United States General Accounting Office

GAO

Report to the Honorable
Lauch Faircloth
U.S. Senate

March 1998

AIR POLLUTION

Prior Indoor Air Quality Problems at the National Institute of Environmental Health Sciences

GAO/RCED-98-69

GAO

United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-279071

March 12, 1998

The Honorable Lauch Faircloth
United States Senate

Dear Senator Faircloth:

The National Institute of Environmental Health Sciences (NIEHS), the component of the National Institutes of Health that does research on environment-related diseases, moved into a new facility at Research Triangle Park, North Carolina, in April 1981. Soon after the agency occupied the facility, some employees began complaining about the quality of the air, primarily in one of the facility's five modules. Even though considerable time has passed, some employees continue to believe that the quality of the air—specifically, the level of formaldehyde emissions—in the building in 1981 has caused them to have continuing health problems.[1]

In response to your inquiries, NIEHS and the Inspector General (IG) of the Department of Health and Human Services issued two letter reports in 1997 addressing some aspects of the employees' complaints; other questions, however, remained unanswered. Accordingly, you asked us to (1) determine the quality of the air inside the NIEHS building when it was first occupied in 1981, (2) identify the health effects associated with exposure to formaldehyde, and (3) describe the current management practices at NIEHS for air handling and air monitoring. This report describes the results of our work.

Results in Brief

The National Institute of Environmental Health Sciences does not have data showing what the air quality was inside its new facility during the first 5.5 months that the building was occupied. However, in response to some employees' concerns, the agency began monitoring the air in September 1981. The agency found that formaldehyde levels ranged from 0.1 to 0.34 parts per million (ppm), well below the Occupational Safety and Health Administration's safety standard in effect in 1981. Officials of the National Institute of Environmental Health Sciences said that during the first 5.5 months, they made adjustments to the air handling system to balance the air flow and introduce more outside air to help alleviate the respiratory problems that some employees were experiencing.

[1]Formaldehyde is a chemical widely used in building materials, in household products, and as a component in other chemicals; it can be released into the air by products containing it.

Formaldehyde is a known irritant. Short-term exposure to formaldehyde at concentrations as low as 0.41 ppm can irritate the eyes and the respiratory tract. Such effects usually pass quickly, however, once the exposure ends. According to the National Institute for Occupational Safety and Health, short-term exposure to very high concentrations of formaldehyde—20 ppm—is considered to be immediately dangerous to the life and health of humans. Long-term exposure to formaldehyde at levels of 14.1 to 14.3 ppm has produced cancer in the nasal passages of laboratory animals. Because it is carcinogenic in animals and is known to damage genetic material in cell cultures, formaldehyde has been classified as a probable human carcinogen. However, examination of epidemiological evidence has not demonstrated a firm relationship between formaldehyde and cancer in humans.

The National Institute of Environmental Health Sciences' current managers are more aware of the need for adequate air handling systems in buildings and for routinely monitoring indoor air levels to protect employees from exposure to indoor air pollutants than managers were in 1981. For example, prior to a recent move into a new laboratory module at Research Triangle Park, the agency took a number of steps to ensure the quality of the building's indoor air, including improved air handling and monitoring measures. Also, the manufacturing standards for building materials and office furnishings are more stringent today to ensure that the off-gassing levels of chemicals such as formaldehyde are much lower than in past years.[2]

Background

When the air quality problem occurred at NIEHS in 1981, far less was known about indoor air pollution than is known today, and there was a strong emphasis on energy conservation. As a result of the emphasis on energy conservation at that time, building engineers at facilities across the country had reduced the air exchange rate of air handling systems and initiated other conservation measures.[3] NIEHS began moving employees into its new facility at Research Triangle Park, North Carolina, on April 11, 1981. The facility was constructed in five modules, each with its own air handling system. Modules A and B were administrative spaces; modules C, D, and E were laboratories. According to NIEHS officials, the laboratory

[2]Off-gassing is the continuous emission, over a period of time, of gaseous pollutants, such as formaldehyde, from building materials and furnishings.

