



Centers for Disease Control
and Prevention
National Institute for Occupational
Safety and Health
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HHE 2024-0038

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Dear Mr. Finch:

On January 16, 2024, as part of the management team at the University of North Carolina (UNC) Hospitals in Chapel Hill, North Carolina, you submitted a request for a Health Hazard Evaluation (HHE) to the National Institute for Occupational Safety and Health (NIOSH). The request reported concerns regarding cancer among employees in five specified areas of the first floor in the McClendon Clinical Laboratories. McClendon Clinical Laboratories are located on the first floor of the Patient Support Tower (PST) on the north side of UNC Women's Hospital in Chapel Hill. Employees were concerned that cancer diagnoses could be related to exposures in the building. This letter summarizes our evaluation, findings and provides recommendations to address these concerns.

Background

The PST is a section of UNC Women's Hospital built and first occupied in 1982. McClendon Clinical Laboratories, located on the north side of PST on the first floor, houses administrative spaces and laboratories that function 24 hours a day performing testing on biologic samples that aid clinicians in diagnosing, treating, and managing patients. The McClendon Clinical Laboratories areas of interest included for evaluation in this HHE were (1) Transfusion Medicine Service, (2) Lab Administration, (3) Lab Quality Management, (4) Microbiology Lab, and (5) Core Lab. We focused on these five areas at the request of employees and the management team that initiated the HHE request.

Evaluation

The objectives of our evaluation were to (1) evaluate reports of cancer among current and former UNC employees who worked in at least one of the McClendon Clinical Laboratories areas of interest in the past 20 years to identify whether an unusual pattern of cancer exists and (2) determine if there is evidence that a workplace exposure(s) contributed to cancer diagnoses among employees.

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To accomplish these objectives, we used an approach that follows the principles outlined in Centers for Disease Control and Prevention’s (CDC) guidelines for investigating cancer concerns in a community [CDC 2022]. We began by reviewing information about employees with cancer diagnoses and information about exposures that may have been present in the workplace. If we found evidence that the pattern of cancer appeared unusual or we identified a carcinogenic exposure of concern at levels known to be hazardous, we planned to take additional steps to identify all cases of the cancer of concern, conduct a statistical assessment, and evaluate the potential for an association between exposure(s) and the cancer(s) of concern. If the pattern of cancer did not appear unusual and a workplace exposure was not identified, there would not be sufficient cause to conduct additional investigation and therefore we planned to end the evaluation.

Evaluation of Cancer Concerns and Review of Documents

To evaluate concerns about an unusual pattern of cancer among employees, we undertook the following activities.

We engaged in meetings with current employees and employee representatives to better understand the origin and scope of workplace cancer concerns. We then participated in a virtual tour with management and employee representatives on February 5, 2024, to understand the layout of the facility and have a visual understanding of the five areas of interest.

The next step involved review of the following information.

- A list of current and former UNC employees diagnosed with cancer generated from a voluntary survey distributed by UNC Hospital Occupational Health during January 18, 2024–March 11, 2024. The survey was sent to 1,657 invited participants. Invited participants included current employees who primarily worked in an area of interest, former employees who separated from an area of interest, or other staff, medical residents, and fellows who likely worked in an area of interest for greater than 1 year. Additionally, any other individuals who heard about the survey and requested access to participate were given access. Of note, UNC did not invite past employees who had worked in an area of interest but transferred to another location outside of an area of interest prior to separation from UNC, current employees who had worked in an area of interest who transferred to another area, or contract workers due to logistical limitations of finding contact information or a presumed limited amount of prolonged time in an area of interest.

The survey requested information on gender, date of birth, race, diagnosis, age at cancer diagnosis, year of cancer diagnosis, family cancer history, tobacco history, number of years worked in the areas of interest, estimated start date in the area of interest, current

work location, previous work location, separation date, possible carcinogenic exposures outside of the UNC work environment, and individual contact information.

