

Acid Rain in the Spotlight

Two events in the past week — the release of a research summary report by the Environmental Protection Agency and a public meeting of the National Commission on Air Quality — symbolize the newfound officiality of a years-old environmental problem — acid rain.

Acid rain, or more properly acid precipitation, is defined as the increased acidity of wet or dry precipitation due to greater quantities of atmospheric sulfur dioxide and nitrogen oxides from the combustion of fossil fuels. Acid rain has long been a subject in scientific circles (SN: 6/15/74, p. 383; 7/10/76, p. 25) and is a fact of life in northwestern Europe. But growing evidence of its effects in the United States — crop damage and fish kills in the Adirondacks — and President Jimmy Carter's August 2 environmental message to Congress, which identified acid rain as a major environmental threat, have brought it to the fore. And with President Carter's directive to form by Jan. 1, 1980, a 10-year comprehensive Federal Acid Rain Assessment Program managed by a standing Acid Rain Coordination Committee, the flurry of papers and hearings and research contracts and deadlines has begun in earnest.

EPA, co-chair with the Department of Agriculture of the Acid Rain Coordinating Committee and slotted to receive more than half the \$10 million annually allotted to acid rain research by the President's directive, is among the first to produce something from all the fuss. At a press briefing last week, Stephen J. Gage, EPA Assistant Administrator for Research and

Development, described the three thrusts of EPA's acid rain research program: environmental effects, atmospheric effects and monitoring.

Included in the program, which is outlined in a report called "Acid Rain Research Summary," will be studies of:

- the already-damaged lakes of the Minnesota Boundary Waters Canoe Area, northern Wisconsin and Michigan,
- crop sensitivity to sulfuric acid,
- the U.S. lakes sensitive to acid rain, in order to determine factors that lead to or would prevent acidification, and
- the transport, behavior and reactions of sulfur dioxide and nitrogen oxides in the atmosphere.

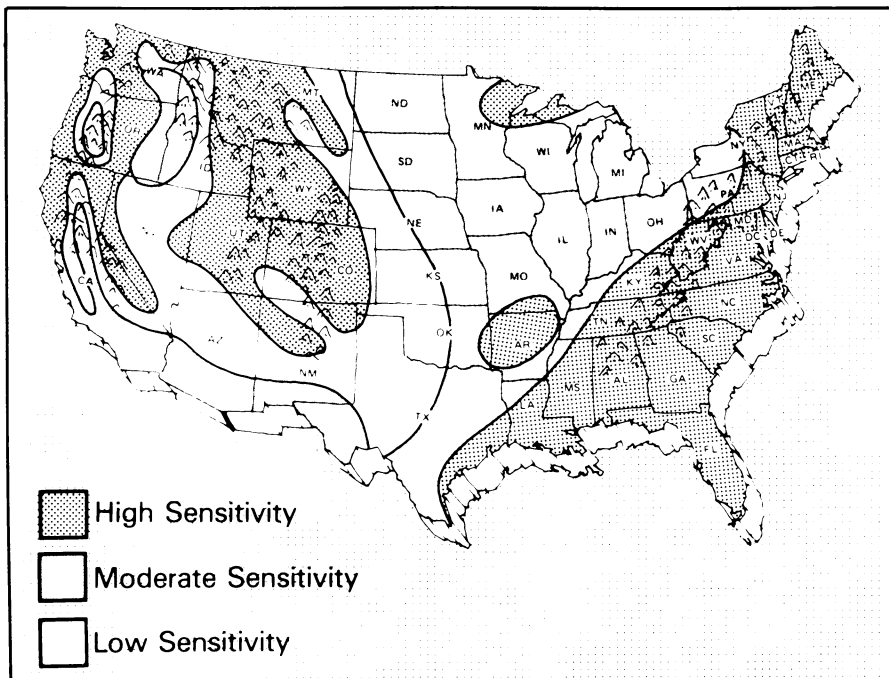
At least two networks will monitor the fall of acid rain. EPA will coordinate the U.S. part of a major global network established by the World Meteorological Organization as well as contribute to the more than 50-station National Atmospheric Deposition Project Network (formerly NC141, see SN: 6/24/78, p. 407).