[3]The air exchange rate is the amount of outside air brought into a building by the air handling system. Increasing the air exchange rate requires an air handling system to cool more air from the outside in the summer and to heat more air from the outside in the winter.

modules required their air handling systems to make a 100-percent exchange of the air, whereas the administrative modules had varying amounts of fresh air added, depending on the outside temperature. Shortly after moving into the new facility, some employees in module A began complaining of respiratory problems and eye and throat irritation. Most of the complaints came from the second floor of module A, where most of the administrative employees had office space.[4] One employee went to the hospital on April 20, 1981, complaining of respiratory problems, and a subsequent worker's compensation claim attributed the illness to her work environment.

According to the U.S. Consumer Product Safety Commission, formaldehyde is normally present at low levels, usually less than 0.03 ppm, in both outdoor and indoor air. Moreover, homes or offices furnished with products that release formaldehyde into the air can have levels of more than 0.03 ppm. The Occupational Safety and Health Administration's (OSHA) occupational safety standard for formaldehyde in 1981 was 3.0 ppm; the current standard is 0.75 ppm. Indoor formaldehyde levels can vary greatly, depending on the type of building materials and furnishings used, the length of time that these materials have had to off-gas, the temperature and humidity, and the amount of fresh air brought into the building. Indoor formaldehyde levels can be reduced by using materials that contain less formaldehyde, airing the materials out before allowing employees into the space, and increasing the amount of fresh air brought into the building. Although formaldehyde levels can also vary with the temperature and humidity, these factors are controlled in an occupied building and, thus, may not have much effect.

In response to requests from your office, two letter reports were issued, one by NIEHS and the other by the Deputy IG of the Department of Health and Human Services, addressing issues involving complaints by employees that they may have become ill after being exposed to the air in the new facility. NIEHS' report, dated March 31, 1997, addresses the events and health effects that may have been caused by exposure to formaldehyde when the new facility was first occupied in April 1981. The IG's letter report, dated August 15, 1997, addresses NIEHS' (1) grievance procedures and treatment of employees, (2) compliance with appropriate policies and procedures regarding employee complaints, and (3) venting and other practices to ensure proper ventilation before the facility was occupied.

[4]Because module A was the focus of the employees' concerns, our work concentrated on that module. However, NIEHS conducted air quality monitoring and adjusted the air handling systems in both modules A and B.

The Quality of the Air Inside the NIEHS Building in April 1981

NIEHS does not have data showing what the air quality was inside its new facility when employees began moving into it on April 11, 1981, or during the first 5.5 months that the building was occupied. NIEHS officials said that such monitoring for airborne contaminants was not common practice at the time. They also said that during these 5.5 months, the air handling system was adjusted to improve the air distribution in module A to help alleviate respiratory problems that some employees were experiencing because it was not immediately recognized that indoor air contaminants could be originating from within the space. In response to the concerns of some employees, NIEHS contracted with the School of Public Health at the University of North Carolina to monitor the air throughout modules A and B and to analyze the results to determine the quality of the air. The initial testing began in September 1981. At our request, an indoor air expert at the Environmental Protection Agency (EPA) extrapolated the range of possible formaldehyde levels in module A when the employees first moved into the space in April 1981. He concluded that those levels were probably higher than the levels measured in September of that year.

The initial monitoring, which took place on September 28 and 29, 1981, found that the formaldehyde levels on the second floor of module A ranged from 0.1 to 0.34 ppm—well below OSHA's standard in effect in 1981. Subsequent monitoring between January 20 and March 1, 1982, by the School of Public Health and others showed formaldehyde levels that were no higher than 0.044 ppm. The monitors were placed on top of desks, in closed wooden bookcases, and in other locations and attached to the clothing of some employees. Formaldehyde levels, however, may have been higher when the employees first moved into the space than when the measurements were taken because research shows that formaldehyde levels in enclosed spaces decrease rapidly during the first few days to several weeks. The contractor also sampled the air in modules A and B for 22 other organic substances and detected minute amounts—less than 0.1 ppm—for 10 of these substances, such as benzene, toluene, and trichloroethane.[5] According to the contractor, the level for each of these substances was well below the standard in effect at the time. An air quality survey done by the National Institute for Occupational Safety and Health for NIEHS in March 1982 reported that the primary source of the formaldehyde was the particle board in the office furnishings.

