

Weighing Risks

Tests Say Air Is Safe,

But Some People Feel

Ill Near Ground Zero

Irritants Causing Symptoms Are Not Known Dangers; Much Remains Uncertain

Fearful, the Luekers Leave

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NEW YORK—In the weeks since Sept. 11, government agencies testing the air near ground zero have reached a nearly unanimous conclusion: There is no significant long-term health risk for area workers and residents.

Yet hundreds, and possibly thousands, of people who live, work or go to school in lower Manhattan have experienced persistent sore throats and hacking coughs. Area physicians report a surge in new or worsened asthma cases. How to explain the contradiction?

It appears that government officials and downtown residents may be concerned with different threats. The U.S. En-

Before and After

The ripple effects of the terrorist attacks have altered many aspects of people's lives, including work, family and community life. See articles on page B1.

Environmental Protection Agency has concentrated on known carcinogens and other dangerous materials, including asbestos, dioxin and lead. Most private scientists and physicians concur with the EPA that, for all but those toiling directly on the cleanup, there probably isn't much risk from these substances.

However, the World Trade Center collapse has stirred up a cocktail of other unfriendly substances, including airborne cement dust, bits of fiberglass, and a host of chemicals emitted by the plastics, jet fuel and other materials that burned at the site for more than three months. Some of these less-well-understood substances probably have caused the cold-like symptoms and breathing problems that have troubled many people near ground zero, according to physicians and researchers.

The government is right that otherwise healthy people are not going to end up dying or in the hospital years from now, says George D. Thurston, associate professor of environmental medicine at New York University's medical school. But some of the dust and chemicals kicked up by the collapse, he says, "turned out to be more irritating than we had thought."

Some people seem especially vulnerable to environmental irritants because of genetic sensitivities or pre-existing health conditions, such as asthma or allergies, according to Paul Lioy, an environmental health scientist affiliated with Rutgers University and the University of Medicine & Dentistry of New Jersey.

Steady Improvement

Overall, the air near where the Twin Towers once stood has improved steadily since the suicide-jetliner attack. The fires appear to have been extinguished, and the burnt smell has largely disappeared, except immediately around the site. Muthiah Sukumaran, a pulmonary specialist and director of intensive care at NYU Downtown Hospital, says that most of the 100 or so patients he has seen with coughs and asthma-like conditions related to the disaster have steadily gotten better with medication. Health experts predict respiratory symptoms will continue to diminish as massive cranes stop clawing at the debris and airborne dust settles.

Even this optimistic prognosis comes with a big dose of caution. Many experts admit that the environmental effects of the disaster are so complex that health problems could crop up in the future. One concern is that the vast variety of chemicals and particles swirling in the air may have interacted in unpredictable ways. Scientific research has detailed the effects of plane crashes, building collapses and hazardous fires—but never the blend of all three, let alone on this scale. "We can't look to any literature or to any studies that have been done and compare them to anything that's happened here," says Kathleen Callahan, the EPA's deputy regional administrator for the New York area.

Dust Cloud

One big uncertainty, says Dr. Lioy, the Rutgers-affiliated scientist, is the impact on the thousands of people caught in the dust cloud on Sept. 11. There was little monitoring of pollution levels that early in the disaster, and "people were breathing in stuff that was far in excess of what anybody would normally be exposed to in their lifetime," he says. Having analyzed the debris, he believes the dust cloud contained—in addition to cement, asbestos and fiberglass particles—such suspected carcinogens as polycyclic aromatic hydrocarbons and other chemical compounds emitted by the conflagration. Dr. Lioy says he and EPA scientists plan to spend a year studying exposure levels to substances in the massive cloud.

Another concern is whether relatively brief exposure to certain chemicals or heavy metals released in the disaster could cause developmental or other problems in unborn children. At Columbia University's Center for Children's Environmental

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Health researcher Frederica Perera is recruiting women who were pregnant at the time of the disaster for a study that will follow them and their babies for several years.

An additional source of anxiety for some residents and employees near ground zero is the continuing threat that cleanup workers may reintroduce contaminants into the air by using improper methods. (See related article this page.)

