Tighter Ozone Standard Urged by Scientists

New data indicate acute health effects at concentrations allowed by air pollution standards; tightening the rule would be costly

THE CURRENT FEDERAL STANDARD on ozone pollution should be tightened to protect public health, several leading scientists in academia assert. According to new data, acute health effects on the lungs that the present ozone rule is intended to prevent have actually been observed in studies of people exercising, say some researchers and federal officials, including Morton Lippmann of New York University and Bruce Jordan, a top official in EPA's air quality office.

The weight of evidence from animal and human studies that ozone causes short-term biochemical and functional changes in the lungs "is clear and compelling," says Lippmann, a former chairman of the Clean Air Act science advisory committee of the Environmental Protection Agency (EPA). Bernard Goldstein, former head of EPA's Office of Research and Development under the Reagan Administration, says "there is sufficient toxicological data to be concerned about repetitive exposure over the years."

But EPA officials say they are not prepared as yet to recommend revision of the standard. The agency is currently reevaluating the ozone standard as part of a routine review required by the Clean Air Act. Jordan, who is chief of the ambient standards branch of EPA's Office of Air Quality Planning and Standards, says that "we're seeing a new wave of data, but much of it has not been peer reviewed. We see a trend [in the data] coming, but we feel a bit uncomfortable making a decision based on the studies right now. All the indications seem to be that any move will be toward a more stringent standard."

A proposal by EPA to toughen the ozone standard would no doubt be met with strong opposition in many areas of the country, which would have to implement more pollution controls that are expensive, elaborate, and politically controversial.

The push to toughen the standard on ozone pollution comes at a difficult moment because Congress is currently deciding how to modify the Clean Air Act. Sixty-two areas of the country, such as southern California and the New York City region, have fallen short of even meeting the current rule. As a result, all the proposals now before Congress to amend the law would extend the compliance deadlines for varying time periods. An aide to the Senate Environment and Public Works Committee says that the "decisions on deadlines for attainment take on more health significance" in light of the new data.

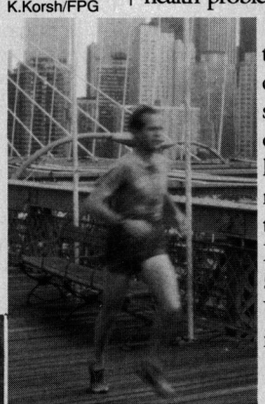
There is "good" and "bad" ozone, as one scientist puts it. Good ozone naturally exists in the upper atmosphere and blocks ultraviolet radiation. But bad ozone is formed in the lower atmosphere in a series of complex reactions involving volatile organic compounds and nitrogen oxides that come from industrial plants and gasoline use in cars and trucks.

The current ozone standard was set by the EPA in 1979 and limits ozone pollution to a maximum hourly average of 0.12 part per million (ppm) that is not to be exceeded more than once a year. Results of one study suggested at the time that ozone concentrations as low as 0.15 ppm impaired the activities of vulnerable individuals, including children, the elderly, asthmatics, and people who exercise outdoors. EPA settled on the 0.12 ppm hourly standard as a way to provide a margin of safety for this population and for the potential for chronic effects as required by the Clean Air Act.

But researchers now say that the hourly limit is out of date in light of a convergence of new data from animal and human studies about ozone's health effects and monitoring information about ozone pollution around the country. The results show that ozone pollution is impairing people's lung functions when they are exposed to lower concentrations over several hours, indicating a need for a limit based over several hours rather than an hourly peak. Recent monitoring data indicate that ozone pollution does not peak and fall rapidly as previously believed, but rises and declines slowly over several hours.

According to the recent animal and human studies, exposure to ozone concentrations comparable to ambient air quality in various parts of country reduces the volume of air that a person breathes out in 1 second (forced expiratory volume or FEV_1), accelerates the aging of the lungs, and causes biochemical changes in the lungs that are worrisome. Scientists emphasize that these effects are acute and that their implications for chronic health problems are unclear.