NIEHS officials said that adjustments were made to balance the air flow and introduce more outside air in module A during the first 5.5 months to

[5]According to NIEHS officials, the 22 organic substances were a standard set of chemicals for an air quality screening, and it was not unusual for some trace amounts of these chemicals to be detected because some of them are used in inks and office supplies.

alleviate respiratory problems that some employees reported. According to the officials, because the air was not being monitored during this period, the levels of formaldehyde that the employees were exposed to are unknown. The officials also said that in the early 1980s, air quality measurements were not usually made when employees first moved into buildings because indoor air quality was generally not recognized as the serious health concern that it is today.

We asked the indoor air expert from EPA to use NIEHS' air monitoring data to extrapolate a range of possible formaldehyde levels in module A when the employees first moved into the space in April 1981. The expert said that the limited amount of data available made it difficult to estimate the possible formaldehyde levels for the period before NIEHS began monitoring the air. However, with the available data as input for a formaldehyde decay curve,[6] the expert's mathematical extrapolation showed that the initial formaldehyde levels probably ranged between 1.2 and 7.5 ppm when the employees first moved into module A—higher than the levels measured in September 1981.[7] In light of his knowledge about formaldehyde off-gassing from building materials and office furnishings, and the variables that can affect the rate of off-gassing, he said he believed that the actual levels were near the lower end of the range and were probably less than 2.0 ppm, which would be below the occupational safety standard that existed in 1981. Moreover, he stated that the formaldehyde levels probably declined quickly during the first few days to several weeks and continued to decline over time. NIEHS officials, however, do not believe that initial formaldehyde levels can be accurately modeled because of the multiple variables that could have affected the concentrations. They said that the lack of reliable information on such variables as the amount of formaldehyde in the materials when manufactured, the temperature and humidity conditions during the period, and the air exchange rates makes any extrapolation results highly suspect and speculative. Given such uncertainties, they believe that the initial formaldehyde levels were probably at the lower end of the extrapolated range because the furnishings had been installed some time before module A was occupied in April 1981.

[6]A decay curve is a graphic representation of the way formaldehyde is emitted from materials (off-gassed) over time.

[7]This range was calculated using the generally accepted certainty level for scientific calculations of 95 percent. In other words, given the available data, it is 95-percent certain that the actual levels of formaldehyde fell within this range.

The General Services Administration's (GSA) guidelines recommend that air handling systems in buildings be tested to determine if they are operating in accordance with specifications. Although the GSA guidelines in effect at the time called for test and balance certifications to be prepared before buildings were occupied, the Health and Human Services Regional Office Facilities Engineering Corps that was responsible for overseeing the building's construction did not have the certification for module A signed until September 29, 1981, 5.5 months after employees moved into the module. NIEHS officials said that they adjusted the air handling system during the first 5.5 months in an effort to alleviate the employees' discomfort. However, an April 27, 1982, memorandum from NIEHS' Health and Safety Manager said that the air handling system could not have been in proper balance on September 29, 1981, as certified, because the agency continued to adjust the system to improve the air flow and the air exchange rate after the certification was signed. A time line summarizing the key events during the first several months of occupancy is in appendix I.

Health Effects Associated With Exposure to Formaldehyde

The short-term effect of formaldehyde is irritation of the eyes and respiratory tract—in particular the nose and throat and, possibly, the lungs with concentrations as low as 0.41 ppm. Because formaldehyde changes quickly into other compounds when it contacts tissue, other body parts, by and large, are not adversely affected by inhaling formaldehyde. Surveys of the known research show there is no evidence that short-term exposure to formaldehyde affects the musculoskeletal, cardiovascular, immunological, neurological, reproductive, developmental, endocrine, renal, or hepatic systems of the human body, while only "a few . . . vague" gastrointestinal effects have been found. Moreover, the effects it has on the eyes and respiratory tract usually pass quickly once the exposure ends. Furthermore, predominant research results have found that people with asthma react no differently to formaldehyde exposure than do those without asthma. According to the National Institute for Occupational Safety and Health, short-term exposure to concentrations of 20 ppm of formaldehyde is immediately dangerous to the life and health of humans.