In part because of the uncertainty about air quality, many businesses and residents have yet to return to the blocks surrounding ground zero. Economy.com, a consulting firm in West Chester, Pa., estimates the disaster will cost New York \$30 billion in lost economic activity this year and next. "If we're going to hold up downtown Manhattan as the financial capital of the world, bring back the residents and recreate the 24-hour community, we've got to convince people that it is safe," says Sheldon Silver, speaker of New York's state assembly. "We don't have that yet."

Since the attack, the EPA has conducted more than 7,500 tests for 300 carcinogens and other dangerous substances, and the findings have so far been generally encouraging. For example, only 29 tests for airborne asbestos, out of 3,500 since Sept. 11, have shown levels above the tough federal threshold for allowing children back into a school building after an asbestos cleanup, the EPA says. Asbestos, which was in fire retardant in part of the Twin Towers, can cause severe breathing problems and cancer when inhaled over a period of years.

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Dioxin levels also briefly exceeded EPA thresholds in some locations near ground zero in the weeks after the disaster, but they fell within safe ranges thereafter. Dioxin, a type of chemical released by burning wood and some plastics, can cause cancer and may lead to reproductive problems.

Citing the generally sanguine federal test results, as well as their own testing, some employers, including Merrill Lynch & Co. and the law firm Cleary, Gottlieb, Steen & Hamilton, have returned to buildings close to ground zero. Dow Jones & Co., publisher of The Wall Street Journal, has said the removal of asbestos at its offices across the street from the disaster site is taking longer than expected. The company says that it plans to return half of its displaced workers but that they won't come back until April at the earliest.

Scant Comfort

Yet, for the more than 100 people who have come to Mount Sinai Medical Center complaining of respiratory problems, the federal tests are scant comfort. Stephen Levin, director of the hospital's occupational-health center, says most of the patients work in offices near ground zero and haven't been involved in rescue or cleanup. Only a handful were caught in the Sept. 11 debris storm. Their diagnoses have included bronchitis, an inflammation in the lungs, and sinusitis, or inflammation of the sinus cavities. Many of the pa-

tients have dramatically reduced lung capacity, inhibiting their ability to exercise or even walk up stairs, Dr. Levin says.

One of the most worrisome diagnoses is a type of environmentally induced asthma, he says. While most upper-respiratory problems go away, this strain of asthma can stay with a person for a lifetime, causing wheezing from exposure to even minor irritants, such as cigarette smoke.

John Graham, 39 years old, never used to have any breathing problems. The health-and-safety instructor for the local carpenters union joined rescue efforts as a volunteer during the first few days after Sept. 11. Although he used to be a recreational runner, he says merely mowing the lawn at his New Jersey home this fall was tiring. A dry cough dogs him, and cold mornings seem to clamp down on his chest so hard it feels "like an elephant is stepping on your lungs," says Mr. Graham, who is now a patient of Dr. Levin's.

The New York Fire Department says more than 1,600 firefighters have had respiratory ailments related to working at ground zero. The firefighters union says about 400 firefighters have ailments serious enough to put them on medical leave.

Several substances are considered likely causes of the ailments. One is cement dust created in huge quantities by the collapse of the towers. Cement con-

Gases and particles may have combined to cause irritation in ways health experts don't understand.

tains limestone, which is caustic and can inflame eye linings and nasal passages and even induce mild bronchitis, according to studies of industrial workplaces. When the dust hits the water protecting the cornea, for instance, it causes a chemical reaction that leads to inflammation.

Another possible problem: bits of fiberglass, mostly from disintegrated building insulation. An analysis of dust taken near ground zero on Sept. 12 by NYU scientists concluded that an astonishing 30% to 40% consisted of fiberglass. The fragments are probably long enough—most longer than 1/100 of a millimeter—that they are filtered out by the nose or naturally expelled from the lungs, Dr. Thurston says. As a result, they probably won't cause long-term respiratory problems. But the fragments might irritate sensitive tissue that lines the eyes, nose and throat, he says. Typically, the EPA doesn't even measure such particles, because they are believed to be too large to cause serious long-term harm.

The fires that smoldered at ground zero—consuming computers, nylon carpeting, office furniture and countless other items—also emitted a potpourri of so-called volatile organic compounds, or VOCs. These

are thousands of gases and aerosols, including benzene, toluene, and formaldehyde.

