Salt Raises Chimps' Blood Pressure

Four thousand five hundred years ago, the Yellow Emperor of China noted in the Nei Ching, an ancient book of medicine, that "if too much salt is used for food, the pulse hardens." That hardened pulse signals high blood pressure.

Researchers today still debate how large a role—if any—salt plays in the epidemic of high blood pressure in Western societies. Some rank salt intake high among determinants of hypertension, while others maintain that factors such as smoking and the stresses of modern society have much greater significance.

Now, research by an international team of investigators goes far in teasing out salt's role from the morass of factors contributing to hypertension. By studying the effects of salt in chimpanzees, the team shows that dietary salt alone can significantly raise the animals' blood pressure.

"The real importance of this experiment in this species, which is closest to humans, is in relation to the basic principles for diet for infants, children, and young adults," says lead investigator Derek Denton of the Howard Florey Institute of Experimental Physiology and Medicine at the University of Melbourne in Australia. "It probably is a good idea to reduce the sodium intake and increase the potassium to make our diet closer to that we evolved with."

Epidemiological evidence to support Denton's advice has existed for years. Preliterate peoples such as the Kalahari Bushmen live on largely vegetarian diets, consuming about half a gram of salt per day compared to the 10 grams a day of the average person in the United States. And the Bushmen's diet is high in potassium. Unlike people in developed countries, Bushmen see no increase in hypertension with age, and the disease itself is virtually unknown.

When the Bushmen move into cities and begin eating a more Western diet, however, their rates of hypertension rise. But such observations fail to prove that salt causes hypertension. As well as changing their diets, urbanized Bushmen may start smoking, drinking alcohol, and eating more fat. Changes in social dynamics may cause stress, which can increase blood pressure.

"It is very difficult in human epidemiological studies to get clear relations between salt and high blood pressure," says Denton. But the chimpanzee study "was a one-variable experiment."

Denton's team studied an established colony of 26 chimpanzees in Gabon, as they report in the October NATURE MEDICINE. The researchers separated the animals into two groups of 13, giving them identical diets of fruits and vegetables. The researchers supplemented the animals' diets with a liquid infant formula that provided calcium—previous studies have indicated that low calcium may lead to hypertension—and, for one group, an amount of sodium that increased over 22 weeks to 15 grams per day.

The researchers measured the animals' blood pressure in millimeters of mercury (mmHg) as a ratio of systolic pressure (when the heart pumps blood) over diastolic pressure (when the heart rests between beats). Normal adult human blood pressure is around 120/80. After 20 months on the high-salt diet, blood pressure in seven chimps rose by an average of 33 mmHg systolic and 10 mmHg diastolic. Three chimps showed no increase, while three others failed to drink all of their sodium-laced formula. The control group experienced no rise in blood pressure. Moreover, 6 months after the researchers weaned the animals off sodium, their blood pressures returned to normal.

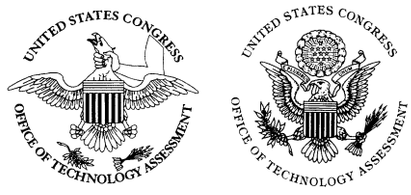
Alan R. Dyer of Northwestern University Medical School in Chicago, who wrote a commentary in the same issue, told SCIENCE NEWS that "the paper is quite convincing about the effect sodium can have in an animal model that is close to man." He notes that "most of the animals can be described as salt-sensitive."

Denton agrees that the data indicate salt sensitivity in most of his animals, but he observes that some develop no problems with the added salt. He suggests that genetic testing may one day identify which humans are susceptible, but until then he advises everyone to lower their salt intake. *— L. Seachrist*

OTA dies, but its analyses will live on

The Librarian of Congress got $350 million and all I got was this lousy T-shirt.

That mordant slogan, worn by many long-time staffers last week, characterized their reaction to the closing of the congressional Office of Technology Assessment Sept. 30. With the end of the federal fiscal year, all but 17 of OTA's employees lost their jobs. And those 17, who are archiving the agency's files, inventorying furniture, closing out contracts, and emptying computer files, will themselves be out of a job come Jan. 31.



Since August, a strangled eagle parody (left) of OTA's logo (right) has emerged on T-shirts—even on the cover of OTA's farewell party program.

Over OTA's 23-year history, staff analysts have issued some 750 reports in response to requests from congressional committees. These ran the gamut from investigations into unconventional cancer therapies, the reliability of polygraph tests, and telecommunications opportunities for American Indians, to ways of reducing urban ozone, designing less-polluting products, and simulating combat. All of the analyses focused on issues with a considerable scientific or technical component. Moreover, they often laid the groundwork for legislation.

But last December, Senate Republicans backed a congressional reform plan drafted by Pete Domenici (R-N.M.) and Connie Mack (R-Fla.) that included a recommendation to abolish OTA. This year, Republican leaders in the House and Senate convened hearings on the matter. And though few criticized OTA's work, several invited witnesses argued that the office's investigatory activities duplicated those of other agencies—such as the Congressional Research Service (CRS)—or was simply a luxury in this era of extremely tight budgets.

Abolishing OTA promises no great savings, however. Its $23 million annual budget equals just half a percent of the cost of weapons not requested by the Department of Defense but nonetheless added to DOD's fiscal 1996 appropriation by the House National Security Committee.

Indeed, OTA's size made it especially vulnerable, says Rep. Amo Houghton (R-N.Y.), who was slated to become chairman of the agency's bipartisan board this coming year. "You don't cut the big bully down to size because he's too big to handle. But the little guy, who may even be the next genius, you can pummel the dickens out of him. And that's what happened to OTA," he says.