Long-term exposure of laboratory animals to formaldehyde at a concentration of 2.0 ppm has not been shown to produce nasal cancer. But at concentrations of 14.1 to 14.3 ppm, studies have shown sharp increases in cancer of the animals' nasal linings. Studies of long-term exposure have also shown that the occurrence of cancer increases as the concentration of formaldehyde increases. Even though it has not been unequivocally

proven that long-term exposure to formaldehyde has the same effect on humans, the results of the tests on animals have raised concerns that it may affect humans. A number of epidemiological studies that examined the incidence of cancer in certain population groups have been done, primarily with groups that have had long-term occupational exposure to formaldehyde, such as morticians and pathologists. These studies have not produced clear evidence that long-term low-level exposure can cause cancer in humans. While many studies have found no or uncertain correlation between formaldehyde and cancer, others have found that the incidence of some cancers increases from exposure to formaldehyde. However, all of the studies that have shown an association had methodological shortcomings. According to The Toxicological Profile for Formaldehyde, "The overall conclusion to be drawn from these and other studies is that there is not a firm relationship between formaldehyde and the induction of cancers in humans."[8]

The three agencies that are responsible for determining whether substances should be categorized as carcinogens—that is, as cancer-causing substances—have placed formaldehyde in an intermediate classification because of the clear evidence that formaldehyde causes cancer in the nasal linings of laboratory animals and the limited evidence from the epidemiological studies of humans. The agencies and their classifications of the effects of formaldehyde on humans are as follows:

- International Agency for Research on Cancer: Probably carcinogenic to humans;
- National Toxicology Program: Reasonably anticipated to be a carcinogen; and
- EPA: Probable human carcinogen.

EPA did a risk assessment of formaldehyde in 1987 and updated the assessment in 1991. The overall result of the update was that EPA reduced the estimated risk of cancer for humans by a factor of 50 (i.e., EPA decided that the risk of cancer from formaldehyde was not as great as it had originally thought). Much of this reduction occurred because of a change in the way that EPA estimated the effects of exposure to formaldehyde. The earlier method measured the concentration of formaldehyde in the air being breathed, whereas the current method uses a more direct measure of the way that formaldehyde affects tissues. This method estimates the levels of formaldehyde at the site where it most often comes in contact

[8]The Toxicological Profile for Formaldehyde, U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, Public Health Service (Atlanta, Ga.: Sept. 1997), p. 233.

with tissue, such as the nasal lining, by measuring the compounds in the tissue that were produced by the exposure to formaldehyde.

In discussing this change, EPA explained that it was desirable to have a complete biological understanding of how cancers were caused by a substance and that this change in method recognized a significant step in that direction. However, because it was not yet completely understood whether or how cancers in humans might be caused by formaldehyde, it was still necessary to extrapolate the risks to humans based on data from animal studies. EPA's decision was significantly influenced by the fact that formaldehyde has been clearly shown to be genotoxic—that is, it causes various kinds of chemical damage and mutations to genetic material—in laboratory microorganisms, tissue culture tests, and some animal tests, which makes it particularly suspected of being a carcinogen.

NIEHS' Current Management Practices for Monitoring Air Quality

NIEHS' current management is more aware of the need to have adequate air handling systems in buildings and to better monitor indoor air levels to reduce employees' exposure to indoor air pollutants. For example, before moving into a recently completed laboratory module at Research Triangle Park, NIEHS initiated a number of health and safety measures to ensure the quality of the module's indoor air, including improved air handling and monitoring measures and the use of less polluting building materials and furnishings. In addition, according to EPA officials, the manufacturing standards for building materials and office furnishings are more stringent today to ensure that the off-gassing levels of chemicals, such as formaldehyde, are much lower than in past years.