The EPA says it isn't worried about the health threat of VOCs in lower Manhattan. Although some of its tests for more than 60 VOCs have shown unsafe levels directly over burning fires, the agency says these gases have quickly dissipated. EPA testers report that by the time the gases rose from the ground to nose level, they were undetectable. The agency stopped monitoring VOCs beyond the disaster site in late September and believes the chemicals "don't pose any long-term risk," says Ms. Callahan, the deputy regional administrator.

But VOCs may have caused some of the symptoms experienced by downtown workers and residents. Pamela Dalton, a sensory-irritation researcher at the nonprofit Monell Chemical Senses Center in Philadelphia, says numerous studies have found that VOCs can irritate eyes and the respiratory tract at low, nontoxic levels. Even if a given chemical isn't present in sufficient quantity to be annoying, or even measurable, she says, "if you combine hundreds of them, they may cause irritation."

Part of the problem, Dr. Dalton says, is that the largest study of combined VOCs involves just 22 of the gases. No one has examined anything close to the scale of the combination of gases at the trade center site. "We have hundreds of VOCs" at ground zero, Dr. Dalton says. "It's potentially more potent."

Yves C. Alarie, a University of Pittsburgh professor of toxicology who studies the health effects of VOCs, agrees that at levels likely present in lower Manhattan, these compounds "are not a long-term health issue." Still, he says, they can cause coughs and throat irritation. The EPA, he says, isn't "doing any relevant measurement for the acute symptoms people are feeling."

The agency's Web site, www.epa.gov, lists daily test results at ground zero for only one VOC, benzene. That chemical is

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emitted by burning fuel and some types of plastics and can cause leukemia. As recently as mid-December, EPA monitoring equipment at the disaster site measured benzene levels 400 times as high as the agency's safety standard for continuous exposure over one year. The chemical dissipates quickly, the EPA says, but the agency has cautioned cleanup workers to wear respirators.

Drs. Alarie and Dalton both say the majority of people exposed to low levels of environmental irritants, including VOCs, eventually become acclimated to them, and symptoms recede.

Still, the EPA's Ms. Callahan says the agency has decided to start measuring again soon for the compounds in the blocks around ground zero. The agency also is expanding testing for some other compounds. It will soon be looking at formaldehyde, a powerful irritant and possible carcinogen that can be produced by the burning of numerous materials, including furniture and carpets.

Beyond VOCs, the gases and particles floating around lower Manhattan may have combined in another way to cause respiratory irritation, some scientists say. Sulfur dioxide, a common air pollutant that comes from burning fuel, normally is mostly filtered out by the nasal passages. But in the post-Sept. 11 air, sulfur dioxide from the combustion of jet fuel and the diesel burned by cleanup vehicles may have attached to particles of other matter that move deeper into the throat or lungs, according to NYU's Dr. Thurston.

Special Vulnerability

According to another hypothesis Dr. Thurston and some other experts suggest, the barrage of contaminants in the downtown air might compromise some people's immune systems, making them more vulnerable to pollutants at levels that wouldn't ordinarily affect them.

More broadly, some people are genetically predisposed to irritation from airborne substances, helping to explain why they may be suffering near ground zero while others aren't, scientists say. Stuart M. Brooks, an asthma specialist at the University of South Florida's medical school, says prior studies have shown that between 10% and 20% of the population has what he calls "hyper-responsive airways." That means that cells in their lungs and breathing passages are more sensitive to environmental irritants. Many of these people don't know they have the condition, although they may have hay fever or other allergies, he says.

Dr. Brooks says his own research has shown that environmental contaminants can trigger asthma in this sensitive population, and he theorizes that has happened near ground zero. If treated with inhaled steroids and other drugs, he says, most of these people will return to their pre-exposure health condition.

Yet to some area residents, such predictions provide little reassurance. "There's no way you can implode and burn 220 floors of office space and not have repercussions," says Donna Lueker, who used to live several blocks south of the World Trade Center. In the weeks after the collapse, she and her husband ventured back to their apartment to retrieve belongings and came away with sinus infections and sore throats.

The couple, in their thirties, and their two-year-old boy have moved across the East River to Brooklyn. "Twenty years from now, I don't want my son to have one lung," Ms. Lueker says.

—Laura Johannes
contributed to this article.