- Records of remedial actions performed within the areas of interest over the past 20 years, including work performed by contractors for asbestos remediation conducted in December 2020 and environmental asbestos sampling during work performed in July 2016.
- Records of various incident reports that took place in the areas of interest. Types of incident reports included chemical spill reports, email correspondence regarding pest and water intrusions in Lab Quality Management in July 2016, and employee reported health and safety issues in all areas, referred to as SAFE reports, from May 2019–January 2024.
- A detailed inventory of chemicals stored within the areas of interest including laboratory reagents and cleaning products.
- Records of regulatory inspections, including an inspection report conducted by the North Carolina Department of Labor in August 2018 and a report from the North Carolina Department of Health and Human Services (NCDHHS) in the areas of interest in January 2024.

Results

Evaluation of Cancer Concerns

Discussions with employees and employee representatives indicated that multiple employees had expressed concern or had heard concerns from other employees about an unusual pattern of cancer among those who had worked or currently worked in areas of McClendon Clinical Laboratories. Employees were especially concerned about one office (E1060) in Lab Administration where three employees diagnosed with cancer had worked. Additionally, employees raised concerns about a perceived excess number of breast cancer diagnoses among employees over the past 20 years.

UNC Occupational Health provided a list of 47 individuals who reported a cancer diagnosis in their voluntary survey. Cancer diagnosis included individuals that listed a specific type of cancer, a precancerous condition, or a cancer workup in progress. The majority of the list was generated by self-report, but a small number (n = 3) by family and friends. Of the 47 individuals, the majority were female (n = 42, 87%) and the median age at the time the data were collected was 58 (range: 34–80 years).

The most common diagnosis reported was breast cancer (n = 25), followed by cancers of the blood, lung, ovaries, and testicles (each with five or fewer diagnoses reported). The primary cancer site was unknown for 4 individuals and 3 individuals had more than 1 cancer diagnosis. The median age at diagnosis (of the 29 individuals with a reported age of diagnosis) was 48 (range: 28–72 years).

Of the 25 individuals with breast cancer, all were female. For the 19 individuals with available information on age at diagnosis, median age of diagnosis was 49 years (range: 28–72 years). A little over half (n = 15/25, 60%) reported a family history of cancer; 10/25 (40%) reported a family history of breast cancer specifically. Among 19 individuals reporting a diagnosis of breast cancer with complete data, the median time between beginning work in the area of interest and receiving a cancer diagnosis was 20 years (range: 1–42 years). Two individuals were diagnosed with breast cancer within 4 years of beginning work.

In addition to the 47 responses with a cancer diagnosis, there were 10 additional responses with no cancer diagnosis. Of these, some had other medical diagnoses, missing data or reported no cancer diagnoses.

The best estimate of the total number of people who worked in the areas of interest provided by UNC during the 20-year period was represented by the number of the invited study population, 1,657.

Review of Documents

Documents described asbestos remediation, indoor air quality, and related compliance activities. Several documents, including detailed asbestos monitoring and clearance reports for locations like the Core Lab and the Microbiology Lab, reveal consistent monitoring during remediation activities and adherence to safety standards. All measured asbestos concentrations in air samples were found to be below the Environmental Protection Agency (EPA) airborne clearance level (0.01 fibers per cubic centimeter) and the OSHA permissible exposure limit (0.1 fibers per cubic centimeter for an eight-hour time weighted exposure), suggesting effective abatement post-remediation and no significant exposures to employees during remediation work activities.

Documents related to indoor air quality investigations, such as emails about indoor air quality in the Quality Management office, described measures taken by management following employee complaints. These complaints described upper respiratory symptoms that could have been related to environmental exposures, including construction activities. Investigations involved taking measurements from devices like the DustTrak™ II and P-Trak Ultrafine Particle Counter, which found that particulate levels were 0.006 mg/m³ (milligrams of dust per cubic meter of air), less than the OSHA Permissible Exposure Limit (PEL) for Particulate Not Otherwise Regulated (PNOR), respirable fraction, at 5 mg/m³. However, older office equipment, notably laser printers, were identified as a significant source of particulate matter, leading to recommendations for equipment upgrades and comprehensive environmental cleaning. One laser printer of concern was removed, and cleaning was completed.