NIEHS completed the new module at its Research Triangle Park facility in August 1996. According to NIEHS officials, the project engineer was responsible for keeping track of the building materials used in the construction and furnishing of the module and for ensuring that the materials did not contain excessive levels of pollutants, such as formaldehyde, that would cause indoor air quality problems. NIEHS officials also said that they ensured that the air handling system installed would meet the air exchange rate for the new laboratory space (i.e., 100-percent exchange) recommended by the American Society of Heating, Refrigeration, and Air-Conditioning Engineers, Inc.[9] Before the new module was occupied by employees in 1996, NIEHS conducted several air monitoring tests of all areas of the building to ensure that the air handling

[9]The Society is an international organization that writes standards and guidelines in its field of expertise—which includes indoor air quality—that describe recommended practices for the design and installation of equipment.

system was functioning properly and that any off-gassing of pollutants from the building materials and furnishings was below OSHA's standards. Even after employees moved into the new module, NIEHS' Health and Safety Branch continued to perform some air monitoring to ensure that air quality problems did not occur. According to NIEHS officials, these improvements have reduced the number of complaints from employees about the air quality in their work space.

NIEHS' air monitoring procedures for existing space have also changed since the indoor air quality problems occurred in 1981. According to NIEHS officials, current procedures require the Health and Safety Branch to perform an indoor air quality assessment whenever an employee complains about the air flow or air quality, whenever renovations to an area result in the use of new building materials or furnishings, or whenever the building management staff suspects that the air flow or air quality may not be correct. Furthermore, according to NIEHS officials, the air exchange rate recommended by the American Society of Heating, Refrigeration, and Air-Conditioning Engineers, Inc., for administrative space (i.e., 20 cubic feet per minute) is currently being used for the older modules A and B at the facility. Also, according to NIEHS officials, some adjustments, in addition to those done as part of routine maintenance, are still being made today as the agency responds to complaints about the indoor air. The officials said they believe that the continued complaints are the result of employees' heightened awareness of indoor air pollution and not to formaldehyde off-gassing.

According to EPA officials, the manufacturing standards for building materials and office furnishings are more stringent today than they were in 1981 to reduce the off-gassing of chemicals such as formaldehyde. As federal agencies became more aware of indoor air pollution problems in the early 1980s, EPA and other agencies worked with the industries that make many of the materials used in office spaces—such as furniture, particleboard and wallboard, and carpet—to reduce the amount of chemicals used in the production of their products. Manufacturers have met these new standards by using less formaldehyde in their products and by using other materials to encase products that contain high levels of pollutants to prevent the off-gassing of these chemicals. In some instances, manufacturers suggest that their products be aired out before they are installed in an office building or that the building be aired out before it is occupied.

Agency Comments and Our Evaluation

We provided copies of a draft of this report to the National Institute of Environmental Health Sciences (NIEHS) for review and comment. The agency generally agreed with the information presented but took exception to the section dealing with the mathematical extrapolation showing the probable range of formaldehyde levels when employees first moved into the new building. The agency does not believe that it is possible to accurately model what the formaldehyde levels were in April 1981 because of the multiple variables that could have affected the levels and the lack of reliable information from 1981.

While we agree that there are many uncertainties that make modeling formaldehyde levels in April 1981 difficult, enough is known about the various factors to do a simple mathematical extrapolation along a decay curve to show that the possible readings would have been higher than those measured in September 1981. For example, factors such as the type of materials in the building did not change significantly, and the air exchange rate in September should have been higher than in April. These, as well as other physical factors, point to the concentrations of formaldehyde being higher in April than in September 1981, but since monitoring was not done in April, there is no way of knowing exactly how much higher. All of the agency officials we spoke with from NIEHS and EPA agreed that the levels of formaldehyde at the facility in April were higher than in September. Opinions differed, however, as to how much higher the levels were, but there was general agreement that they were likely to have been no higher than 2.0 ppm. NIEHS stated that the initial levels were probably below 2.0 ppm because higher exposures would have caused significant eye irritation in most people and most employees first occupying the space were able to tolerate their indoor environment. We added NIEHS' views as appropriate. Appendix II contains the full text of the agency's written comments.

