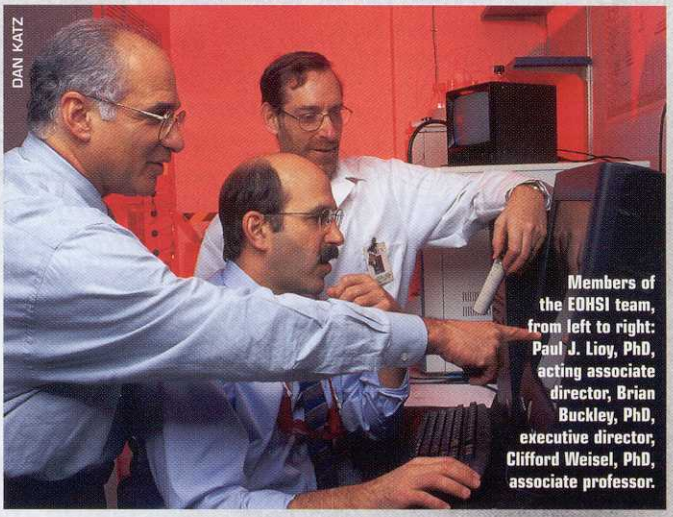
WHAT'S IN THE DUST?

BY MARYANN BRINLEY

It's pale grey, sunset pink and fluffy. It has filled the urns at hundreds of memorial services at churches, mosques and synagogues. It's loaded with contaminants. And it's the object of intense investigative scrutiny at the Environmental and Occupational Health Science Institute (EOHSI).


DAN KATZ

Members of the EOHSI team, from left to right: Paul J. Lioy, PhD, acting associate director, Brian Buckley, PhD, executive director, Clifford Weisel, PhD, associate professor.

"Ordinarily, our investigations center on some exotic sample from a household or other setting that requires an exposure characterization and health effects evaluation," says Paul J. Lioy, PhD, acting associate director of EOHSI, a joint venture of UMDNJ-Robert Wood Johnson Medical School (RWJMS) and Rutgers University. "In this case, the inquiries are about the dust and smoke resulting from the terrorist attack on the World Trade Center (WTC)."

"A crushing event of unprecedented nature created dust that's truly unique," says **Brian Buckley, PhD,** executive director of EOHSI. Buildings of 110 stories anchored into bedrock 75 feet below ground, asbestos, concrete, fiberglass, computers, jet fuel, airplanes and vehicles were all part of the mix.

A Canadian crew from the Discovery Channel, reporters from The Wall Street Journal and The New York Times and worried residents of Manhattan have all asked: What's in the dust? EOHSI is one of several organizations answering the question.

A white helmet with red respirator caps sits prominently on a windowsill behind Lioy's desk. "That's my World Trade Center hard hat," he explains. Returning to ground zero several times, Lioy and associates, wearing respirators, ventured outdoors and into offices and apartments collecting dust using brushes, small shovels and plastic bags.

Lioy is coordinating the analyses from an EOHSI team of 16 scientists, as well as other researchers and the National Institute of Environmental Health Sciences (NIEHS). Their initial report was submitted for review in January, and Lioy delivered the first presentation in February. "Mass quantities of molecules — some toxic — from a structure that was still burning, mineral fibers, glass fibers, all kinds of fibers...everything you can imagine is

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in there," Lioy explains. The dust's fluffy consistency comes from all the fibers present, including asbestos. Lead, too, turned up at levels not to be ignored, and not just from lead-based paint but from millions of computer monitors, each containing up to four pounds of this contaminant. "People have tried to say that there is no problem but I've been straight with everyone from the very beginning," Lioy says.

Compiling this data was no easy endeavor, says Clifford Weisel, PhD, associate professor in the Department of Environmental and Community Medicine at RWJMS. One of the first steps was to put the dust into a refrigerator. "Cooling prolongs the stability," Weisel says, "by reducing the chance that microbial presence in the dust will degrade the organic chemicals."