But, as one reporter pointed out at the briefing, outlining research needs is one thing, taking care of the immediate threat is another. Increasing acidic precipitation has already caused the average pH of the Adirondack lakes to drop from 6.5 in the 1930s to 4.8 now; more than 90 of those lakes are completely fishless. And the problem is spreading westward, as pointed out by University of Colorado (Boulder) researchers William M. Lewis and Michael C. Grant.

At a public meeting of the National

Commission on Air Quality, which was established by Congress to evaluate the Clean Air Act, Grant and Lewis described "definite, unexpected evidence of acid precipitation near the continental divide." Four years of measurements near the Indian Peaks Wilderness Area 30 miles north of Denver — an area thought to be pristine — showed a nearly seven-fold increase in rain acidity, they said. Moreover, the researchers cannot pinpoint the problem's geographic source; with increased use of tall stacks on coal-burning power plants, shooting pollutants higher into the atmosphere, the culprit could be Denver, or it could be California.

And that problem — long-range transport — is one of the Commission's main concerns; its unwieldy charge, the Clean Air Act, is not now designed to regulate long-range transport of pollutants. According to EPA's Gage, improved controls of sulfur dioxide emissions will reduce the level of that pollutant. Nitrogen oxides, "in a few years," will be controlled at an 80 percent to 90 percent level as opposed to the current 40 percent to 50 percent level, he says. Even so, long-range transport will continue to make acid rain a transboundary, international problem. The answer, according to Gage, lies in understanding the mechanisms of acid rain enough to control it and in gaining the legislative handles necessary to do so. That answer does not bode well for the Clean Air Act. Says Gage: "Unless the Clean Air Act is changed there will be no way to get to the problem." □



Preliminary map indicating acid rain-sensitive areas of the continental United States.

Incest and 'vulnerable' children

The taboos surrounding incest have inhibited not only victims from discussing it but, until recently, behavioral scientists from studying it. Now, however, information is mounting concerning who participates in incest and under what circumstances. What remains less well known is why it occurs. Most explanations center on emotional difficulties of the adult involved in the incestual relationship, but some experts suspect that the child's level of vulnerability may also be involved in some cases. And in a report in THE INTERNATIONAL JOURNAL OF PSYCHIATRY IN MEDICINE (Vol. 9, No. 2), a Yale University psychiatrist suggests that certain children may indeed be more vulnerable than others to incest.

Robert K. Davies, now medical director at Fair Oaks Hospital in Summit, N.J., studied the medical records of patients admitted to the psychiatric inpatient unit

of Yale-New Haven Hospital between 1968 and 1977. The study focused on electroencephalograph (EEG) and IQ measures of 22 patients who had been the child or younger member of an incestuous relationship.

The study was undertaken because Davies and his colleagues had been "struck by EEG abnormalities" in several patients in treatment who had been incest victims, he said in an interview. "Although much has been written about the psychodynamics and family dynamics of the individual involved in incestuous relationships, there has been little documentation of neuropsychological factors that may play a role," he explains.

Of the 22 former incest victims, Davies found that 17 had abnormal EEG's (which were taken routinely after the patient's admission); of these, six suffered actual seizures. This 77 percent incidence compares with a 20 percent incidence of abnormal EEG's reported in a 1965 study of all patients admitted to the hospital unit, and with estimates of from 5 percent to 30 percent among the general population.

In addition, of the 13 study subjects who underwent psychological testing, five showed "dull normal" IQ scores and seven exhibited problems in perceptual motor tasks, concrete thinking and word-finding. In addition, impulsive behavior was reported in 18 of the 22 patients, and depersonalization (feelings of unreality about oneself or surroundings) in 12.

These results, Davies says, suggest that "these neuropsychiatric handicaps create a vulnerability that enhances inappropriate relationships within a family and makes it more difficult to resist an incestuous relationship." He notes that such EEG abnormalities "are frequently associated with disturbances in cerebral mechanisms in the temporal and limbic regions which may mediate identity formation and the sense of personal boundaries." This type of problem may translate into a child's increased demands for closeness, which "in susceptible family constellations ... may provide added stimulus for the breakdown of the incest taboo."