Scope and Methodology

Our review included interviews with NIEHS officials, current and former NIEHS employees, and scientists and experts knowledgeable about modeling, air handling, air monitoring, and the exposure to and the effects of formaldehyde. We also reviewed available documentation and air monitoring data compiled by NIEHS from September 1981 through March 1982. Because no air quality measurements were taken in the new NIEHS facility during the first 5.5 months that it was occupied, we relied on extrapolations and interviews to determine the most likely quality of the air inside module A when it was first occupied. We asked an EPA scientist, who was identified by the agency as an indoor air expert, to use NIEHS' air

monitoring data from September 28, 1981, through March 1, 1982, to extrapolate the formaldehyde levels when employees first moved into module A. To identify the available research on the health effects of formaldehyde, we reviewed The Toxic Profile for Formaldehyde (the September 1997 peer-reviewed draft) prepared by the Department of Health and Human Services' Agency for Toxic Substances and Disease Registry. We also reviewed the April 1987 Assessment of Health Risks to Garment Workers and Certain Home Residents From Exposure to Formaldehyde, prepared by EPA's Office of Pesticides and Toxic Substances, and the June 1991 update, Formaldehyde Risk Assessment, prepared by EPA's Office of Toxic Substances. We also reviewed other technical literature on the health effects of formaldehyde. We performed our work from October 1997 through January 1998 in accordance with generally accepted government auditing standards.

As arranged with your office, unless you announce its contents earlier, we plan no further distribution of this report until 15 days after the date of this letter. At that time, we will send copies to the appropriate congressional committees; the Secretary, Department of Health and Human Services; and the Director, Office of Management and Budget. We will also make copies available to others on request.

Please call me at (202) 512-6111 if you or your staff have any questions. Major contributors to this report are listed in appendix III.

Sincerely yours,

Peter F. Guerrero
Director, Environmental
Protection Issues

Contents

Letter 1

Appendix I
Key Events in the Move to Module A and the Monitoring of Indoor Air Quality 14

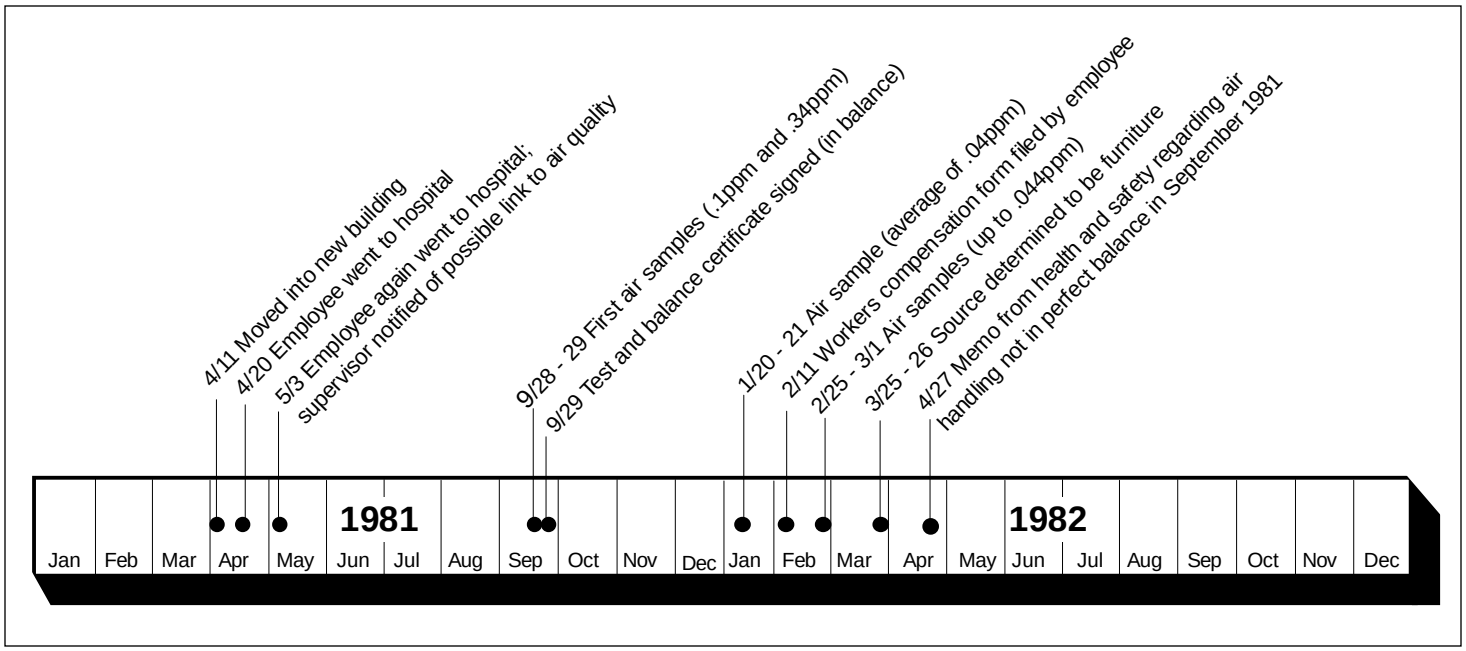
Appendix II
Comments From the National Institute of Environmental Health Sciences 15

