Excess lead linked to boys' delinquency

A group of boys between the ages of 7 and 11, with high lead concentrations in their bones displayed attention problems, aggressive behavior, and delinquency, a new study finds. In contrast, boys in that age group possessing low to moderate lead concentrations showed fewer such problems, asserts a scientific team directed by Herbert L. Needleman, a psychiatrist at the University of Pittsburgh School of Medicine.

"These data argue that environmental lead exposure, a preventable occurrence, should be included when considering the many factors contributing to delinquent behavior," the investigators conclude.

The link between high lead concentrations in bone and boys' delinquency remained strong even after taking into account differences in mothers' IQs, occupations, and schooling. Consideration of the presence of two parents in the home and signs of adequate child-rearing practices also left the results unchanged.

None of the previously identified characteristics of lead poisoning showed up in boys displaying high bone lead content, Needleman's group reports in the Feb. 7 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION. The investigators relied on an X-ray technique to estimate lead concentration in the upper leg bone of one leg of each boy; the extent to which these measurements correlate with lead concentrations in blood, on which current guidelines are based, remains unclear.

If the new findings are representative of the general population of U.S. children, "the contribution of lead to delinquent behavior would be substantial," the scientists contend.

Their study consisted of 212 boys enrolled in Pittsburgh public schools, all of whom are taking part in a larger, long-term study of delinquency. The researchers obtained lead measurements from the boys twice, at about 10 and 12 years of age.

Experimenters administered behavior and delinquency questionnaires twice annually to each boy from age 7 to 11. Questionnaires included items on physical complaints, depression, anxiety, and thought and attention problems. At around the same times, parents and teachers also rated the boys on these measures.

About half the boys selected for the study had consistently engaged in aggressive and problem behaviors before the study began.

When the boys were 7 years old, parent and teacher reports did not reveal any striking difficulties unique to high-lead youngsters. But 4 years later, parents and teachers noted substantial increases in behavior and attention problems for the high-lead group, compared to the rest of the boys. Self-reports by boys with high concentrations of lead in their bones also revealed significant boosts in delinquent acts and attention difficulties by age 11.

These findings confirm earlier reports of lead-related behavior and attention difficulties based on smaller samples of children, parents, and teachers, Needleman and his coworkers conclude.

Problem behaviors that emerged in high-lead boys serve as moderately accurate harbingers of adult violent crime, alcoholism, and domestic abuse, states Terrie E. Moffitt, a psychologist at the University of Wisconsin-Madison, in an accompanying editorial. Moffitt's own studies indicate that symptoms of attention deficit–hyperactivity disorder and impulsive behavior, as well as low intelligence, loom large in cases of lifelong delinquency (SN: 4/15/95, p. 232).

"Links between such measures and lead exposure warrant careful attention," she holds. — *B. Bower*

Planning the budget for this year and last

The President's fiscal year (FY) 1997 budget plan, released Feb. 5, is a quick read. At 20 pages, it outlines spending recommendations but, unlike previous budget proposals (SN: 2/11/95, p. 87), contains no figures for individual agencies, including those funding science.

The administration promises to provide those details the week of March 18.

Disagreements between Congress and the President over FY 1996 appropriations and balancing the budget slowed the administration's FY 1997 budget preparations. "This has been a very difficult year in which to make a budget," explained Alice M. Rivlin, director of the Office of Management and Budget, at a press conference Monday.

The President has nonetheless signed into law FY 1996 appropriations for the entire budgets of some agencies and parts of others. Research and development (R&D) stands to receive a good portion of the FY 1996 pie, predicts the American Association for the Advancement of Science (AAAS) in Washington, D.C., which has recently compiled and analyzed available government budget figures.

"There is still a tremendous amount of uncertainty because of the ongoing budget negotiations," AAAS reports. But as of late January, "R&D is faring better than many had expected earlier in the year."

The National Institutes of Health received an appropriation of $11.4 billion, 3.5 percent more than in FY 1995. Indeed, NIH "is likely to be the only civilian agency to enjoy an increase in FY 1996," AAAS predicts.

