**DEPARTMENT OF HEALTH & HUMAN SERVICES** **Public Health Service**

Phone: (304) 285-5751
Fax: (304) 285-5820

Centers for Disease Control
and Prevention (CDC)
National Institute for Occupational
Safety and Health (NIOSH)
1095 Willowdale Road
Morgantown, WV 26505-2888

October 22, 2009

Paul Krell, President
Administrative and Residual Employees Union Local 4200
705 North Mountain Road, Suite A211
Newington, Connecticut 06111

Dear Mr. Krell:

Please find attached the Interim Report X which provides updates on the NIOSH medical and environmental surveys at 25 Sigourney Street, Hartford, Connecticut. The interim report is based on results of cross-sectional data analyses of the last health and environmental survey conducted in August 2007, as well as some data analyses of the multiple cross-sectional surveys conducted in 2001/2002, 2004, 2005, and 2007. Much of the information in this report was included in presentations by NIOSH staff at the stakeholders meeting held on June 18, 2008 at the Sigourney Street building or was addressed in the response letter dated September 15, 2008 to the 17 questions asked by the Department of Public Works Commissioner, Connecticut. This report also contains analyses examining associations between environmental and health data from the 2007 surveys.

If you have any questions regarding the information provided in this interim report, please do not hesitate to contact us at 1-800-232-2114.

Sincerely,

Park Juhyeong

Ju-Hyeong Park, Sc.D., C.I.H.
Industrial Hygienist
Field Studies Branch
Division of Respiratory Disease Studies



Jean Cox-Ganser, Ph.D.
Research Team Leader
Field Studies Branch
Division of Respiratory Disease Studies

## SUMMARY AND CONCLUSIONS

The NIOSH 2007 investigation and longitudinal analyses of all 4 surveys demonstrate that the new onset of diseases such as asthma, hypersensitivity pneumonitis, and sarcoidosis have been declining since 2000 or 2001, but that there is still an excess of respiratory illnesses (physician-diagnosed asthma, wheeze, shortness of breath, and upper respiratory symptoms) among building occupants when compared to national or CT state data. Even after we adjusted these prevalences for the entire building population using non-participant survey data, the prevalence ratios for asthma and wheeze still remained elevated and were statistically significant. One-third to one-half of symptomatic persons in the 2007 survey reported that their symptoms improved when away from the building. The various respiratory and non-respiratory symptoms related to the building environment were more prevalent in occupants who had worked at the building for longer time periods (before 2004), compared to the occupants with a shorter occupancy time (after 2004). Lower respiratory symptoms consistent with asthma and post-occupancy physician-diagnosed asthma were significantly associated with exposure to the highest tertile level of culturable fungi, ergosterol, and endotoxin within the building. These findings indicate that the remediation activities undertaken for the past several years before 2007 seemed to contribute to declining of incident illnesses among occupants of the building, but that the remediation did not resolve the health issues in the building.

Our environmental data analyses on changes in the levels of microbial agents over the four NIOSH surveys indicate that in 2004 and 2005, the levels of total culturable fungi and ergosterol in floor dust had been similar to or lower then the levels found in 2002. However, the levels in 2007 were higher than those found in 2002. The increase in fungi levels in 2007 consistently occurred across all 15 occupied floors and was mostly contributed by an increase in levels of hydrophilic fungi (water loving fungi such as *Phoma* and *yeasts*). The upper floors in the building ($14^{th}$ floor or higher), where historical water incursion mostly took place, were more likely to be categorized into the highest fungal exposure group in tertile categorization. In contrast, high levels of endotoxin did not show any distinct pattern, except for in 2005 when high exposure levels were clustered in the lower floors ($12^{th}$ floor or lower) of the building. The overall mean level of endotoxin was also highest in 2007 of all the NIOSH surveys, although the level in 2005 was close to that in 2007.