K.Korsh/FPG



One of the studies that has triggered concern showed that children playing outdoors at a summer camp in New Jersey could expel less air when ozone levels were about 0.113 ppm. A research team led by Dalia Spektor of New York University, Lippmann, and others studied 53 boys and 38 girls attending a YMCA camp in Fairview Lake in northwestern New Jersey in 1984.

According to the results published earlier this year in the journal *American Review of Respiratory Disease*, a third of the children experienced a temporary reduction in FEV_1 of 16% on average during a period when ozone concentrations were close to the federal standard, but never exceeded it. EPA staff recently proposed in a draft document that a 10% reduction in FEV_1 constitutes an adverse health effect. While a variety of factors could account for change in lung function, including motivation on the part of the child, humidity, other air pollutants such as sulfates, and temperature, researchers found that ambient ozone concentrations most strongly correlated with the effects on the lungs.

EPA also has studied the effects of longer term exposure to ozone, but in a more

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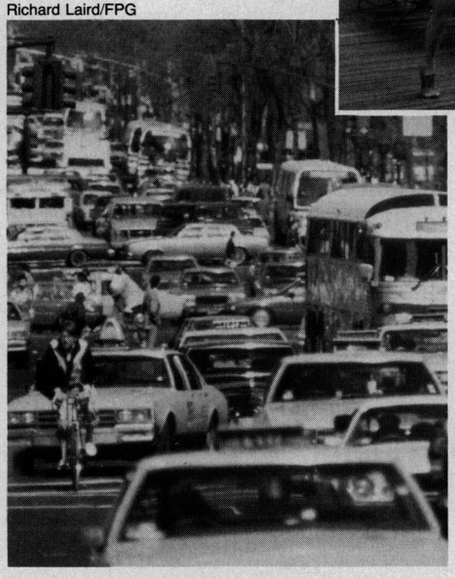

Running into trouble. *Studies of people exercising show temporary lung effects from ozone.*

controlled setting. Researchers evaluated ten nonsmoking men who exercised moderately while exposed to 0.12 ppm of ozone over 6.6 hours in a chamber at the agency's laboratories in North Carolina. The subjects exercised for 50 minutes over 3 hours in the morning and again in the afternoon. The adults' FEV_1 dropped significantly, according to results published this year in the *Journal of the Air Pollution Control Association*. The findings were confirmed by a subsequent study of 22 nonsmoking men, according to results presented at a scientific meeting last month sponsored by EPA in Nijmegan, Netherlands.

At this meeting, researchers presented other results that they say raise additional concerns about longer term exposure to low levels of ozone. Various experiments with rodents and primates showed that longer term exposure to ozone concentrations near the ambient range retard the ability of the animals' lungs to clear out toxic particles and cause inflammation of the lining of the animals' lungs. One study indicated that the function of cells that fight off bacterial infection in the lungs of rodents was impaired. Lippmann and others are concerned that these effects might lead to chronic damage.

Lippmann and others have been talking about the possibility that EPA should set a new standard at 0.08 ppm over several hours. The present 1-hour rule translates roughly to 0.10 ppm over 8 hours. Goldstein, who is now at the University of Medicine and Dentistry of New Jersey–Robert Wood Johnson Medical School, says, "I'd like to see EPA commit to a longer term standard," although he declines to specify the concentration or the period of time. The important consideration, Goldstein says, is to revise the rule so that ozone concentrations are controlled over a longer period of time.

Thomas McCurdy of EPA's Office of Air Quality Planning and Standards estimates that if a 0.08 ppm, 8-hour standard were adopted, an additional 9 areas around the country would be out of compliance, including mid-size cities such as Columbus, Ohio, Niagara Falls, and Ashville, North Carolina.

Jordan of EPA says that the new data will be discussed at the next Clean Air science advisory board meeting this fall. He says "the agency has moved on data that's a heck of a lot weaker than this. Data was probably was not as strong in 1979 to support .12 ppm as it is for multiple hour standard."