The fact that most of the patients tested were admitted for psychosis or depression should not have influenced their EEG or IQ scores, Davies says, although he adds that "some" brain wave abnormalities have been associated with schizophrenia. He also notes that nearly all the subjects came from middle class New Haven families and were not subject to other forms of abuse, as has been found with incest victims from other backgrounds, and which conceivably might contribute to neurological deficiencies.

"We're not saying the kids are at fault, or the adults not at fault," he says. And it is "unlikely" that such factors "are either necessary or sufficient for incest to occur," Davies says. But he adds that "they may underlie and augment" other family problems that contribute to incest. □

Negative emotions and cancer survival

"Let it all hang out," may be good advice as far as cancer survival is concerned. A half-dozen studies conducted by various investigators from the 1950s to mid 1970s showed that cancer patients who are able to externalize negative emotions live longer than do cancer patients who suppress their feelings. And now these findings have been confirmed one more time by Leonard R. Derogatis and his co-workers at Johns Hopkins University School of Medicine in Baltimore. They report their findings in the Oct. 5 *JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION*.

Derogatis and his team studied 35 women receiving drug treatment for spreading breast cancer. Each patient completed self-report inventories on psychological symptoms and moods. Each patient was also analyzed psychologically and had her medical history, such as previous therapies, sites of spreading cancer tissue and current response to therapy, recorded. The patients were then followed up in subsequent months to record their rates of survival. Whereas 13 of the patients lived a mean of only 8.6 months, 22 had survived, as of July 1978, a mean of 22.8 months — a highly significant difference. So the researchers labeled the former patients short-term survivors and the latter patients long-term survivors and then compared the results of each group's psychological tests and interviews.

Derogatis and co-workers report that long-term survivors had revealed, on the symptoms test, significantly higher levels of anxiety, hostility, alienation and other negative emotions than had short-term survivors. Similarly, long-term survivors had manifested significantly more negative moods than had short-term survivors. As for the results of psychological analysis, the long-term survivors had been found to possess significantly more negative attitudes toward their illnesses, their physicians and their treatments than had the short-term survivors. Derogatis and his colleagues conclude that cancer patients whose coping styles facilitate external, conscious expression of negative emotions and psychological distress appear to survive longer than do patients whose coping styles involve suppression or denial of psychological distress.

For this conclusion to be valid, of course, it is necessary to rule out any possible physical explanation for why certain of the patients survived a much shorter period than did others. Derogatis and his team have attempted to do so. They examined the medical histories of their subjects and were not able to find any statistically significant differences in physical characteristics between long- and short-term survivors. What's more, at the time of their psychological testing, the two groups did not show any significantly different response to antitumor therapy. In

fact, the short-term survival group had been getting drug therapy somewhat longer than had the long-term survival group — exposure that should have increased survival, not shortened it.

The crucial question now is how expression of negative emotions physiologically boosts survival among cancer patients. It is well established that hormones influence tumor growth, and links have been made between psychological factors and hormone status. So it is conceivable that venting negative emotions could alter hormone levels, which in turn could cause a breast tumor to regress, particularly if therapy was applied at the same time. □

Backpack planned for shuttle tile repair

One of the problems causing delays and increased costs during development of the space shuttle has been with the layer of heat-resistant tiles designed to protect the craft from the high temperatures of reentry through earth's atmosphere. If individual tiles become detached or severely damaged during the launch ascent (some have come off while the shuttle was being transported through the air atop its 747 jet carrier), the greater heat of reentry could cause serious problems by burning through the exposed aluminum skin underneath. The National Aeronautics and Space Administration thus announced last week that it is hastening development of a backpack-type maneuvering unit so that shuttle astronauts will be able to move around their vehicle in orbit to inspect and repair damaged tiles.

The device, an outgrowth of earlier versions tested in the Gemini and Skylab programs, is being planned for a variety of shuttle tasks—deploying payloads, checking instruments, etc. — but its development is now being accelerated by "several