The dust was dried, weighed, and placed in clean glass vials. Some portions were dissolved in acid to be analyzed by an Inductively Coupled Plasma Spectrometer. With plasmas at roughly the temperature of the sun, or somewhere between 6,000 and 10,000 degrees Centigrade, the spectrometer is hot enough to melt, vaporize and then ionize metal. The team identified three species of arsenic as well as chrome, a primary component of cement. "Differentiating between species of the same component was important because the toxicity of a metal is dependent on its state. Take chromium," Buckley explains. "Chrome 3 is a micronutrient but chrome 6 is a potential carcinogen."

A new technique known as Microwave Assisted Solvent Extraction (MASE) was used to sort out organic compounds. "Similar to your microwave oven at home, but MASE is designed for laboratory use," Buckley says. Using a gas chromatograph, the team separated the organic components and an Ion Trap Mass Spectrometer, capable of identifying up to 16,000 compounds, identified them. Some test duplication and overlap were intentional. As Buckley explains, "I might have tested dust from a spot with a higher chrome level than someone else." In the case of jet fuel components, Weisel explains that the sample taken blocks from ground zero had higher levels than the sample from the site itself. What wasn't burned up during the attack was carried away by the force of the collapse.

To get rid of the dust, 10 Environmental Protection Agency (EPA) vacuum cleaner trucks were on site within days of the disaster. Power scrubbers wet down streets and sidewalks. Playground sandboxes were emptied and refilled. Protocols are still in place for dust suppression and removal. "However, major problems still exist in all the homes with dust and smoke remaining," says Lioy. "These must be cleaned using hazardous waste clean-up techniques to prevent exposure to asbestos, lead and glass fire particles." Long-term health impact studies are planned to monitor thousands who escaped, especially pregnant women and rescue workers. **HS**

CONTAMINANTS PRESENT AT THE WORLD TRADE CENTER SITE

CONTAMINANT	HEALTH EFFECTS	SOURCE
Asbestos	Carcinogenic. Causes tissue damage in the lungs when inhaled over long periods and can lead to asbestosis, mesothelioma, and lung cancer.	Used as an insulator and fire retardant, applied to steel beams.
Benzene	Flammable and carcinogenic. Short-term effects include dizziness, headaches, and tremors. Long-term exposure can lead to leukemia.	Combustion of plastics.
Biohazards	Exposure to blood and body parts can transmit infectious diseases such as hepatitis and AIDS.	Human remains.
Chromium	Carcinogenic when inhaled at high concentrations; can cause skin ulcers.	Video and computer monitors.
Copper	Can cause dizziness, headaches, vomiting, liver and kidney damage.	Electrical wiring and cables.
Diesel fumes	Asthma trigger. Can aggravate symptoms in asthmatics.	Truck traffic and heavy machinery.
Dioxins	Chloracne is a short-term effect of exposure. Strong evidence for carcinogenic, teratogenic, reproductive, and immunosuppressive effects.	Combustion of polyvinyl chloride found in electrical cables and other insulating materials.
Freon	Damages the ozone layer. When burned, can produce phosgene, a potent cause of severe and life-threatening pulmonary edema.	Refrigeration and air-conditioning equipment.
Lead	Neurotoxic. Damages the central nervous system, especially in children. Can also cause kidney and reproductive damage in adults.	Video and computer monitors, rustproofing paint used on steel beams.
Mercury	Neurotoxic. Damages the peripheral nervous system, especially in children.	Thermometers and other precision instruments.
Particulate matter	Asthma trigger. Can also aggravate cardiovascular disease.	Pulverized concrete and other materials, smoke, dust, and soot.
Polychlorinated biphenyls	Carcinogenic. May also cause reproductive and developmental abnormalities.	Electrical equipment.
Sulfur dioxide	Pulmonary toxicant. Can cause severe airway obstruction when inhaled at high concentrations.	Combustion.

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