Congress and the administration have yet to agree on how much to give NIH's parent agency, the Department of Health

AAAS

Research and Development Funding (So Far)
Budget Authority (in millions of dollars)

Department or Agency	FY 1995 (estimated)	FY 1996 (Clinton)*	FY 1996 (Congress)**	% Change (1995–1996)†
Defense (military)¶	35,216.2	35,161.2	36,631.9	1.3
NASA	9,728.6	9,517.1	9,238.7	-7.7
Energy	6,261.0	7,012.9	6,318.9	-1.8
Health and Human Services	11,496.6	12,014.7	12,055.8#	2.2
(National Institutes of Health)	(10,770.2)	(11,293.3)	(11,441.3)	(3.5)
National Science Foundation	2,411.7	2,540.0	2,373.7	-4.3
Agriculture¶	1,527.7	1,483.4	1,471.3	-6.4
Interior	671.6	679.3	554.2	-20.2
Transportation¶	639.4	727.1	525.5	-20.5
Environmental Protection Agency	599.7	681.6	526.8	-14.9
Commerce	1,117.1	1,403.7	805.1	-30.6
All Others	1,315.4	1,346.2	1,171.7	-13.6
TOTAL R&D	70,984.9	72,567.1	71,673.8	-1.7
Total Defense R&D	37,775.5	37,929.9	39,431.9	1.7
Total Nondefense R&D	33,209.4	34,637.2	32,241.9	-5.6

* Budget requested by Clinton administration.
** Budget requested or appropriated by Congress.
† Difference between 1995 estimates and 1996 congressional figures, after subtracting projected FY1996 inflation rate of 2.7 percent.
¶ Final appropriations.
# Appropriation requested by House only.

and Human Services.

(Percentages in this article have been adjusted for the 2.7 percent inflation rate anticipated by the Congressional Budget Office for FY 1996. Figures for 1995 remain estimates because the agencies haven't released final numbers yet.)

R&D budgets for the Department of Defense, the Department of Agriculture, and parts of the Department of Energy have become law. Defense-related R&D at the Departments of Energy and Defense received $39.4 billion, a 1.7 percent increase over FY1995, AAAS reports. Funding for Energy's basic science programs grew by 7.4 percent, while Defense's fell 6.2 percent.

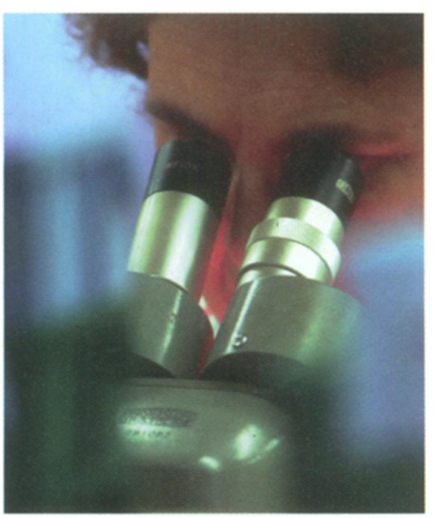
If Congress has its way, the government's nondefense R&D programs will suffer a 5.6 percent decrease overall. "But this figure is by no means final," AAAS warns. In contrast, Congress requested a cut of about 13 percent in the budgets of most other domestic programs.

Agriculture's R&D budget got cut by 6.4 percent. Funding for its basic research declined 3.1 percent, from $594.2 million to $591.5 million, AAAS reports.

The President has not signed FY 1996 appropriation bills that would fund NASA, the Environmental Protection Agency, the National Science Foundation, the Commerce Department, or the Department of the Interior. They are operating on funds that run out March 15.

Congress has proposed some big cuts in those agencies, however (SN: 4/22/95, p. 245; 9/23/95, p. 204), including eliminating Interior's Bureau of Mines (SN: 1/6/96, p. 7). The department's National Biological Service would move to the U.S. Geological Survey. Also in danger of getting the ax is Commerce's Advanced Technology Program, which develops risky, but potentially lucrative, enterprises with industry.

