

## Hyperactivity grows into adult problems

A substantial minority of hyperactive boys enter adulthood holding low-paying, nonprofessional jobs, abusing illicit drugs, and regularly committing irresponsible and violent acts, according to a long-term study published in the July ARCHIVES OF GENERAL PSYCHIATRY.

However, childhood hyperactivity — officially known as attention-deficit hyperactivity disorder (ADHD) — does not increase the likelihood of chronic unemployment as an adult, assert Salvatore Mannuzza, a psychologist at the New York State Psychiatric Institute in New York City, and his colleagues. About one in three hyperactive boys completes all or part of college, and a surprisingly large number end up owning their own small business, the researchers note.

“Regardless of adult psychiatric status, ADHD placed children at relative risk for educational and vocational disadvantage,” Mannuzza’s team reports.

The study consisted of 91 white males, with an average age of 26, who first received a diagnosis of hyperactivity between the ages of 6 and 12. All had been treated for the disorder, primarily with a stimulant medication that often eases symptoms. Three categories of symptoms typify ADHD: inattention, including difficulty concentrating on school projects; impulsivity, such as constantly jumping from one activity to another; and hyperactivity, often signaled by an inability

to stay seated or to sit still without fidgeting.

Another 95 men who had displayed no evidence of ADHD as children served as a control group.

Nearly one-quarter of the hyperactive boys failed to finish high school, compared with only two of the controls. Only one hyperactive boy, compared with eight controls, went on to obtain a graduate degree.

Fewer members of the ADHD group held professional-level jobs, such as accountant, stock broker, or scientist.

In contrast, 16 of these same men owned and operated their own small business, compared with five controls. The reasons for this finding remain unclear, and further study is needed to determine its accuracy, the scientists say.

Overall, 30 men who grew up with ADHD experienced an ongoing mental disorder, compared with 15 controls. Two diagnoses accounted for most of the psychological disturbances in the former group: antisocial personality disorder, characterized by long-standing irresponsible, aggressive, and often criminal behavior; and abuse of illegal drugs.

Only 10 of the men with an earlier diagnosis of hyperactivity received either a current ADHD diagnosis or suffered from substantial ADHD symptoms, the researchers maintain. This probably represents an underestimate, in their opinion, since interviewers did not ask 15 men in the ADHD group about symptoms of adult hyperactivity because those men denied having had significant signs of hyperactivity as children. — B. Bower

## Panel weighs health impact of herbicides

The National Academy of Sciences’ Institute of Medicine (IOM) this week released a report that finds a statistical link between three cancers, two other disorders, and exposure to chemicals in herbicides used during the Vietnam War.

U.S. troops sprayed nearly 19 million gallons of herbicides over about 4 million acres in Vietnam between 1962 and 1971. The herbicides defoliated large areas of thick jungle, thus enabling U.S. military forces to scan for enemy troops. Concerns about the health effects of herbicides, such as the dioxin-tainted Agent Orange, first surfaced in 1970. Since that time, the debate over the health effects of herbicides has been clouded by scientific uncertainty, politics, and a maelstrom of strong emotions.

The 16-member IOM panel of epidemiologists, toxicologists, and other experts stepped into the fray after Congress passed a law calling for a review of the existing scientific evidence on the possible health effects caused by exposure to herbicides. The panel issued the report, “Veterans and Agent Orange,” at a July 27 press conference held in Washington, D.C.

“For the very first time, veterans and the American public have a solid reason to believe that their concerns about exposure to Agent Orange, dioxin, and other toxic chemicals are at long last being taken seriously,” said Sen. Thomas Daschle (D-S.D.) at a hearing of the Senate Committee on Veterans’ Affairs, held the same day to review the IOM report.

The panel found strong evidence of a statistical association between herbicides or dioxin and soft-tissue sarcoma, non-Hodgkin’s lymphoma, and Hodgkin’s disease, three types of cancer. The panel’s review also turned up substantial evidence of a link between herbicide exposure and chloracne, an acne-like skin disorder, as well as porphyria cutanea tarda, a liver disorder that causes skin blistering.