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The documents reviewed described issues related to pest management and water intrusions within UNC Women's Hospital. Pest control and water leakage are critical issues because they can lead to the degradation of building materials and create environments conducive to microbial growth, including mold, which poses health risks, though cancer is not one of these health risks. The hospital's environmental health and safety team appeared to address these concerns by sealing potential entry points for pests and repairing leaks to mitigate water damage each time after employee complaints were filed.

The review of the list of chemicals used during work in the areas of interest identified the presence of several chemicals within McClendon Clinical Laboratories that are potentially carcinogenic to humans, including three products containing formaldehyde, two with phenol, and some containing ethylenediaminetetraacetic acid. These substances are recognized for their potential carcinogenic properties under certain exposure conditions, as classified by the International Agency for Research on Cancer (IARC). Given the presence of these hazardous chemicals, UNC Women's Hospital maintains safety protocols and handling procedures to minimize exposure risks. Additionally, a review of spill reports indicates that there have been no reported incidents where laboratory workers were exposed to hazardous levels of these chemicals.

The SAFE reports document a total of 13 safety incidents at UNC Women's Hospital during May 2019–January 2024, encompassing a range of safety concerns within the workplace. Four of these reports involved respiratory complaints, with half of the reports describing the indoor air quality issue that was described on page 4 and 5. The remaining two cases related to respiratory health were attributed to odors and exposure to cleaning solutions, which induced irritant symptoms among staff. Additionally, the reports include five incidents related to dermatological issues, such as dermatitis or inflammation, which were suggested to be caused by exposure to ingredients in personal protective equipment (e.g., gloves or face masks). Three of the reports documented minor incidents involving small splashes from cleaning or laboratory solutions. Lastly, there was one report detailing an injury related to an ergonomic hazard.

Inspection reports and correspondence with the North Carolina Occupational Safety and Health Administration office, including a formal complaint regarding respiratory and allergy-like symptoms experienced by employees, were suspected to be related to irritant effects from construction performed near the Quality Management offices in 2019. The North Carolina Department of Labor inspection report dated October 2019 found no violations of safety standards related to the complaint. Lastly, the NCDHHS conducted a visual inspection of the areas of interest in January 2024 and did not observe any issues suggesting air quality problems within the Laboratory Administration offices or any hazards or chemicals likely to cause health impacts to staff.

Discussion

After review of available information, we did not find evidence of a pattern of cancer that appeared unusual or identify a specific carcinogenic exposure of concern at levels known to be hazardous. The sections below provide more detailed discussions on evaluation of a cancer cluster and the documents reviewed.

Understanding cancer and its occurrence in the general population

Cancer is a group of different diseases that share the same feature: uncontrolled growth and spread of abnormal cells [CDC 2022]. As a group of diseases, cancer is very common and has a major impact on affected individuals, families, and society. Approximately 40% of men and women in the United States will be diagnosed with cancer at some point in their lifetimes. The most common cancers estimated to be diagnosed during 2024 (excluding non-melanoma skin cancer) are breast cancer, prostate cancer, lung and bronchus cancer, colon and rectum cancer, melanoma of the skin, bladder cancer, kidney and renal pelvis cancer, non-Hodgkin lymphoma, pancreatic cancer, leukemia, thyroid cancer, and liver cancer [ACS 2024a].

Most cancers are caused by a combination of multiple factors and each different type of cancer has its own set of contributing causes. Some of these factors include personal characteristics (e.g., age, sex, family history of cancer); personal habits (e.g., diet, smoking, alcohol consumption); underlying medical conditions; and exposure to cancer-causing agents in the environment, including the work environment. These factors may act together or in sequence to cause cancer. Although some risk factors for certain types of cancer are known, the causes of many types of cancer remain unknown. In many cases, people with no known risk factors develop cancer.

What is a cancer cluster and how do we determine if cancer could be related to a common exposure?

NIOSH receives many requests to evaluate workplaces regarding concerns related to perceived excesses of cancer. These concerns are understandable, as it can be alarming when employees in the same workplace report developing cancer. However, this does not necessarily mean that the cancer was caused by a workplace exposure.

Cancer often appears to occur in clusters. Scientists define a cancer cluster as “a greater than expected number of the same or etiologically related cancer cases that occurs within a group of people in a geographic area over a defined period of time” [CDC 2022]. A cluster can also occur when groups of individuals who are not expected to develop a particular cancer become ill.