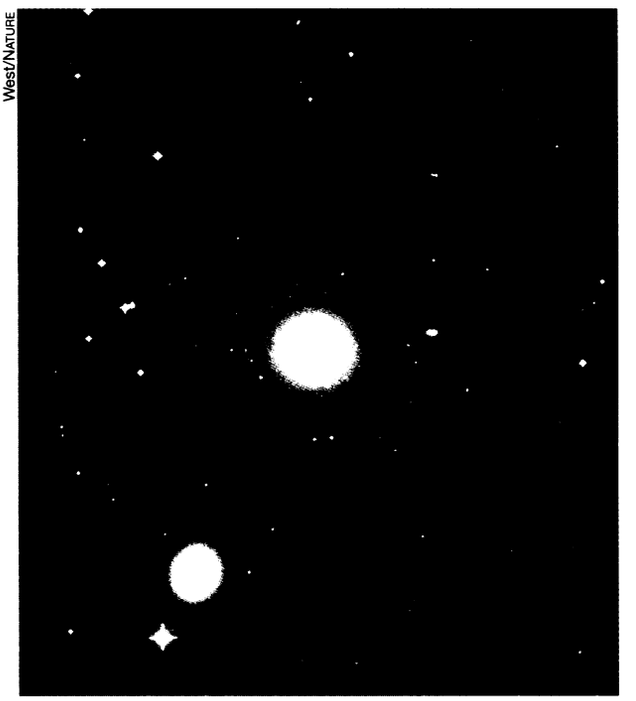
Funding for basic science in 1996 would drop by almost 34 percent at Interior, 25 percent at EPA, and 2.7 percent at NSF. — *T. Adler*



NIH may lead civilian agencies in funding increases.

Tracing the architecture of dark matter

Stars and galaxies set the night sky aglow, but these glittering jewels account for only a tiny portion of matter in the cosmos. For more than half a century, astronomers have gathered evidence that at least 90 percent of the mass in the universe doesn't emit light. This invisible material, known as dark matter, exerts a gravitational tug, just as stars and galaxies do, but has otherwise remained a mystery.



West/Nature

Central region of the Fornax cluster.

Now, a team of Japanese astronomers argues that dark matter has another property in common with visible material. The unseen matter forms small lumps that coalesce into bigger lumps, in the same way that visible stars group into galaxies and galaxies assemble into clusters.

The researchers also speculate that two distinct kinds of dark matter may exist—one that congregates around individual members of a cluster of visible galaxies and another that gathers around the cluster as a whole.

Yasushi Ikebe of the University of Tokyo and his colleagues report their findings in the Feb. 1 NATURE.

To trace the dark matter in a cluster of galaxies, Ikebe and his colleagues measured the distribution of hot, X-ray-emitting gas that resides there. They made the standard assumption that the pressure exerted by the hot gas equals the gravitational attraction of the cluster. Under this condition, regions that have a higher density of dark matter will trap more of the gas.

In July 1993 and January 1994, Ikebe's team used the Japanese X-ray satellite ASCA to map the X-ray-emitting gas within a nearby cluster, Fornax. Instead of being distributed smoothly within and just outside the cluster, the gas clumped into two distinct regions. Some of the gas gathered around NGC 1399, a massive galaxy at the center of Fornax, while a larger amount concentrated around the entire cluster.

From these findings, the researchers conclude that dark matter congregates into lumps on both the galactic scale and the much larger cluster scale. They further propose that dark matter clumps at various sizes in between.

Previous observations had already hinted that clusters of galaxies contain a substructure of dark matter, notes Michael J. West of Saint Mary's University in Halifax, Nova Scotia, in an accompanying commentary. "Nevertheless, Ikebe [and his team] do provide strong additional support for the notion that the dark matter content of the universe is arranged in a continuous hierarchy of structures from small to large scales.

"This hypothesis lies at the heart of most currently popular models for structure formation in the universe, which propose that [the patterns of] galaxies and larger structures originate from small clumps of dark matter that clustered together to form progressively larger objects," says West.

Neta A. Bahcall of Princeton University calls this picture "consistent" with her team's recent finding that the dark matter in clusters consists largely of material contributed by the halos around individual galaxies. When galaxies form a cluster, some of the dark matter gets stripped off and gathers around the cluster as a whole, she speculates.

Ikebe and his collaborators propose an alternative explanation for the clumping. They suggest that they may have seen effects of two kinds of dark matter. Indeed, cosmologists suggest that slower material, known as cold dark matter, might form the smaller, galaxy-sized lumps, while faster material, known as hot dark matter, assembles into the bigger lumps associated with galaxy clusters.

Models in which the universe consists of a mixture of hot and cold dark matter are currently in vogue as astrophysicists try to reconcile old theories with new data about the evolution of the cosmos.

— *R. Cowen*