The government acted quickly on those findings. At the Senate hearing, Secretary of Veterans Affairs Jesse Brown announced that Vietnam veterans with Hodgkin’s disease and porphyria cutanea tarda will now be entitled to disability payments based on their service in Vietnam and their exposure to herbicides. The VA already compensates veterans suffering from non-Hodgkin’s lymphoma, soft-tissue sarcoma, and chloracne.

The IOM panel reviewed data from 230 epidemiological studies. Most of the studies focused on people who reported on-the-job contact with the chemicals in herbicides or people exposed as a result of an industrial accident. They generally did not include Vietnam veterans, whose

## Biting flies flee elephants’ swatters

Elephants make their own fly swatters and use them most frequently in the heat of the day, when biting pests are out in force, a new study finds. Presented at the annual meeting of the Animal Behavior Society in July, the report shows how elephants use their heads — and their trunks — not only to employ a tool, but also to modify and save it. This behavior illustrates the elephant’s highly evolved, complex brain, says study coauthor Benjamin L. Hart.



Benjamin L. Hart

He and Lynette A. Hart, both animal behaviorists at the University of California, Davis — site of the July meeting — traveled to Nepal, where they observed the swatting behavior of 15 captive Asian elephants. The animals fashioned fly swatters out of whatever they could wrap their trunks around — leafy branches, banana stalks, burlap. Sometimes the elephants altered the branches, shortening sticks or trimming side stems.

Charles Darwin observed elephants swatting flies in 1871, but his and other reports remained isolated sightings. The new study is the first to systematically document tool use in elephants, Benjamin Hart says.

exposure to herbicides has been difficult to document. The panel acknowledged that limitation but said its review suggests that people (including Vietnam veterans) who come in contact with these chemicals run a risk of developing the three cancers and two other diseases.

"How big that risk is quantitatively, we just don't know," says IOM panel member David Kriebel, an occupational epidemiologist at the University of Massachusetts at Lowell.

The IOM panel also found hints of a weaker association between exposure to herbicides and lung and throat cancers, prostate cancer, and multiple myeloma, a cancer of the bone marrow. However, the group says the observed link could result from chance or bias.

A raft of disorders fell into a gray zone in which the panel concluded that available studies were not of sufficient quality or did not have the statistical power to warrant any conclusions. These health problems include immune disorders, renal cancer, leukemia, birth defects, and infertility.

Finally, the IOM committee sifted through the evidence and concluded that there appeared to be no connection between herbicide exposure and skin cancer, bladder cancer, brain tumors, or gastrointestinal tumors such as stomach cancer.

— K.A. Fackelmann

## Pleistocene diet: Tough on the teeth

For a predator, dinner is always catch as catch can. But the saber-toothed cats and other large carnivores living in America at the end of the last ice age had a particularly difficult time finding enough food, according to a study of teeth preserved in the tar pits of Los Angeles' Rancho La Brea. The preponderance of jaws with broken teeth suggests that carnivores back then had to crunch on bones or pick them clean in order to get their fill.

Blaire Van Valkenburgh and Fritz Hertel of the University of California, Los Angeles, analyzed specimens dating from the late Pleistocene epoch, 36,000 to 10,000 years ago, when Earth was emerging from the latest ice age. The most plentiful fossilized teeth at Rancho La Brea belong to coyotes and three species of extinct animals: the American lion, the saber-toothed cat, and the dire wolf.

Compared with modern carnivores, the animals that died at Rancho La Brea had a far higher frequency of broken teeth. The tar pit animals fractured between 5 and 11 percent of their teeth, whereas existing predators break only 0.5 to 2.7 percent, the researchers report in the July 23 SCIENCE.

The researchers also found a high proportion of broken teeth among ice age

## Atomic rebound makes breaking up hard

When chemical reactions occur in solution, solvent molecules exert a strong influence on the making and breaking of bonds. A team of researchers has now obtained the first glimpse of what happens when a laser light pulse lasting only a few femtoseconds (quadrillionths of a second) excites and splits an iodine molecule surrounded by a layer of argon atoms.

