic upsurge of concern on the part of consumers and newsmen alike to make public health—"Public."

The concern for public health today has been heightened recently in Pennsylvania by such factors as skyrocketing health care costs for consumers, crack-downs on nursing home conditions, rising VD rates among our youngsters and the steady rise in cancer deaths in many of the 67 counties in this Commonwealth.

As newspaper publishers, you know much better than I why they have been page one stories. To me, they beg for answers to the who, what, where, when, why, and how of our daily existence. Pennsylvanians question these trends constantly and look to us in public health to provide the answers and to you in the newspaper profession to report them.

Sometimes the answers are easy. Most of the alarming trends in health in this country and in our state can be traced to faulty individual and family life styles.

What's wrong you may ask with our modern life style? Nothing, if you can survive it. But I personally believe that Americans today are being programmed by parental example from childhood to think they can smoke, drink, take drugs, overeat, work under intense stress, not exercise, not sleep, engage in strenuous physical exercise and yet live to age 65.

Through some gentle but firm persuasion and modern health education techniques we feel we can change many of the harmful life styles that exist with Americans. It involves time and patience, but we work at it every day and we can live with our modest successes in this area.

Occasionally, however, those in public health are faced with questions for which answers don't come so easily.

I've entitled my talk today "New Crises in Public Health." And indeed during the last two months, the Pennsylvania Department of Health has been pre-entitled with more than its share of crises.

Just two months ago, the Health Department was in the midst of tackling the Legionnaires' Disease, which remains an unresolved mystery even now. And in a week we must be prepared to mobilize our resources for a statewide immunization campaign against swine flu.

Both of these emergency situations have taken the resources of the Health Department to the limit more so that at any time during its 70-year history, but we are learning to cope with them.

Our search continues for the mystery disease which killed 29 persons and sickened 151 others who attended a state American Legion Convention in late July.

The Legionnaire's Disease already is destined for the medical history books both because of its unusual circumstances and its devastating death rate.

We want very much to be able to write a final chapter to the Legionnaire's Disease. We want very much to solve this mystery which thus far has eluded the intense scrutiny of the medical and scientific community.

I have pledged to continue our investigation of the Legionnaire's Disease until such time as we come up with an answer or exhaust all theories in the process of finding the causative agent.

Last week I spent an entire day in Atlanta with officials of the Center for Disease Control reviewing the findings to date. I am satisfied that scientists there are continuing with a thorough investigation of every aspect of the disease including epidemiologic, microbiologic, toxicologic and pathologic studies.

By mutual consent, the Pennsylvania Health Department and the Center for Disease Control have invited seven distinguished members of the medical and scientific community to form a team to review all findings in the Legionnaire's Disease up to the present time.

Members of the Legionnaire's Disease medical-scientific team are: Jay Sanford, M.D., School of Medicine, Uniformed Services University of the Health Sciences; Morton Schwartz, M.D., Department of Infectious Diseases, Massachusetts General Hospital; Raymond R. Suskind, M.D., Department of Environmental Health, University of Cincinnati; Alexander D. Langmuir, M.D., Visiting Professor, Epidemiology, Department of Preventive and Social Medicine; Louis Weinstein, M.D., Peter Bent Brigham, Hospital; David R. Finn, M.D., Cardiopulmonary Unit, Williamsport Hospital; and Marvin Kuschner, M.D., Dean, School of Medicine, State University at Stonybrook.

The medical-scientific team will meet at the Center for Disease Control on October 7 and 8 at which time they will conduct an intensive review of the findings. The Team will develop a report on their findings and make recommendations for future strategies to be used in the continuing investigation.

The team's report will be widely disseminated to the medical and scientific communities for their review.

In addition to this new federal-state and city development in the Legionnaire's Disease investigation, I am today implementing a new state plan which will intensify efforts to attempt to unravel the cause of this mystery disease.

The new state plan for the continuing investigation is mandated because the Health Department's epidemiology section is faced with a need for a long-term priority investigation of this outbreak, using present resources designed now only for acute infectious disease control and investigations.

The staff now involved in the investigation at the state, city and federal levels are part of acute-response teams whose priorities are varied.

The tempo of the investigation has changed and present efforts are primarily in the area of gathering data and interpretation; and epidemiological, clinical and pathological characterization of the outbreak. Laboratory studies continue at the State Laboratory and with their consultants as well as the Bureau of Laboratories at the Center for Disease Control.

What bothers me is that if an epidemic of the magnitude of the Legionnaire's Disease outbreak occurred in another area of the state, many of the resources I have just cited would be diverted to the new epidemic and leave the Legionnaire's Disease outbreak in, possibly, an unsolved status.

Several questions remain to be answered concerning the outbreak specifically and Legionnaire's Disease in general. The Commonwealth of Pennsylvania bears the responsibility to address these priority questions:

1. To identify the causative agent or agents responsible for the epidemic and eradication of the agent, if possible.
2. To provide a full, detailed characterization of the epidemic.
3. To determine the existence of a continuing health problem.
4. To acquire sufficient resources to assure these objectives; and
5. To continue an open flow of information and cooperation among the Center for Disease Control, Philadelphia Health Department, other involved states, the Pennsylvania Department of Health, and the Pennsylvania news media.

In order to accomplish this, the Pennsylvania Health Department is already recruiting for a top flight epidemiologist whose credentials are acceptable to both our department and the Center for Disease Control. This individual will serve as project officer for the continuing Legionnaire's Disease investigation.

The new project officer will provide liaison with the Center for Disease Control and the Philadelphia Department of Health and will be responsible for completing the investigation and final report.

The project officer will provide the Health Department's Bureau of Health Communications with sufficient information for dissemination to the news media on a timely basis. The project officer's relationship with the Department will be terminated upon completion of the investigation and submission of a report.

The continuing investigation will include:

1. A continuation of laboratory activities in an effort to identify the causative agent.
2. Development of new systems to gather epidemiologic information needed to answer questions posed by current and future computer analyses.
3. Development of on-going surveillance systems to determine whether this or similar public health problems exist on an on-going basis.
4. Development of a surveillance system to obtain a true picture of the incidence of pneumonia in the City of Philadelphia.
5. Involvement of experts in the fields of infectious disease, toxicology, epidemiology and immunology for the purpose of developing a differential diag-

nosis of known agent capable of causing the outbreak. A brief report will be requested from each expert. This would be of particular value in assigning degrees of significance to those relatively few agents about which little is generally known, for example, mutant viruses.