In many workplaces, the number of cancer cases is relatively small. This makes detecting a possible common cause difficult, especially when there are no apparent cancer-causing

exposures. Many factors need to be considered when we assess whether cases of cancer among employees could be related to workplace exposure(s), including:

- Potential for exposure to cancer-causing agents
- Types of cancer reported
- Number of cancer cases reported
- Timing of the cancer diagnosis in relation to the exposure

Cancer clusters potentially related to a workplace exposure usually need to consist of the same type of cancer or etiologically related cancers, because this makes it more likely that a common causal pathway from exposure to disease exists. When several cases of the same type of cancer or related cancers occur and that cancer is either uncommon in the general population or uncommon in the group of people developing it (for example, breast cancer in men), it is more likely that a common workplace exposure may be involved. These issues are discussed below in a series of questions that we used to place information about cancer concerns among workers in McClendon labs in context.

Was exposure to a specific chemical substance or physical agent known or suspected of causing cancer occurring in the areas of interest in McClendon Clinical Laboratories?

No. Our review of environmental health and safety concerns and assessments at UNC Hospitals did not identify any documented exposures to known or suspected carcinogens at levels known or suspected to cause cancer. In the scientific literature, the relationship between some chemical and physical agents and certain cancers has been well established. For other agents and cancers, the evidence is not definitive, but a suspicion exists. When a known or suspected cancer-causing agent is present and the type of cancer occurring has been linked with that agent in other settings, we are more likely to suspect a connection between the workplace exposure and cancer diagnoses.

Concerns about asbestos were raised due to its properties and usage in building materials and industrial applications. Asbestos fibers, when airborne from disturbed materials, pose health risks including lung diseases and cancers like mesothelioma, as well as laryngeal and ovarian cancers [IARC 2012]. However, asbestos is less concerning for breast cancer as there is no established link between asbestos exposure and breast cancer in the scientific literature. The latency period for asbestos-related diseases can be up to 30 years [ATSDR 2001; NCI 2021], emphasizing the importance of ongoing monitoring and management of asbestos-containing materials to minimize exposure and ensure safety. Based on the information we reviewed, it appears the asbestos management has been adequate in the areas of interest.

Has enough time passed for a potential exposure to cause cancer?

The latency period is the time between an exposure to a cancer-causing agent and occurrence of disease. Latency periods vary by cancer type but are usually between 10–20 years [Rugo 2004].

A minimum latency of 4 years has been proposed as a conservative estimate for solid cancers, and of 0.4 years for hematopoietic cancers [Howard 2015]. For individuals who provided details about their employment start date and the timing of their cancer diagnosis, we evaluated this information and found that 41 people had met the minimum latency requirement of working in an area of interest for at least 4 years before their diagnosis. However, we did not identify any known carcinogenic exposure of concern. As a result, we are unable to determine when such an exposure might have started or whether we have captured a relevant timeframe during which cancer could have developed if an exposure had been present.

Do employees who worked or are working in the McClendon Clinical Laboratories have an unusual distribution of types of cancer?

No. Occupational exposure-related cancer is more likely when the same type of cancer or related types have been diagnosed in employees and that type of cancer is not common in the general population. When a group of observed cancers includes multiple types of cancer or multiple cases of a common type of cancer, occupational causes of the observed cancers are less likely and difficult to identify. The distribution of cancer among employees who have worked in the McClendon Clinical Laboratories does not appear unusual, because it includes many different types of cancer and most of them are commonly diagnosed in the United States (including breast, non-Hodgkin lymphoma, lung, and skin cancer).

Do employees who worked or are working in the McClendon Clinical Laboratories have more cancer than people who have not worked there?

No. The number of cancer cases does not appear to be greater than what is expected based on the available information. Cancer is a common disease and can be found among people at any workplace. When multiple cases of cancer occur in a workplace, they may be part of a cluster if the number is greater than we expect compared to the number in other groups of people similar in age, sex, and race. However, small populations can have highly variable disease or tumor rates that rarely match the overall rate for a larger area, such as the state. At any given time, some populations have rates above or below the overall rate. Even when high rates occur, it may still be consistent with the expected random variability. Calculations like this make many assumptions that may not be appropriate for every workplace. Comparing rates without adjusting for age, sex, or other population characteristics assumes that such characteristics have the same distribution in the workplace as in the larger population, which may not be true.