Paul Lioy of the University of Medicine and Dentistry of New Jersey and a member of the EPA advisory board, remarks, "all the health data coming together say we've got a problem. The present standard is not adequate." ■ **MARJORIE SUN**

Superfund Program Under Fire

The federal government's multibillion dollar program to clean up hazardous wastes at thousands of sites across the nation is a management disaster, according to the Office of Technology Assessment (OTA). The nonpartisan research arm of Congress reports that although the Environmental Protection Agency (EPA) often spends tens of millions of dollars to clean up a location, it may use less than optimal methods due to poor analyses—or simply to save money.

As a result, says OTA in an unusually critical report, *Are We Cleaning Up?*, many clean-up jobs may have to be redone. "There is no assurance of consistently high quality studies, decisions, and fieldwork, or of active information transfer," says OTA, which describes the Superfund program as a "loose assembly of disparate working parts."

The heart of the problem, says OTA, is the decentralized management of the cleanups. A huge amount of money—some $5 billion—has been spent on mopping up hazardous wastes since 1980, when Congress created a trust fund, the so-called "Superfund," to pay for fixing contaminated sites. The agency, however, has no firm matrix for determining what cleanup technology is best to use. Nor are there tight controls on what various cleanup strategies should cost.

The weaknesses of EPA's administration of the Superfund program are illustrated in the report with 10 of more than 100 cases that OTA examined. In the case of Pristine, Inc., of Reading, Ohio, the agency chose to spend $22 million on in situ vitrification, a process that involves heating the ground with electricity, encapsulating some wastes in glass-crystalline structures, and burning off other wastes. OTA says the agency erred in choosing this technology, first because the cost of incineration was grossly exaggerated; and second because it is not clear how effective vitrification is in permanently dealing with hazardous wastes.

If the program continues to be run in the same way, OTA says, public confidence in the program could be lost. To make the program operate better, EPA must do a better job of integrating into agency standards lessons learned in selecting and applying cleanup technologies at sites across the country. Headquarters must also exercise more oversight and control of regions to avoid squandering Superfund money, which is derived from fees imposed on the petroleum and chemical industries.

Among the other problems identified by OTA:

- EPA pushes its staff to complete "record-of-decision" actions that dictate how site cleanups are conducted. But trying to meet year-end deadlines for the sake of complying with bureaucratic goals "can lead to poor cleanup decisions," says OTA.
- EPA's Superfund work force is young, often lacks training, and suffers from high turnover. Contractors working for the agency also lack experience. Heavy work loads and limited funds make it difficult for both EPA staffs and contractors to keep up with developments in cleanup approaches and technologies.
- EPA ignores language in the Superfund Amendments and Reauthorization Act of 1986, which urges the agency to use permanently effective treatment technologies over methods that consolidate and stabilize wastes for a given time.
- EPA may chose an impermanent cleanup approach to a site because of its lower costs. The agency, however, often does not give adequate consideration to the potential for stabilization techniques such as clay caps. OTA observes that decisions to reject a more expensive, but permanent solution may be influenced at times by private parties that are financially responsible for the site's contamination.

The report is a blow to EPA's assistant administrator for solid waste and emergency response, J. Winston Porter, who has led the program since 1985. But Porter defends the agency's performance, stating that the OTA report does not reflect the enormity of the national cleanup task and the difficulties that the agency engineers encounter.

"We strongly object to the tone that Joel Hirschhorn chose to take in this report," said David Cohen, press spokesman for Porter. Cohen said that the ten cases studies cited in the report, which was directed by Hirschhorn, do not accurately portray how the cleanups are being run. "We have a fairly good program, says Cohen, noting that it is not a "management disaster" as the report suggests.

Hirschhorn acknowledges that EPA has a complex program to manage and cites cases where the decision process on site cleanups have been executed well. He told *Science*, however, that the report's tough language was appropriate because the program is headed for trouble unless changes are made. ■ **MARK CRAWFORD**