6. The development of a final report within eight months, if possible.

It is my hope that with these increased, intensified efforts we can adequately probe the mystery surrounding the Legionnaire's Disease and ultimately come up with the answers.

The other crises I spoke of sometime ago is one I am hoping your newspaper publishers can help us out with.

Beginning Friday, October 8 and continuing for 25 days, the Health Department will begin to immunize the state's elderly and chronically ill with combination shots of A-Victoria and Swine Flu vaccines. This will be followed by mass public inoculations against swine flu the first week in November and continuing for 40 days into mid-December.

If this preventive health program is to be a success, we must make every attempt to convince Pennsylvanians of the importance of receiving this protection and get them out to the mass immunization sites according to our established county-by-county schedules.

Anything you can do in this endeavor—running news stories, editorials and publishing the vaccination sites and schedules—will be greatly appreciated.

I know many of you have questions about the Legionnaire's Disease and the Swine Flu Immunization Campaign, so I'll be happy to answer your questions at this time.

[Mailgram]

NEW YORK, N.Y., August 22, 1976.

COMMISSIONER OF HEALTH,
Philadelphia, Pa.

DEAR SIR: The excessive criticism of my colleagues has caused me considerable distress, since the convention in a hotel in your city still remains a problem. I believe I have a solution which fits all the criteria which I read in the papers and is a plausible explanation for the available facts.

1. All people who suffered from the illness were in the same hotel dining room at the same time.

2. Some 27 died but more than 120 suffered from the illness and some had no illness.

3. The illness took 3 to 5 days to develop and was not communicated to relatives who subsequently came in contact with the original contact.

4. No organism has been found in the sufferers. No new cases were reported.

5. Assume whatever the cause was present in the room in which all sufferers were present. Those who were under the ventilating or closest to the outlet would get the greatest amount and subsequently died.

Fact 1. Freon gas is the most common gas used in refrigeration—the chemical formula of which is CCl_2F_2 —if heated or overheated may become phosgene, the chemical formula of which COCl_2 and F_2 which is in its free state an active gas which will combined with nickel, chromium or any available metal which the paper stated were in excess in the examined organs and may have come from the containers in which the organs were kept and probably came from the action on the stainless steel containers by the free fluoride in the organs contained.

Phosgene is one of the two commonest inhalation gases used in World War I. Mustard gas is the other and these effect the lungs (by inhalation) causing edema and necrosis of the lung parenchyma which could then become infected or may have caused the temperature from the absorption of the necrotized tissues.

The effect of the gaseous fluoride has a similar effect on the tissues when inhaled and unites with the organic protein of tissues and may be released when in contact with the receptacles in which the tissues were carried. The formula of the phosgene in the conversion of Freon to phosgene with liberation of the fluoride can be converted to phosgene and free fluoride can be converted from the Freon by heat since phosgene has three elements commonly found in human

tissue, namely: carbon, chloride and oxygen. The only possibility is to test for excessive fluoride. I trust that you have not already done so. You'll extend me the courtesy of this test for fluoride.

Sincerely,

H. NORMAN RUNSDORF.

Mr. MURPHY. The committee will recess for about 15 minutes.

[Brief recess.]

Mr. MURPHY. The next witness is William G. Chadwick, vice president and managing director, the Bellevue Stratford Hotel.

He is not here, yet. We will defer his testimony.

The next witness is Joseph P. Buckley, commander of District I, Veterans of Foreign Wars.

Mr. Buckley?

**STATEMENT OF JOSEPH P. BUCKLEY, COMMANDER, DISTRICT I,
DEPARTMENT OF PENNSYLVANIA, VETERANS OF FOREIGN WARS**

Mr. BUCKLEY. Mr. Chairman, I would like to point out that District I, Veterans of Foreign Wars, is composed of the county of Philadelphia, all posts in the county area.

We became very concerned when we first began receiving reports of the Legionnaires' disease deaths. Possibly, I have more concern than the average person because my wife was involved.

As late as last Wednesday she was ordered by her doctor, on orders from the Center for Disease Control, to have further chest X-rays taken for some reason.

They did not put her, formally, on the victim's list because there was a deviation in temperature but she is still suffering all of the symptoms, pressure, pains, and everything else involved.

I would like to say that the action I took was fully authorized by my executive board. We issued a press release on the 4th of August. That is as far back as we were working on it.

We were working, essentially, out of concern for our sister organization, the American Legion, where the tragic deaths were occurring.

I have no doubt in my mind that if proper procedure had been followed at the time we became aware of it, some of these deaths could have been spared.

I have a copy of the press release here, which I have given to Mr. Cole. I do not want to go into it in depth. He has a copy of it but I have extra copies with me if anyone cares to have one.

That was the only concern that we had. We asked for a full investigation at all levels into these tragic deaths. The questions that I asked, and would like to ask, and to make part of the record in connection with that, are these.

One, why the denials by all of the investigative agencies at all levels, that they have no interest in this. I am including the Chemical Warfare Division.

We followed up with a request after this press release with the district attorney's office, the Federal Bureau of Investigation, and the homicide department in the city of Philadelphia. I had people in my home interviewing me, taking medical reports. I was informed by the

detective who questioned my wife and myself that they had 50 members of the homicide team in Philadelphia working on this.

Still, when we followed up and asked them how their investigation was proceeding, asking them if we could be instrumental in helping them in any way, they denied that they were actively investigating it. This goes down to all levels.

Since we are dealing with human lives, I would like to know, since they have no interest—why? Why there was no interest. They certainly should be interested, I think.

We have, possibly, 180 people with serious illness, some of it recurring, contrary to reports that there is no second generation or recurrence on it. I would like this question answered first and foremost. I would like to know why they have no interest in it.

I have enough confidence in the skill of our chemical warfare departments. Being fully aware of their procedure, I think they could pin this thing down very quickly if they wanted to.

They said they have had no formal invitation; therefore, they are not getting involved.

Another thing—why did the news media in the city of Philadelphia vilify everyone concerned? We were practically nailed to a cross by two daily newspapers in the city of Philadelphia.