In this evaluation, out of 1,657 employees contacted, 47 (approximately 2.8%) had a reported cancer diagnosis, with 41 meeting assumptions about latency if a workplace exposure had been identified. Approximately 40% of men and women in the United States will be diagnosed with cancer at some point during their lifetimes. Thus, 41 cancer cases among current and former employees does not exceed general expectations. Furthermore, it is estimated that one in eight women in the United States will develop breast cancer over their lifetimes [Feuer et al. 1993].

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Assuming half of the 1,657 employees are female (approximately 829), we would anticipate about 104 women might develop breast cancer eventually. Therefore, the 25 cases reported among current and former employees, with 23 meeting latency assumptions, is lower than the expected number. Additionally, the National Cancer Institute [NCI 2023] finds that the likelihood of developing breast cancer among women during their working ages of 20 to 65 years is 7.3%. A proportion of 25 cases among an estimated 829 female employees (3.0%) does not suggest an excess burden of breast cancer compared to the general population.

We acknowledge that additional cases of cancer beyond those considered here likely exist among employees who either did not receive or respond to the survey distributed by UNC (i.e., employees who have died, employees who did not meet the inclusion criteria for the survey). However, based on the available information, we have no evidence that additional case finding would identify an excess of a specific type or related types of cancer. As employees age, more cases of cancer are expected and will occur, including more cases of breast cancer over time. For more information about breast cancer, see Appendix A.

Conclusions

We found no evidence that the cancers reported by past and current employees in the McClendon Clinical Laboratories are the result of an exposure from a workplace carcinogen. We did not identify evidence to support employee exposure to hazardous levels of cancer-causing substances in the workplace. We also found evidence that the distribution of cancer types reported by employees is not unusual and there does not appear to be an excess of cancer.

We do not think further case finding or investigation would lead to the identification of an unusual pattern or excess of cancer among employees.

We encourage UNC management to communicate the results of this HHE with all employees. Acknowledging employees' concerns, focusing on transparency, and increasing communication, including receiving and responding to questions from all potentially affected employees, will provide a consistent and reliable source of information about the safety of the workplace and may reduce occupational health and safety concerns over time.

Recommendations

Based on our conversations and the information provided, we recommend the actions listed below to create a healthier workplace. We encourage management to coordinate with employees when developing an action plan to address these recommendations. Employees directly involved in the work can best set priorities and assess the feasibility of our recommendations for the specific situation in McClendon Clinical Laboratories.

1. Encourage employees to seek assessment and treatment from a qualified health professional if they are experiencing work-related symptoms. Occupational medicine physicians can be found through a variety of sources, including the Association of Occupational and Environmental Clinics (<http://www.aoec.org/>) and the American College of Occupational and Environmental Medicine (<http://www.ocoem.org/>). It may be useful to provide the physician with a copy of this report.
2. Routinely inspect the building for water intrusion and damage. Correct these upon discovery.
 - a. Consider using the *NIOSH Dampness and Mold Assessment Tool* when inspecting the building for dampness and mold. The tool and instructions for use are on the NIOSH website (<https://www.cdc.gov/niosh/docs/2019-115/>).
 - b. The following paper also provides detailed instructions on using the NIOSH tool and provides an example Excel file for data entry in the supplementary materials.