Appendix III
Major Contributors to This Report 18

Abbreviations

GSA	General Services Administration
EPA	Environmental Protection Agency
IG	Inspector General
NIEHS	National Institute of Environmental Health Sciences
OSHA	Occupational Safety and Health Administration
ppm	parts per million

Key Events in the Move to Module A and the Monitoring of Indoor Air Quality



Source: National Institute of Environmental Health Sciences' files.

Comments From the National Institute of Environmental Health Sciences

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

National Institutes of Health
National Institute of
Environmental Health Sciences
P.O. Box 12233
Research Triangle Park, N.C. 27709

February 13, 1998

Mr. Peter F. Guerrero
Director, Environmental Protection Issues
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Guerrero:

Enclosed are comments by the National Institute of Environmental Health Science on the GAO Draft Report entitled "Information on Prior Indoor Air Quality Problems at the National Institute of Environmental Health Sciences," GAO/RCED 98-69, March 1998.

Sincerely,

Kenneth Olden, Ph.D.
Director

Enclosure

cc:
Mr. William Gillen, NIH

NIEHS COMMENTS ON THE GAO DRAFT REPORT ENTITLED INFORMATION ON PRIOR INDOOR AIR QUALITY PROBLEMS AT THE NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES, GAO/RCED 98-69, MARCH 1998

1. The GAO Draft Report correctly observes that NIEHS does not have data indicating the quality of the air during the first 5.5 months after the new building was occupied in April 1981. Pre-occupancy monitoring for airborne contaminants was not common practice at that time. The initial efforts of the NIEHS building management staff were focused on adjusting the ventilation system to improve air distribution. There was not an immediate recognition that indoor air contaminants could be originating from within the space.

2. An indoor air expert from EPA was asked by GAO to estimate possible formaldehyde levels at the time employees first moved into the module A space in April 1981. The expert's mathematical extrapolation indicated that initial levels could have ranged from 1.2 to 7.5 ppm, with the actual level probably less than 2.0 ppm. Although individuals vary in their ability to tolerate the irritating effects of formaldehyde, exposures above 2.0 ppm will cause significant eye irritation in most people. The fact that most employees first occupying the space were able to tolerate their indoor environment, supports the estimate that the actual levels were less than 2.0 ppm.