We were accused of borderline insanity, bizarre theories, even reaching our conclusions in a dark closet with a ouija board.

Again, these same papers have more or less borne out, recently, our contentions that we had from the start. They have called us, apologized on the phone, asked us for our data, any facts that we had at hand. We absolutely refused to surrender that to them.

We were working with the district attorney's office in Philadelphia another agency that says they have no interest in it, but they were working on it. They received all of the information that we had at our command.

At the Homicide Bureau, I was in contact with Lieutenant Brennan, who has called me at least three times. I have called him on a few different occasions.

He sent a personal representative to pick up a copy of the press release at our executive board meeting. They say that they have no interest.

One more thing I would like to get into the record. On August 6 at 8:20 a.m., a local news commentator had a talk show, on WCAU radio, all night. I was up simply because my wife had these symptoms and could not sleep.

We caught this broadcast on the radio beginning at 3:20 in the morning and it was repeated every 5 minutes thereafter until 5 o'clock that morning.

The commentator had information from Jerry Jensen, a television commentator from KGO-TV in San Francisco that the CIA had a man in custody who was an antiwar activist employed at Fort Detrick, Md., engaged in the manufacture of these different viruses and bacteria and that since the American Legion posed a threat to world peace he thought it was his personal debt to society to spirit some of this chemical away and use it against the Legion.

The last broadcast was at 5 a.m. At 9 minutes after 5, after having this Jerry Jensen on an open phone line—and Norm Fasto was the

commentator at WCAU who had him on open phone line—a so-called Army spokesman came on, said that there was nothing to back it up because they had conducted, in that short period of time, an inventory on their toxic substances and they had found nothing missing.

I would like to say this: That they were ordered 2 years prior by Presidential order to destroy all of those toxic substances.

If they conducted an effort to comply there was something illegal in simply having it there. I do not think they could conduct an inventory of a virus, where something the size of a pinhead could poison 100 people, in that short a time.

I do not know what has happened, but I have never heard one reference to it, at any time, in any of the news media, from that time to this.

We do have a running log, which I turned over to Mr. Cole, of the time the broadcast was made and I would like to know why there was no followup on that.

It was stated here, yesterday, in testimony that the purpose of this committee of investigation was to set up a possible competent way of handling such situations in the future.

This is not the first outbreak of this but, rather, the fifth. It has happened in four different places in the United States.

I would like to know why these guidelines have not already been established. Certainly, there is some incompetency somewhere. I think you will have to agree with that since it has happened before, we should have these guidelines set up in case of emergency.

Another thing I find absolutely unbelievable is that highly experienced researchers at CDC had negated the value of tissue cultures through repeated use of improper utensils, and this in spite of a request by independent researchers and competent physicians who are working on this, toxicologists, pathologists, virologists—not to do so.

They practically depleted the entire supply of tissues, as I understand it, through the improper use of the utensils.

I would like these questions answered, Congressman. That is all I have to say.

Mr. MURPHY. Thank you, Mr. Buckley.

Mr. William G. Chadwick, vice president and managing director of the Bellevue Stratford Hotel.

Do you have a statement for the committee, Mr. Chadwick?

**STATEMENT OF WILLIAM G. CHADWICK, VICE PRESIDENT AND
MANAGING DIRECTOR, BELLEVUE STRATFORD HOTEL, PHILA-
DELPHIA, PA.**

Mr. CHADWICK. I have no written statement.

Mr. MURPHY. How many guests were registered during the period of July 21 through July 24 in 1976? How many American Legion members?

Mr. CHADWICK. We can give you the individual nights. We had, in total, 807 people registered on the night of the 21st day of July.

On the night of the 22d of July, we had 833 persons registered. On the night of the 23d of July, we had 781 persons registered. On the 24th of July, we had 146 persons registered.

Mr. MURPHY. How many were associated with the American Legion Convention?

Mr. CHADWICK. Different totals—on the night of the 21st, there were 622; on the night of the 22d, there were 726; on the 23d, there were 694; on the 24th, there were 22.

Mr. MURPHY. Of the guests registered have there been, to your knowledge, illnesses to non-Legion visitors?

Mr. CHADWICK. Not to our knowledge; none reported.

Mr. MURPHY. Relative to the air-conditioning system at the Bellevue, would you describe it; its operating characteristics and generalized history, of the system?

Mr. CHADWICK. We have a large central system that does the majority of the air-conditioning at the Bellevue Stratford; one having a 600-ton capacity; the other having an 800-ton capacity. They can be worked together or separately.

We do not often work them together because it does not that often get that hot.

The system is simply a chilled-water system. The chilled water is cooled by the operation in the subbasement. The cooling is carried to the upper floors to some 70 diffusers by way of chilled water.

The coolness carried by the water is then, in effect, distributed by fan action in the diffusers to the various areas.

Mr. MURPHY. When was this system put in?

Mr. CHADWICK. The system was installed somewhere around 1953-54.

Mr. MURPHY. Any overhauls recently?

Mr. CHADWICK. It has periodic adjustment made to it. Of course, there is a starting-up period each season when air-conditioning comes into need in the early spring of every year.

Mr. MURPHY. Have you had any malfunctions in the system this year?

Mr. CHADWICK. Malfunctions—probably to the extent of getting the usual starting-up problems such as a bearing wearing out or an adjustment needed or gas being added to the system.

Mr. MURPHY. We have had evidence and other information that there was a Freon leak in the system. Are you familiar with that?

Mr. CHADWICK. Yes, I am familiar with that. In the early part of the spring at the startup time, the big 800-ton machine had 300 pounds of RACON-11. It is not Freon. It is a trade name. This was added to it. This is a normal thing, they tell me.

Mr. MURPHY. Was any Freon added since then?

Mr. CHADWICK. There was some added after the convention, sometime in August. There was 100 pounds added. This gas tends to purge away under the normal operation.

Mr. MURPHY. When was the decision made to close the Bellevue Stratford?

Mr. CHADWICK. The 9th of November. We brought the results of the operations to the board of directors of the Bellevue Stratford meeting at 4 o'clock in the afternoon on the 9th and they approved the decision to close the operation.

Mr. MURPHY. Had there been discussions that the hotel would be closed before the Legionnaires' visit?

Mr. CHADWICK. Absolutely not.