Park J-H and Cox-Ganser JM [2022]. NIOSH dampness and mold assessment tool (DMAT): Buildings (Basel) 12(8):1075–1092, <https://doi.org/10.3390/buildings12081075> (Supplementary materials <https://www.mdpi.com/article/10.3390/buildings12081075/s1>).
 - c. If dampness or mold is not identified during visual inspections but is suspected because of musty odors or continued health complaints, consider other methods to look for hidden problems such as under flooring or in wall cavities. Thermal imaging with an infrared camera, especially after heavy rains, can be used inside and outside buildings to identify water intrusion leaks.
 - d. Keep a record of when and where mold or water-damaged materials are discovered and what has been done to promptly fix the underlying problem leading to the water damage.
 - e. Monitor repaired areas to ensure repairs and remedial actions are effective.
3. Follow best practice guidelines for maintaining acceptable indoor environmental quality during construction and renovation projects. This includes scheduling renovation activities and informing employees in advance about any remediation efforts and successful efforts already made and the logic behind decisions made. For more information, see the NIOSH online resource at <https://www.cdc.gov/niosh/docs/wp-solutions/2020-110/default.html>.
4. Ensure employees know how to report health and safety concerns with management (i.e., SAFE reporting system). Concerns about potential exposures or questions about

workplace safety should be addressed by the appropriate personnel, and employees should be kept informed about follow-up actions.

5. Although we found no evidence that the identified cancers were caused by exposures at the workplace, employees may have concerns about their own risk factors for cancer. Encourage employees to learn about their individual cancer risk factors, measures to reduce modifiable risk factors, and availability of preventive cancer screening programs for certain types of cancer.
 - a. Modifiable personal risk factors that are associated with certain types of cancer include tobacco use, alcohol consumption, a diet low in fruits and vegetables, physical inactivity, and obesity.
 - b. Employees should discuss available cancer screening programs according to age, sex, or family history with their primary care provider. For some types of cancer, these programs can lead to earlier detection and earlier treatment, which may increase the chances of curing the disease.
 - c. Share the following American Cancer Society webpage with employees as it may address some of their concerns regarding cancer and causes of cancer <https://www.cancer.org/cancer/risk-prevention.html>.

This letter serves as a final report and concludes this health hazard evaluation. NIOSH recommends that employers post a copy of this letter for 30 days at or near work areas of affected employees. We are sending a copy of this letter to the Occupational Safety and Health Administration Region IV Office and the North Carolina Department of Health and Human Services.

Thank you for your cooperation with this evaluation. If you have questions, please contact Dallas Shi (dshi@cdc.gov), 513-458-7171 or Rachael Zacks (Rzacks@cdc.gov), 513-841-4223.

Sincerely yours,

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Appendix A

Breast cancer originates from the tissues of the breast and is one of the most common cancers affecting women worldwide, although it can also occur in men. The breast comprises different types of cells, but most breast cancers begin in the lining of the milk ducts (ductal carcinomas) or the lobules that supply the ducts with milk (lobular carcinomas) [ACS 2021].

Breast cancer is the most common cancer and is the second leading cause of cancer death among women in the United States. In 2024, it is estimated that 310,720 new cases of invasive breast cancer will be diagnosed in women in the United States and about 42,250 women are expected to die from the disease [ACS 2024a]. The lifetime risk of developing breast cancer for a woman in the United States is about 1 in 8, or around 12%–13%. This risk is influenced by several factors, including genetic, behavioral, and environmental influences [ACS 2022; Feuer et al. 1993].

Often, early breast cancer does not cause noticeable symptoms, which makes early detection challenging. Screening tools such as mammography are currently the most effective methods for early detection. Despite these tools, many cases are diagnosed at more advanced stages, where they are harder to treat, and the prognosis is less favorable. The 5-year relative survival rate for breast cancer in the United States varies significantly based on the stage at diagnosis, ranging from 99% for localized disease to 31% for metastatic disease [ACS 2024b].

Key risk factors for breast cancer include age, sex, family history of breast cancer, genetic mutations (such as *BRCA1* and *BRCA2*), hormonal factors (e.g., use of estrogen-progestogen contraceptives or menopausal therapy, early menarche, late menopause, and pregnancy history), lifestyle factors like alcohol consumption and obesity. Although less common, occupational exposures, such as those to certain carcinogens and endocrine disruptors in sectors like plastics and textiles, have also been implicated in some studies [Brophy et al. 2012; Fenga 2016]. Most studies on occupational exposures suggest that at least 10 years of latency is needed to see effects in the working population [Labrèche et al. 2010; Pedersen et al. 2020; Videnros et al. 2019; Villeneuve et al. 2011].