Measurement of culturable fungi or other microbial agents in floor dust for exposure assessment in the NIOSH studies has both strengths and limitations. Although it is not a direct measure of inhalation exposure, measurement of microbial agents in dust may be a good indicator for long-term exposure because airborne dust tends to accumulate in the floor over time and floor dust can serve as a reservoir for microbes. The NIOSH study findings also support the usefulness of surface dust sampling as an exposure assessment tool in epidemiologic studies. In these studies, we demonstrated that the measurements of microbial agents (total culturable fungi, hydrophilic fungi, ergosterol, and endotoxin) in floor dust were significant predictors of post-occupancy physician-diagnosed asthma, asthma-like symptoms, or various work-related upper and lower respiratory symptoms. In addition, utilization of surface dust sampling method has been supported by other public health organizations. The Institute of Medicine report *Damp Indoor Spaces and Health* (IOM 2004) stated that surface

dust sampling may be the method of choice for examining the association between fungal exposure and chronic health outcomes such as asthma. As noted by an American Industrial Hygiene Association (AIHA) publication on indoor mold published in 2008 (Presant B, Weekes DM, Miller JD. 2008. Recognition, Evaluation, and Control of Indoor Mold., Fairfax, VA, AIHA), "Settled dust is much less influenced by short-term fluctuations and has commonly been used as an exposure assessment tool for many substances indoors for 15 years." The book also stated, "The mass of fine dust per unit area combined with the activity in the building at the time of sampling has been used to estimate long-term patterns in potential inhalation exposures." Given that air sampling methods have significant limitations in use for exposure assessment (e.g. potential misclassification of occupants' exposure with limited number of short-term air samples), dust sampling methods are promising for large epidemiological studies.

With the information we have, we do not know if increased levels of culturable fungi in the floor dust in 2007, as compared to 2002 levels, are indicative of water-damaged areas or damp environments inside the building. According to the Department of Public Works (DPW) records reviewed by NIOSH, the first major construction activity related to water intrusion began in 2000. The repair of roof copings and brick caulking that was completed between March 2000 and November 2000 reportedly stopped 95% of the water intrusion associated with roof leaks. Remedial action completed in 2000 and 2001 was a mixture of cleaning, replacement of carpet and wallboard, upgrades to the air handling systems, and repairs to the building exterior. The carpet on each floor of the building was cleaned. In addition, interim repairs, including caulking, began around windows associated with leaks during a heavy rain event in March 2001. Water-stained carpet was replaced on the 17$^{th}$, 18$^{th}$, and 19$^{th}$ floors. Water-stained wallboard on the 5$^{th}$, 17$^{th}$, and 19$^{th}$ floors was replaced as well. Permanent repairs on the building exterior designed to prevent water incursion began in April 2002. However, although all of these remediations had been undertaken, there were still some indications that the building had current water incursions before the 2007 NIOSH survey. Occupants had reported intermittent window leaks in several locations on the 16$^{th}$, 17$^{th}$, 18$^{th}$, and 19$^{th}$ floors since the 2002-2003 major remediation that included window repairs. In June and July 2007, DPW requested Silver Petrucelli & Associates, Inc. to conduct a water infiltration study. Through water flood testings on windows, Silver Petrucelli & Associates, Inc. identified failure of the flashing above the windows in those upper floors with reported leaks. In addition, a DPW response to an employee e-mail question dated August 26, 2008 indicated that there were still two areas with water leaks on the 18th floor. This information, along with no evidence of changes in cleaning practices and no changes in environmental sample analysis methods, indicate that increased fungal levels in 2007 floor dust might be a result of incomplete remediation or previously remediated areas that may have started to fail again.

## RECOMMENDATIONS

Based on our four investigations and data analyses, we recommend the following:

1. Remediation of the building should be completed according to previous environmental consultants' recommendations such as found in the Turner Building Science Group report from 2005.
2. Initiate a routine maintenance program for evaluation of water damage in the building including regular observational assessment of water stain, mold growth, mold odor, and dampness, and systematic evaluation of window leaks, roof leaks, and functionality of exterior walls.
3. Continue to communicate with occupants regarding indoor environmental complaints (water damage, water stains, indoor air quality etc.) and health complaints.
4. Initiate a surveillance program to monitor occupants' symptoms and new onset of possible building-related illnesses.
5. Continue to practice daily or routine cleaning and housekeeping protocols, including HEPA vacuuming, to more efficiently remove potential microbial agents or other contaminants, and to minimize accumulation of dust in floor carpet.