Mr. MURPHY. Subsequent to August 7, 1976, the approximate date of the Legionnaires' disease being known, how were you informed of

the outbreak and were you kept abreast of the developments by any authorities such as the city or State health authorities?

Mr. CHADWICK. I was notified by a newspaperman showing me a release from our notice over the AP signature on the 2d of August. That is the first time that we knew that anything like this had happened.

Bear in mind that this convention had checked out of the hotel on the 24th of July. As far as being updated by the various public health sources, Federal, State or city, we finally got some information in written form from the CDC in Atlanta but that was only some time later.

We were contacted by these organizations, all three of them, immediately. We gave them free access to our hotel. We opened the hotel up to them for inspection and we provided personnel on an overtime basis at cost to us so that they could see everything possible. We gave them an open book as far as the Bellevue Stratford was concerned.

Mr. MURPHY. When did the Franklin Institute come in and do a survey of the air-conditioning system?

Mr. CHADWICK. Franklin Institute, if I am right, came in sometime, probably, the latter part of August. However, I am not sure. I would not count on that date if I were you.

Mr. MURPHY. Can you describe the extent of their survey?

Mr. CHADWICK. They examined the water systems and the air-conditioning systems. I was not particularly close to it so I gave them an engineer to go with them, a man who was one of the supervisory engineers for the chain of hotels. He spent considerable time with them. In fact, they were in for 2 days.

I think they were given free access and free opportunity to examine anything they wanted.

Mr. MURPHY. How many personnel from Franklin?

Mr. CHADWICK. I believe he had two there.

Mr. MURPHY. How many hours, total, did they spend?

Mr. CHADWICK. It would probably have to be a rough guess. They probably spent, maybe, 15 or 20 hours. I really do not know.

Mr. MURPHY. Then, Drexel came in?

Mr. CHADWICK. They had some people from Drexel that the city sent in, I understand.

Mr. MURPHY. But you had to, generally, rely on the news media for all of your information concerning the outbreak?

Mr. CHADWICK. To a great extent, that is right.

Mr. MURPHY. Would you have any recommendations to make as to how the situation could have been handled better, from your standpoint as a businessman?

Mr. CHADWICK. I only wish, Congressman, that they had not used the name of the Bellevue Stratford so freely. That is the only thing I can say. I am not prepared to "critique" their investigation. I am not a scientific person. I am an innkeeper—but you, yourself, see the results.

Mr. MURPHY. If Center for Disease Control or one of the State or city health authorities gives a clean bill of health to the Bellevue Stratford would you reopen?

Mr. CHADWICK. We cannot afford to reopen. We have spent a lot of money in the last 105 days, since August 2, trying to recapture its

popularity and its clientele. As far as we are concerned, the hotel is closed.

Mr. MURPHY. What are the plans for the hotel, for the structure, itself?

Mr. CHADWICK. It has been placed on the market. They have asked the real estate people to market it.

Mr. MURPHY. Not for demolition?

Mr. CHADWICK. We are trying to sell it.

Mr. MURPHY. The property, itself, is intact—fixtures?

Mr. CHADWICK. Everything remains intact. We put the hotel to bed. Someone can reopen it next week, if they like.

Mr. MURPHY. Thank you very much, Mr. Chadwick. We appreciate your testimony.

[The following correspondence was received for the record:]

CONGRESS OF THE UNITED STATES,
HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON CONSUMER PROTECTION AND FINANCE
OF THE COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
Washington, D.C., November 30, 1976.

Mr. WILLIAM G. CHADWICK,
Vice President/Managing Director,
Bellevue Stratford Hotel, Philadelphia, Pa.

DEAR Mr. CHADWICK: I appreciate your appearances before the Consumer Protection Subcommittee and your testimony on November 24, 1976, relative to the Legionnaires Disease.

Senator Schweiker had intended to ask you a series of questions based on a letter he received from Richard L. Brunker, Ph.D., Heavy Metal Toxicologist. Unfortunately, Senator Schweiker had to leave and he asked that I submit the questions to you by letter and that your answers be inserted in the record immediately after your testimony.

I have enclosed a copy of Dr. Brunker's letter and Senator Schweiker's questions are as follows:

1. How long had it been since the mentioned incinerator was used?
2. Why did you stop using it?
3. When was it utilized again last summer? (Dates if possible.)
4. What was burned in it? How much and what sorts of materials?
5. Was any smoke or odor detected?
6. Was there any way of fumes leaking into lobby, elevator or air-conditioning shafts, etc.?

I would appreciate your attention to this matter as quickly as possible, and I thank you in advance for your cooperation.

With kind personal regards.

Sincerely,

JOHN M. MURPHY, *Chairman.*

Enclosure.

HADDONFIELD, N.J., November 22, 1976.

Hon. RICHARD SCHWEIKER,
Capital Office Building,
Washington, D.C.

SIR: While attending the symposium held by the Center for Disease Control in the Bellevue Stratford Hotel in Philadelphia this past week, I was amazed to learn that the principal investigators of this organization appeared to be totally unaware of advances in heavy metal toxicology that have been documented during the past decade. Such knowledge would have provided answers to questions that these investigators have contended to be unanswerable. I can support all remarks that follow concerning scientific data with published scientific documentation.

The CDC investigators freely admit that they have no explanation to two key questions concerning this tragic incident. They are:

1. While data indicate that the affected legionnaires spent considerable time in the hotel lobby, no member of the lobby staff appeared to be affected by this disease.

Supportable Scientific Explanation.—It has been demonstrated and published that mammals can easily be induced to be resistant to high levels of toxic heavy metals. All that is required is a brief exposure to sub clinical levels of this heavy metal which was found to evoke the formation of specific molecules (metallothionines) endowing the affected organism with resistance to very high concentrations of this toxic heavy metal. This concept (or idea) is supported by Dr. Thomas Clarkson of the University of Rochester School of Medicine. Dr. Clarkson is recognized as this country's foremost heavy metal toxicologist.

2. The delay of 3 to 8 days between exposure in the lobby to the possible toxin and the onset of symptoms.

Supportable Scientific Explanation.—Organometallic compounds such as nickel-carbonyl or methylmercury are very non-polar molecules. It has been repeatedly demonstrated in both animals and humans that such molecules are initially absorbed by the constituents of the vascular system and because of their non-polarity they are slowly accumulated by the lipid-containing central nervous system (the brain). This translocation requires several days and would explain the symptoms evidenced by the victims.

