Low lead levels can harm kids' hearing

Children whose blood-lead levels fall well within the generally accepted "safe" range may have incurred subtle but significant hearing loss, according to a new study by Environmental Protection Agency (EPA) scientists. "This may be a possible explanation for at least some of the learning disabilities that have been observed previously" in lead-exposed children, says David A. Otto, one of the study's authors and a physiological psychologist at EPA's Health Effects Laboratory in Research Triangle Park, N.C.

Otto says these results, when taken together with other new data on childhood effects of low-level lead (SN: 11/22/86, p.333), suggest there is now justification for reducing the current federal guideline on what constitutes an excessive body burden of lead in children – 25 micrograms per deciliter (μg/dl) of blood.

Using data on 3,000 youths between the ages of 4 and 19 from the most recent National Health and Nutrition Examination Survey (NHANES), the EPA scientists correlated blood-lead levels with hearing at pitches between 500 and 4,000 hertz, a range that Otto says covers most speech.

"We found that as blood-lead levels increased from approximately 10 μg/dl to approximately 30 or 35 μg/dl, there was a hearing loss in the range of about 10 decibels," he says. Though adult lead workers have experienced hearing losses at blood-lead levels of about 50 μg/dl, deficits in Otto's study could be linked with lead levels as low as 12 μg/dl. He notes that most audiologists would not consider the 5- to 10-decibel losses detected in the children to be "*clinically* significant." However, he says the EPA researchers believe that this slight impairment in hearing might contribute to learning disabilities, even speech impairments, that could go unnoticed in preschool children.

Otto says he is not sure of the exact mechanisms that might trigger the hearing impairment. But his earlier studies have linked potentially serious adverse hearing changes, such as significant delays in conduction velocity within the auditory nerve, to high lead exposures in children. Because symptoms persisted five years after blood levels dropped to normal U.S. levels – between 10 and 15 μg/dl – Otto worries that "these may be long-term effects that do not go away."

"It's not surprising that an agent [lead] that impedes cell-to-cell communication would in fact affect auditory processing," says Ellen Silbergeld, a lead toxicologist with the Environmental Defense Fund in Washington, D.C. But she believes the major importance of Otto's new study may be the clue it offers to how lead affects learning and IQ. Silbergeld says she is particularly troubled by how low the lead levels were that affected hearing; NHANES data suggest, she says, that 80 percent of U.S. children have blood-lead levels above 10 μg/dl. However, Otto notes, a near phaseout in U.S. use of leaded gasoline – believed to be the leading source of lead in children – means average childhood lead levels should be declining. *– J. Raloff*

Test blaze goes off

The long-awaited prescribed burn of California chaparral (SN: 10/4/86, p.213) finally took place on Dec. 12. Though a recent rain limited the fire's intensity and acreage, 50-foot flames were not uncommon. Smoke plumes rising from the 300 acres that burned were tracked for about 40 miles downwind. Some 50 researchers on hand to measure environmental effects of large-scale fires "seem to have got all the data they can handle," says project coordinator Philip J. Riggan of the U.S. Forest Service in Riverside, Calif. In February the scientists plan to reconvene and share their preliminary data. □

Winter depression: Rise and shine?

As daylight wanes in the fall and winter, some people slow down, oversleep, overeat and become depressed and unable to function normally. In a number of studies, artificial bright lights have eased these symptoms of winter depression, also known as seasonal affective disorder (SAD) (SN: 3/9/85, p.152).

Yet reports from several laboratories presented last week failed to resolve a key question: How do the lights work?

At the meeting of the American College of Neuropsychopharmacology in Washington, D.C., Alfred J. Lewy and Robert L. Sack of the Oregon Health Sciences University in Portland reported that the daily biological rhythms of most winter depressives are delayed and appear to be reset by morning light, which they find to be the best treatment for SAD. In a study of 19 such patients, the researchers used the hormone melatonin as a marker for light sensitivity and body rhythms.

Melatonin secretion begins when it becomes dark, gradually reaches a peak during the night and falls again with the approach of daylight; in 18 of the patients, this pattern began and ended several hours later than normal. These patients markedly improved over four weeks when exposed to one-half hour or two hours of bright light upon awakening in the morning; light presentation from 8 p.m. to 10 p.m. was far less effective, and a combination of morning and evening light resulted in improvement about halfway between morning-only and evening-only conditions.

"It is as if the light exposures when given together counteract one another," says Lewy.

The exceptions included one subject who responded worst to morning light and best to evening light, notes Lewy, and had a melatonin secretion pattern that was advanced, rather than delayed, by several hours. In addition, about one-quarter of the patients responding to morning treatment did better on one-half hour of light than on two hours of light.

"'The more bright light the better' is not necessarily the case for SAD patients," says Lewy. "By and large, most of them are phase delayed [with respect to daily biological rhythms] and should respond preferentially to morning light." But it is difficult, he adds, to control for nonspecific effects, such as patient expectations, in light treatment studies.

Support for Lewy's hypothesis comes from a study conducted by Frederic Quitkin and his colleagues at the New York State Psychiatric Institute in New York City. They observed the most substantial improvement among 28 SAD patients exposed for one week to two hours of bright light in the morning and evening; significant improvement also occurred with two hours of morning light only and 30 minutes of morning and evening light. Evening light treatment alone produced negligible effects.

"There were complete remissions only among patients who got at least some morning light," says Quitkin.

Other researchers contend, however, that the brightness and duration of light is more important than its timing. In a study conducted by Norman Rosenthal and his colleagues at the National Institute of Mental Health (NIMH), two hours of bright light at midday were as effective as two hours in the morning among 16 SAD patients. Previous studies, notes Rosenthal, have found even greater improvement among winter depressives exposed to four hours of evening light, from 6 p.m. to 10 p.m.

"Most SAD patients seem to be more sensitive to morning light treatment," says Rosenthal, "but since you can get the same effects at other times, a resetting of biological rhythms is probably not taking place." Bright lights, he suggests, may temporarily correct an as-yet-unidentified chemical imbalance in the brains of SAD patients.

Most winter depressives examined at NIMH ride a seasonal pendulum, becoming agitated, gregarious and impulsive in the spring and summer (SN: 3/8/86, p.152). But Lewy observed no such symptoms among 40 SAD patients in Portland. Long, bright summer days are less frequent in the Pacific Northwest, says Rosenthal, and may account for the lack of a seasonal swing there. *– B. Bower*