   NIEHS wishes to point out that the assumption that initial formaldehyde levels could be accurately modeled is speculative. The formaldehyde concentration resulting from material off-gassing in module A would have been profoundly influenced by multiple variables such as, the content of formaldehyde in the materials when manufactured, the length of time from manufacture to placement in the building and occupancy by employees, temperature and humidity conditions during these periods, total air volumes and air exchange rates, the actual surface area of the source materials, the variable emission rates from different sources, and other factors. Reliable information from 1981 is not available to allow accurate estimation for most of these variables. Given the high degree of uncertainty, results from the decay curve modeling must be viewed as suspect and speculative. Statements in the Draft GAO Report that formaldehyde levels were higher when employees first occupied module A are just as speculative if based on the decay curve model. The 95% statistical certainty asserted by footnote 7 in the Draft Report does not reflect the great uncertainty in the assumptions used to derive the extrapolated concentration range. Thus, it is no more accurate than the speculative assumptions used in applying the model.

3. The GAO Draft Report mentions that NIEHS contracted with the School of Public Health, University of North Carolina (UNC), to monitor the air in Building 101 modules A and B. The monitoring was conducted on September 28-29, 1981. It should be noted that in addition to this survey, NIEHS also contracted for a follow-up evaluation of the air quality and air monitoring was conducted by UNC during January, February, and March, 1982. Further, NIEHS requested assistance from the National Institute for Occupational Safety and Health, resulting in a third air quality survey conducted on March 25-26, 1982.

4. It is stated in the GAO Draft Report that the test and balance report for Building 101 air handling systems was not signed and certified until September 29, 1981, after the employees had moved into module A. NIEHS would like to clarify that NIEHS was not responsible for testing and balancing of the building air handling systems prior to building acceptance. As stated by the HHS Inspector General's Office in their report to Senator Faircloth, the HHS Regional Office Facilities Engineering Corps in Atlanta, Georgia, was responsible for over seeing all phases of this building's construction, including the certification of the test and balance report.

5. The GAO Draft Report indicates that adjustments to the air handling systems are being made as NIEHS responds to employee concerns about indoor air quality. NIEHS wishes to clarify that any current air system adjustments or recent indoor air quality concerns are not related to the off-gassing of formaldehyde that occurred in 1981. Maintaining good indoor air quality is a vital part of NIEHS facility management programs. In any large building, such as the NIEHS Building 101, indoor air quality complaints or concerns may be voiced from time to time, particularly during renovations. As the GAO Draft Report indicates, current NIEHS procedures require prompt and thorough investigation of all employee complaints regarding health and safety, including indoor air quality.

6. In Appendix I (Timeline of Key Events Associated with the Move and Indoor Air Quality Measurements at NIEHS), the GAO Draft Report indicates an employee was "sent" to the hospital on two occasions. While it is acknowledged that the employee did seek hospital treatment, NIEHS did not send the employee to the hospital.

Major Contributors to This Report

Resources, Community, and Economic Development Division

William F. McGee, Assistant Director
Joseph L. Turlington, Evaluator-in-Charge
Richard A. Frankel, Technical Adviser
Philip L. Bartholomew, Evaluator
James B. Hayward, Evaluator

Ordering Information

The first copy of each GAO report and testimony is free. Additional copies are $2 each. Orders should be sent to the following address, accompanied by a check or money order made out to the Superintendent of Documents, when necessary. VISA and MasterCard credit cards are accepted, also. Orders for 100 or more copies to be mailed to a single address are discounted 25 percent.

Orders by mail:

U.S. General Accounting Office
P.O. Box 37050
Washington, DC 20013

or visit:

Room 1100
700 4th St. NW (corner of 4th and G Sts. NW)
U.S. General Accounting Office
Washington, DC

Orders may also be placed by calling (202) 512-6000
or by using fax number (202) 512-6061, or TDD (202) 512-2537.

Each day, GAO issues a list of newly available reports and testimony. To receive facsimile copies of the daily list or any list from the past 30 days, please call (202) 512-6000 using a touchtone phone. A recorded menu will provide information on how to obtain these lists.

For information on how to access GAO reports on the INTERNET, send an e-mail message with "info" in the body to:

info@www.gao.gov

or visit GAO's World Wide Web Home Page at:

http://www.gao.gov

PRINTED ON RECYCLED PAPER

United States
General Accounting Office
Washington, D.C. 20548-0001

Bulk Rate
Postage & Fees Paid
GAO
Permit No. G100

Official Business
Penalty for Private Use $300

Address Correction Requested