I strongly urge those concerned with this investigation to initiate procedures to monitor the possibility that the lobby staff and afflicted survivors are now resistant to nickelcarbonyl toxicity.

Also, considering that the Bellevue Stratford Hotel is now closed, it would seem prudent to test the atmospheric integrity of the incinerator that was pressed into service last summer because of labor problems concerning the trash collectors of Philadelphia. This incinerator had not been utilized for many years because of air pollution legislation. It had been used before and during the American Legion Convention and is located under the hotel lobby.

It appears highly possible that earlier exposure to the initial sub clinical concentrations of a toxic substance such as nickelcarbonyl rendered the hotel staff resistant to its toxic effects, but the legionnaires were sudden interlopers into a very toxic atmosphere for extended periods of time.

These possibilities have never been considered or tested by the CDC investigators because they are completely unaware of the current scientific status of this toxicity. Dr. David Fraser who heads this investigation was not familiar with these data before I spoke to him last Monday. Would you please try to do something to instill some sort of scientific zeal and integrity in these gentlemen.

Sincerely

RICHARD L. BRUNKER PH D.,
Heavy Metal Toxicologist.

THE BELLEVUE STRATFORD,
Philadelphia, Pa., December 16, 1976.

HON. JOHN M. MURPHY,

Chairman, Subcommittee on Consumer Protection and Finance of the Committee on Interstate and Foreign Commerce, House Office Building, Washington, D.C.

DEAR CONGRESSMAN MURPHY: In reply to your letter of November 30th, 1976, wherein you ask that I reply to a number of questions posed to you by Senator Schweiker relative to a letter received from a Dr. Richard L. Brunker, my answers are as follows:

1. The incinerator has been used continuously for the past 25 years, to our knowledge, or longer. In 1969 it was shut down for a period of one week to be up-dated in order to conform with the pollution laws at that time. It is in constant use 5 to 7 days a week from 7 AM to 5 PM as required.

2. We have not stopped using it.

3. See reply to question No. 1.

4. Hotel trash from guest rooms, restaurants, commercial and office areas, such as, paper, cardboard, wooden crates, etc.

5. None.

6. Fumes, after going through an after-burn and after-wash, are emitted from the top of the stack at the roof level above the penthouse on the 20th floor of the hotel.

It is indeed a pleasure to cooperate with you. If we can be of further service, please do not hesitate to call us.

Sincerely yours,

WILLIAM G. CHADWICK,
Vice President and Managing Director.

Mr. MURPHY. Did you have a statement? Would you identify yourself for the record, please?

STATEMENT OF LOUIS J. D'AMBROSIO, PHILADELPHIA, PA.

Mr. D'AMBROSIO. My name is Louis J. D'Ambrosio, 1108 Anchor Street, Philadelphia, Pa.

Mr. MURPHY. You are speaking as an individual, not as a representative of the American Legion?

Mr. D'AMBROSIO. Yes. I want to make a statement about what the board of health in Philadelphia said to me. That is what I want.

Everything was answered, but No. 6 I want to get on. With regard to No. 6 in my statement, I did not have a high fever. I had 99° and, at one time, 100° but it was not over 100°.

I called the board of health after I got out of the hospital, saying I will come down to take a blood test.

Mr. MURPHY. The city?

Mr. D'AMBROSIO. The city, yes. I asked them, when do you want me to come down for the blood test. They called me 2 days before I got out of the hospital. They made an appointment 2 weeks later to get another blood test.

I called them up. Dr. Polk's assistant called. I have to go to the Frankford Arsenal where I work at. I have to get the phone numbers of the person I called. I called that person up.

I told him, "I am calling in reference to getting a blood test." He asked, "What hospital were you in?" I said, "In Kennedy Hospital. I went in the 5th of August."

He said, "Give me the temperature—you did not know the temperature?" I said, "No, I did not." He said, "You are not a legionnaire." I said, "Wait a minute. I was a delegate down there so I am making a statement for anybody—under 100°, now."

I had diarrhea for over a week before I went in the hospital. My wife also had diarrhea for over a week.

Thursday, after I had come from the funeral of Mr. Stricker, the adjutant for the finance, that is, I called the "Hot Line," thanks to Mr. Hoak when he put that "Hot Line" on television—I have to thank him—because I could not get in touch with anybody else.

I called the "Hot Line" and told them I cannot walk. I have chest pains, I had the headaches that Saturday of the 24th. I had the headaches; then, I had the diarrhea, then the chest pain and all of that. I also had eye and back pains before entering the hospital.

I am making reference for the people who did not get the high temperature. They should also be checked out—the people who did not go to hospital and the people who were in the hospital.

Mr. MURPHY. What is the paper you are referring to?

Mr. D'AMBROSIO. The paper I gave you.

Also, I want to put into the record, Congressman, that my legs are still not functioning right. My family doctor told me to get another

blood test so I am going to go in and get another blood test. I want to put that on the record, too. Therefore, I am not healed yet.

Mr. MURPHY. And you were not counted as the Legionnaires' disease case?

Mr. D'AMBROSIO. Yes. Because I did not have the temperature.

Mr. MURPHY. How many more people are there like you?

Mr. D'AMBROSIO. There were 5 to 10 people from my post No. 211.

Mr. MURPHY. Did you receive a questionnaire?

Mr. D'AMBROSIO. I was in the hospital when they sent it out.

Mr. MURPHY. Did it go to your home?

Mr. D'AMBROSIO. No; it did not.

Mr. MURPHY. Where did it go?

Mr. D'AMBROSIO. I do not know where it went. I had detectives and everybody calling me. Even at the hospital, they called me. That is why I asked for this time to get the people who had under 100°.

My wife was sick and I was sick and I laid in the hospital for 12 days. Thank you very much for your time.

[The attachment to Mr. D'Ambrosio's statement follows:]

FRANKFORD POST No. 211,
Philadelphia, Pa., November 22, 1976.

I would appreciate answers or clarifications to the following questions:

1. What caused the odd odor that occurred for approximately 5 minutes in the hospitality room and nearby hallways?

2. What type of a valve did the air conditioner man change?

3. Is it true that this air conditioner man became ill after making repairs?

4. Was any follow-up made to the Doctor's finding of animal bacteria in human tissue being tested?

5. Did the high humidity coupled with the large crowds cause many air conditioners to malfunction thus rendering some rooms cold while others were warm?