"With femtosecond time resolution, we can obtain snapshots of chemical reactions in real time," says chemical physicist Ahmed H. Zewail of the California Institute of Technology in Pasadena. This capability permits researchers to monitor motions on an atomic scale and to investigate what role solvent molecules play in easing bond formation or bond breaking.

Zewail and his Caltech co-workers studied the behavior of iodine molecules enveloped in clusters of argon atoms traveling in a molecular beam. From previous studies of isolated iodine molecules in the gas phase, they already knew that extremely short light pulses at different wavelengths cause iodine molecules to break up in different ways.

At a wavelength of 614 nanometers, a light pulse lasting only a few femtoseconds causes such a rapid breakup of an iodine molecule into two iodine atoms that the two atoms shoot away from each other at high speed. At a wavelength of 510 nanometers, the dissociation of iodine molecules occurs much more slowly.

The presence of argon atoms changes the dynamics of this chemical reaction considerably. In the first case, the two

iodine atoms speed apart until they hit the surrounding "wall" of argon atoms. The iodine atoms rebound along their original paths and recombine into a molecule. This "hot" iodine molecule then gradually cools down via repeated collisions with its shell of argon atoms.

"We see the recombination of the atoms, which you don't see in the gas phase," Zewail says.

In the second case, because the iodine molecule breaks up more slowly, the surrounding argon atoms have sufficient time to get between the two iodine atoms. "There is plenty of time for the solvent to rearrange, and as a result of that, we lose this [fast] recombination of the atoms," Zewail says.

The results demonstrate that the dynamics of the dissociation of iodine molecules depend critically on how swiftly bond breaking occurs relative to how quickly solvent atoms rearrange themselves. The researchers can also pinpoint the rebound of iodine atoms within their argon trap as the mechanism responsible for a process by which a solvent may enhance bond formation in solution by trapping reactive atoms or molecules in "solvent cages."

"Now we want to try to generalize this result," Zewail says. "There are a lot of other solvents we would like to do." By studying what effect solvent composition has on the dynamics of this and other chemical reactions, researchers may obtain important insights into the atomic forces that lead to various types of chemical behavior.

Zewail, Qianli Liu, and Juen-Kai Wang describe their findings in the July 29 NATURE.

— I. Peterson

remains of dire wolves in Mexico and Peru, suggesting that this pattern occurred elsewhere, not just at Rancho La Brea.

Among modern carnivores, those that eat bone, such as the hyena, run the greatest risk of fracturing their teeth. Van Valkenburgh and Hertel therefore propose that carnivores from Rancho La Brea broke many teeth because they ate or gnawed on bones more often than their modern counterparts do. These early carnivores may have been forced to consume as much of their kill as possible because prey was scarce or because predators faced stiff competition.

The teeth story from the tar pits could reflect how the ecosystem of North America was changing in response to a wave of extinctions that wiped out most of the larger mammals on the continent between 13,000 and 10,000 years ago. This was the time when mastodons and mammoths disappeared, as did camels, many species of horses, and super-size elk.

With their prey vanishing, predators may have had to alter their feeding practices, the researchers suggest.

Paleontologist Russell Graham of the Illinois State Museum in Springfield praises the study, saying, "It's a novel way of trying to figure out what the feeding strategy of these animals was. A lot of previous studies have looked at this in a subjective way, but Van Valkenburgh has found a way to quantify this and test it."

The new findings could rekindle the debate concerning the causes of the late Pleistocene extinctions. Paleontologists have traditionally explained the die-offs as the result of climate change at the end of the ice age. But some argue that human hunters, arriving from Asia, sped across the virgin continent, wiping out the big herbivores (SN: 3/27/93, p.197).

If future teeth studies show that carnivores altered their habits long before humans came to North America, that would bolster the climate change hypothesis, Graham says. — R. Monastersky