6. Was I taken off the Legionnaire's disease list because my temperature did not exceed 100°, although I met all other necessary criteria for said list?

LOUIS J. D'AMBROSIO,
Sergeant and Secretary, Color Guards,
Also Sergeant of Arms.

Mr. MURPHY. Thank you, Mr. D'Ambrosio.

We will review, completely, the files that Mr. Hoak referred to in his testimony.

After 2 days of hearings and, particularly, after hearing the testimony of the witnesses from the Center for Disease Control, I am convinced that the charges that have been heretofore unsubstantiated in isolated press reports are true.

The investigation into the cause of the Legionnaires' disease at the Federal level was characterized by poor communication and initial misdirection of resources almost bordering on tunnel vision toward swine flu and a decided lack of organization. In other words, the work done by the Federal people, to be charitable, was botched up.

This, in all probability, means that we may never determine the cause of the respiratory disease in Philadelphia. That is the so-called Legionnaires' disease.

I do not see how we could have been awarded three Nobel Prizes this year and have blown the search of the Philadelphia epidemic.

It is totally unacceptable that in a country of 220 million people, supposedly the most advanced technology in the world, we would find ourselves in a position of not knowing what happened in Philadelphia

and, even worse, not being in a position to prevent it from happening again.

I plan to meet with the subcommittee in Washington to develop protocols, regulations, and guidelines and legislation to give directions to the Center for Disease Control on how to handle outbreaks of this nature in the future. They, obviously, currently, do not have the capability of achieving this.

We will stress the need for enhanced knowledge, recognition, care, and systematic research relevant to outbreaks such as occurred in Philadelphia.

Thought must be given to the greater use of CDC, of toxicologists, and of the fact that they must share in the initial efforts to bring to a rapid solution any future outbreaks of this variety.

If legislation to enable the CDC to establish a greater toxicological recognition capability is needed, then, that legislation will be introduced.

If it is necessary that legislation be drafted, it will enable the CDC to utilize the toxicological recognition capabilities of other branches of the Federal Government such as OSHA, the Army's Chemical Warfare Service, or any other branch of Government to prevent such a reoccurrence and to enable this Government to adequately fulfill its obligations to its people, then that legislation will be introduced.

I point out here that highly competent persons other than Dr. Sunderman and equally close to the investigation believe that it might have been caused by the willful introduction of a poisonous substance.

In my view, qualified persons from the Army's chemical warfare area, the Central Intelligence Agency, and the Federal Bureau of Investigation should have entered this case but to date they have performed no indepth investigation of the outbreak. We will try to remedy this.

We must not, again, find ourselves as we have in Philadelphia, improperly utilizing our capabilities and employing the Nations' health experts and expertise in an exercise of futility.

The subcommittee will stand adjourned.

[The following letters were received for the record.]

UNIVERSITY OF WISCONSIN—MADISON,
FOOD RESEARCH INSTITUTE,
November 19, 1976.

HON. JOHN M. MURPHY,
Chairman, Subcommittee on Consumer Protection, and Finance of the Committee on Interstate and Foreign Commerce, Congress of the United States, House of Representatives, House Office Building, Washington, D.C.

DEAR SIR: I just received your invitation to participate in the public hearings on the "Legionnaires Disease," November 23 and 24, for which I thank you. I am sorry to state that I will be unable to attend, but I would like to make the following statements for insertion into the Congressional Record, if possible.

The occurrence of the so-called Legionnaires Disease certainly was a severe and unusual happening. The inability of our public health scientists to determine the cause of the disease is very disturbing. However, I have no reason to doubt that the investigators did all that possibly could be done in searching for a bacterial or viral infectious agent. There are other possible causes that should be considered such as toxic chemical or biological agents that might have been accidentally, or even deliberately, used by someone to contaminate the air, food, or water consumed by the victims. One hates to think of any covert activities going on in our society; but having had about 30 years' experience with the Department of Defense at the Biological Laboratories, Fort Detrick, Maryland,

and at the Army Chemical Center, Edgewood, Maryland, working on these agents and how they might be used against us, I feel that we should be ever mindful of possible sabotage. I think that this possibility need only be brought to the attention of our public health administrators and included in the protocols for future examinations. Our public health scientists are, or can be, informed through the Department of Defense of the proper techniques for detecting these agents and treatments for them.

The above statements are all I would have to present at the hearings.

Sincerely yours,

EDWARD J. SCHANTZ, *Professor.*

NORRISTOWN, PA., *November 25, 1976.*

Re Ciguatera fishpoison in the Northeast—alias "Respiratory Disease, Philadelphia", alias "Mystery Disease" Et cetera and Et cetera.

Congressman JOHN M. MURPHY,
*Subcommittee on Consumer Protection,
House Office Building, Washington, D.C.*

HONORABLE CONGRESSMAN: Again I thank you for placing my documents on the record of your subcommittee hearings of the last two days. At the advice of Congressman William Green's staff, I still fear that my words of proof of medical coverup may, by their very passion and violence, give you some fear that the pursuit of my charges can only embarrass you.

If my words give you fear, I apologize. That is my inadequacy. Mine and the English language's. U.S. Vice President R. L. Stevenson said: "This world and the English language are not constructed upon the same pattern".

Perhaps, if I try now to explain my actions of August sixth and thereafter more briefly than the 134 pages of documents I gave you, we can communicate in this language. How inadequate is the language? Well—I thought I heard the Commonwealth's Doctor Bachman answer the committee that the State had no toxicology capability. Yet—on August sixth I told both Mister Sideman and toxicology (Doctor) Shoemaker of Philadelphia's Girard Avenue State laboratories what was the cause of the pandemic disease on the streets of Philadelphia and wherever else the ciguatoxic fish might be served.

Five or six days later I personally handed documents to toxicology department supervisor Leonard Sideman and a female technician in toxicology who seemed to be along at the guard's desk of the lab building only as a protective witness for Doctor Bachman's State bureau of health. Those documents proved my statements of August sixth that the "mystery disease" was easily identifiable from its special set of symptoms (called its syndrome). In later telephone conversation with Doctor Shoemaker, he said he was not a capable investigator outside his field of commercial chemical toxins; and he said he therefore had sent my documents to Harrisburg for a Doctor Rosen, Epidemiologist. See, John, how the English language misfits the truth. When Doctor Bachman said his office had no toxicology capability, he told you the toxicology capability he was admitting he had was a totally incompetent and incapable whole toxicology department. When we speak the English language for self protection as Bachman did, things are not what they seem, as Alice said.

Grant me this indulgence: I shall try to explain a thing of this world which is a new idea; words in this language are not yet perfectly joined together to explain it best; I have apologized for my own inadequacy with the language; still, John, do what I personally asked and try to assign yourself or another human being to try to understand my new idea in spite of my imperfect language.

What is the first step to my idea? To think. Think about the poisons in the fishflesh of the world. Are there some which are tricky enough to make the most mysterious cases of illness known to man? Yes. There are four or more inter-flesh poisons (each with chemical complex variations of a family of similar poisons). Most such families are either nausea producing or exceedingly toxic so as to tell their presence with a few hours; one such poison family is known to not be so. It is the slow-acting toxemia of "unclassified" and "treacherous" ciguatera toxins. How and where do we know this? We see it in the "bone ache" of nearby (geographically) Bermuda which usually takes three or four days to make the victim know he is sick. And we see it in the history of medicine and the histories of great exploration-by sailing ships. In sailing days hundreds of thousands of men died of fever or aches and the stoppage of breathing (of respiratory disease). Those deaths were logged as deaths by (1) burning ague,

(2) calenture, (3) "shipfever". (I make a special note with the last of the three because "shipfever" was more unclassified and general—that is, both the typical death and all other ship's illnesses might be so called.)

Use the above. Think of a better name that could have been given to the aching fever, and silent respiratory failure death or eventual long and slow recovery of strength of the typical disease called all of the above. It would have been better if all such cases had been called "mystery disease, sea". Thus perhaps in later centuries or recent days they could more easily have been identified as forms of the same family of ciguatoxic poisonings as is Bermuda's bone-ache. In science—every little bit of clear truth and understanding helps future thoughts. And every little bit of "pure", "theoretical", or "historical" work of science is a jewel whether it becomes worthless or invaluablely priceless.

Two pieces of work which will be keys to the success of the solution of "Respiratory Disease, Philadelphia" are: One, the plain observation of Doctor Mowbray of the Bermuda Aquarium decades ago that the local fishpoison called the bone-ache had the exact latency now evident in the legionnaire fraction of the poison victims; and, two, the details about fishpoisons' relapses as confirmed in the three volume work published by the Government Press, Bruce W. Halstead's "Poisonous and Venomous Marine Animals," for the combined armed services.

The first straight fact really doubly confirmed my scientific solution of the mystery to me, myself. The second straight fact will confirm it to your investigator and you. You heard all the witness's testimony. No one denied poison as the most probable cause. Yet, no one else with doctorate and panels of side-kicks was able to cite a plain reference to latency of two to several days with peaks at three or four days as in "Mystery, Philadelphia." I cite Bermuda's Doctor Mowbray in scientific journals. (I know you also heard what I heard from the proponents of four metallic and industrial poisons: To make his own case, each and all managed to destroy the other three cases!)

The second straight fact is the one which I suddenly encountered at the hearings. I knew there were always long and slow recoveries from fishpoison and that the victims at Philadelphia had the same symptom. Next, there are some strange and exotic symptoms (such as the swollen head of Marie Tucker just before death and the laryngeal spasm of Doctor Ernest Campbell's first patient at Bloomsburg, and of Legionnaire Kiley who signed himself into the Dillon, South Carolina Hospital because he "could not swallow".) I talked to Philadelphia District Commander Buckley of the Legion on the first day of the hearing. He told me of his wife's case of the disease. This became the first victim's case that I asked follow-up questions about.

The fact of a unique symptom of ciguatera which is not like the case of any other poison or other disease was there—screaming for us to see it. Buckley's wife had three serious relapses into sickness. Hear this: "A case of ciguatera will render the patient more susceptible to intoxication for the next year or more" (Journal of Forensic Science, p. 190, Vol. 2, 1967). This is critical. What has been happening to (Kaz?) Buckley and to a friend of Adjutant Hoak who was rehospitalized on the day of his testimony to you, has been happening to many surviving legionnaires. It can make a strong definitive proof by experiment of ciguatera. The experiment will be necessary; it will be dramatic; it will work by forcing even the insanely criminal Center for Disease Control to admit the truth.

How does one diagnose and prove ciguatera? Usually in the hard way or not at all. The regular test is to have some of the poisoned fish saved a week after the patient ate the fish and to then feed it to a mongoose! Is that proof rare? You bet. All odds are against it. But * * * elsewhere in the literature there is this typical finding of a unique characteristic of ciguatera, roughly, "A victim of ciguatera may be so susceptible to fish poisoning thereafter that he may show the symptoms of the disease again even if he eats a "good" or "safe" fish in the company of others who show no signs of poisoning." That's it.

That is why adjutant Hoak complained of the many sick of the Legion who do not seem to be recovering. (That is also why one of the legionnaires who has been almost continuously sick since he and his wife got the complete same sickness except that his fever never passed 102, will certainly agree with me that the insane criminals at the CDC are prima facie guilty of fraud to deny my advice since August sixth by false disease criteria.) He was your witness.

Therefore, you of the federal government must now do the experiment to prove the crime of your own CDC. You must set an experiment for the VA hospital at Philadelphia. Have ten human volunteers—five disease victims and five non-

victims. Invite them to stay at the hospital for ten days during which they may sample to feast on a variety of fish dishes together (except that all get the fish each day in the same measured and daily increasing amounts). The victims of "Alleged Respiratory Disease, Philadelphia" will all get the symptoms of the poison disease; non-victims will not. In the days before you begin that experiment your Ray Cole could follow up on the many legionnaire non-fatal cases where the relapses have happened. He can begin by asking part of them very directly, "How soon after you ate the fish did you feel the symptoms of relapse?" Next, he can ask another part of them if they can recall what they ate in the time range which first part have answered. (Thus, without mentioning *fish* or suggesting the word to all the other relapse victims, you should *always* find them saying they did eat fish.)

Your aide Raymond Cole can confirm the importance of the experiment and at the same time he will find out about how long it takes from the eating of fish to a relapse. Then, (to be double safe), all the human volunteers may be tested by small but increasing feedings of fish after each smaller increased dose has been watched for results for the time of latency which you find. (That is, if victims get sick twelve hours after eating fish; then, you may begin on one day intervals with very small amounts of fish and small increases permitted each twenty-four hours. Thus: avoid the danger of the symptoms of relapse being dangerous to life.)

Let me now give you a direct comparison and analogy. By it you shall understand my acts after August sixth. Say that you have done the investigation in the paragraph above to the point where you have found all the surviving victims of the ciguatera are subject to relapses twelve hours after they do eat fish. Say, next, the physicians who would have to oversee your experiment with the ten people were to say, "we refuse to permit that experiment because we say it is no use—and we claim the only right to decide what is useful because we are 'medical science.'" Then: you would be sure they were doing so for the criminal purpose of obstructing the solution and the ending of the fishpoison deaths in this area. I was just that sure after August sixth.

I had gone to my local library on the morning of August sixth to test my theory that (since the victims had all seemed to eat the local fish about Friday, July twenty-third) and the symptoms were those of systemic poisoning (I could not then define the words toxemia, slow) that what might well be involved was the most bizarre mystery type of poisoning I had ever heard of: either the fish poisoning which mysteriously hit Drake's fleet and other sailing ships, or fish accidentally cured with a poison salt (substituted for a chemically similar safe salt) as had happened during my adulthood at Philadelphia once before. I asked the librarian (named "Loretta", I later learned) to help me to research the case and she immediately pointed out the paperback \$3.95 book, "Emergency Medical Guide of 1973." Now—it just happens that the "Guide" has the best short descriptions of the fishpoisons. Why is that important? Because far more than half the research papers (monographs) on the far out subject have been written since 1950. The description there by doctor John Henderson was the syndrome of the symptoms of "Philadelphia Mystery Respiratory Diseases" in all its fine points except for the one variation (called anomaly): At Philadelphia, as in Drake's fleet, a burning fever after no symptoms of nausea for a few days after eating the fish was the very, very common case. (As the legionnaire who gave testimony that he and his wife had most symptoms since August without 102 degree fever and are angry that the CDC will not admit they have the same disease testified to you, the fever anomaly is not a universal one among the poison diseased here.)

Return, Congressman Murphy to my analogy. I know from August sixth that I had gone to the librarian with an open mind and sought facts. The facts she pointed to had proved my proposed theory. I have since had no doubt that any other human being can understand that proof. The latest description of fishpoison, ciguatera, fitted and explained the legion outbreak.

Have some apprentice reporters and some GS-5 underpaid clerk at Atlanta brought a citation about fishpoison which was written before 1940 to reporters and epidemiologists? And do senior physicians and editors let the work of their own novice noodleheads quote "disprove" unquote the truth because what was written before 1940 about this subject is ancient history which was written before five-sixths of the scientific investigation of the subject? Whatever the reason, since August I have had no doubt that anyone competent to investigate for fishpoison in the legion outbreak of poisoning would quickly confirm it.

And when I inform the CDC of the ongoing cause of deaths to Americans I expect they will react with due competence and diligence. And when they reacted and claimed to not have competent investigating capabilities (just as doctor Bachman for the state covers up the fact he has toxicologists), I felt fully justified to accuse them of responsibility for the resultant deaths, or homicides, or murders. I did so accuse the CDC. To my mind they did reply by criminal acts to show intent to murder. On August twelfth (p. 5, 6 (Proofs), I reminded them there were many non-Legionnaire victims.

On August fourteenth, they proved Federal criminal intent by removing those poison victims from the list of victims. On August sixteenth, (p. 19, Proofs), my telegram to Senator Schweiker protested that fraud with intent to murder for its obvious political purpose of claiming to hide poison deaths of Pennsylvanians to keep Pennsylvania Republican delegates from switching from Gerald Ford. (Even at this late time, it is easy to show the criminality of the CDC fraud. They still try to hide one-third of the fishpoison victims as not part of their fake disease. They call about 151 "respiratory disease, Philadelphia" victims; but 70 more they call "Broad Street Pneumonia" victims and non-Legion victims as if Broad Street were in Oshkosh instead of in Philadelphia.)

Then, Congressman, you may see in my September 22, 1976 letter to Doctor Fraser and his answer (p. 45-54, and 66, Proofs) that I asked if he were going to go in murder and in fraud to hide the continuing killing of citizens by the fishpoison with the CDC active premeditated lies of "we ain't got no sense" as their fake act. See that he answered in the affirmative for Federal first degree murder.

Yes, sir. You will fully understand my charges only when the committee itself has found that my words are true in the two dramatic proofs (fish-eating older Catholics are the major part of victims. Startlingly, victims can create their own relapses from this strange disease of ciguatoxic fishpoison merely by eating "good" fish with others who will not get the symptoms at all).

From my own experience we can predict that the murder doctors of the CDC will fight to stop the experiment with five of the victims eating fish again to create such a proof relapse. As they do so they will confirm their several week fraud with intent to murder to hide the Federal fishpoison killings as long as they can. CDC hides. More people eat poisoned fish and die. Q.E.D. (from my mathematics), CDC=first degree murder. We have Doctor Fraser's October first reply to my September 22nd letter as proof.

I deeply hope you will not let the CDC hold up the Congress with the proof of the cause in the form of the startlingly dramatic proof that fish-eating will make a victim relapse. Ignore Doctor Fraser and Doctor Sencer. They are confessed murderers. They are physicians, not scientists. You do not need Pliny the Elder to tell you they murder with impunity. You know their trade.

You of Congress can embarrass the National Institute of Science into sponsoring the new experiment. Pose to them this question, "Doctor Boehlke of the Academy of Natural Science says you cut off funds for continuing research in Ciguatera by Doctor Banner in Hawaii to save a few thousand dollars this year because you believed Ciguatera was no problem. Will you not then demand that an experiment which charges that your false economy abets poison murder be done at once to prove or disprove said charge of crime? I hope the Congress can control its Federal scientists and physicians.

Very truly yours,

CLAUDE E. JOHNSON.

[Whereupon, at 2:22 p.m., the hearings were adjourned.]