Roger Herdman, the agency's last director, points to OTA's low visibility as an additional factor. Unlike the CRS, which will look up information for any member of Congress, OTA worked only for committees. As a result, Herdman says, most of the large group of incoming

legislators last year experienced the value of CRS immediately. In contrast, he says, "the opportunity to know OTA well came as you served more time, rose in the leadership, and became committee chairmen." These leaders may be influential, he says, but there were too few of them when the fate of the agency came to a vote this summer.

After getting their proverbial pink slips in mid-August, OTA employees expedited their work schedules to complete 27 additional analyses, filling some 4,200 pages. Ten books—1,500 pages of camera-ready text—were finished and sent to the printer only last week.

What made it possible, Herdman explains, was 60 days of severance pay and the commitment of OTA staff. About 130 of the agency's 142 full-time employees stayed to the end. "These federal employees, 100 percent of whom just got fired, stayed until the very last second of the life of their agency—just to turn out all of the work that they possibly could for those employers who just fired them," he noted with pride.

In fact, as those last 17 books begin returning from the printer, many OTA employees will return to work gratis, stuffing the reports into envelopes for mailing to Congress and the public.

Anyone not already on the mailing list for these reports can obtain them through the Internet. OTA will make the last 2 years of its offerings available on its World Wide Web site (http://www.ota.gov). By January, all 23 years' worth of OTA reports will be available from the federal government on CD-ROM. —*J. Raloff*

Birds: Lightweights in the genetic sense

Birds are the star athletes of the vertebrate world, pushing their bodies to metabolic extremes in order to defy gravity. Evolution has given them an edge by creating a lightweight skeleton, an aerodynamic coat of feathers, and a highly efficient respiratory system.

Their advantages even extend to the molecular realm. According to a new study, birds cast off excess genetic baggage long ago and in the process developed a much leaner genome.

Biologists have long known that bird cells contain less DNA than those of reptiles, mammals, and amphibians. But they did not know where the genetic differences lay. Austin L. Hughes and Marianne K. Hughes of Pennsylvania State University in University Park explored that question by comparing the sequences of 31 equivalent genes in humans and chickens—two animals for which this information exists.

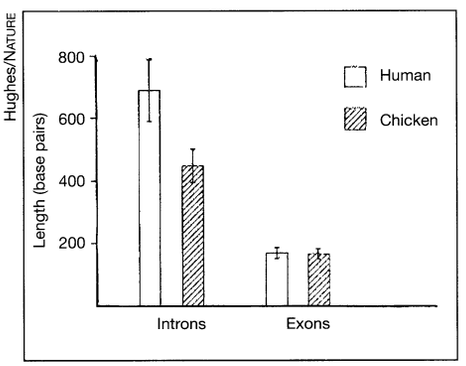
They found that all of the chickens' sequences were shorter because they contain shorter introns, the regions of genes that contain so-called nonsense, or noncoding, DNA. Exons, the regions that contain the blueprints for protein formation, were roughly the same size in chickens and humans, the scientists report in the Oct. 5 NATURE.

A single genetic change could not have shortened all chicken introns, the researchers argue. Instead, evolution gradually trimmed avian DNA, perhaps as an adaptation for flight.

Because the typical cell size of an animal tends to match the length of its genome, the development of shorter introns could account for the relatively small size of bird cells. Smaller cells should make birds more metabolically efficient by speeding up the diffusion of oxygen into the interior portion of cells.

To support their theory, the investigators note that bats tend to have less DNA than other mammals. Furthermore,

Hughes/NATURE



Slim genes: Chickens have smaller introns but similar-size exons.

eagles, pigeons, and other strong flyers have smaller genomes than weak flyers or flightless birds. "It would seem that reduced genome size is an adaptation for flight in vertebrates," conclude the Penn State scientists.

Intron researcher Stephen R. Palumbi of the University of Hawaii in Honolulu warns that the smaller intron size in birds might not have evolved in connection with flight. "There are lots of differences between chickens and humans [aside from flight ability] that may explain that pattern," says Palumbi. Nonetheless, he finds it compelling that bats also have smaller genomes, whereas flightless birds have larger ones.

Evolutionary geneticist Robert C. Fleischer of the National Zoological Park in Washington, D.C., adds that "birds apparently have very efficient enzymes for correcting mistakes in DNA." These enzymes prevent segments of noncoding DNA from multiplying and thereby enlarging the bird genome as they do in other animals. Fleischer had jokingly suggested that the correction system might reduce the weight of birds, although he did not pursue the idea. "I didn't think that anyone would take it seriously," he says. —*R. Monastersky*

SST emissions cut stratospheric ozone

Responding to NASA's proposal to put 500 new high-speed civil transport (HSCT) planes into service by 2015, scientists have been estimating the potential impact of routine supersonic flight on Earth's stratospheric ozone (SN: 10/22/94, p.260). Now they have some hard data.

David W. Fahey, an atmospheric scientist at the National Oceanic and Atmospheric Administration in Boulder, Colo., and his colleagues have measured exhaust emissions from a Concorde supersonic transport (SST) plane during high-altitude flight.

Traversing the exhaust trail of a Concorde 11 times during an Air France flight from Fiji to New Zealand last year, a NASA environmental research plane sampled the SST's exhaust, the researchers report in the Oct. 6 SCIENCE. The Concorde flew at 53,000 feet and at twice the speed of sound.

The scientists measured carbon dioxide, water vapor, reactive nitrogen and hydrogen, and sulfurous particles in the exhaust, finding more small particles than expected. The particles' abundance and size indicates that "sulfuric acid is produced from fuel sulfur more efficiently than expected after emission from the engine," Fahey's team says.

"If a fleet of HSCT aircraft produces particles at a rate comparable to that of the Concorde, increases in particle number and surface area would occur throughout the lower stratosphere in the Northern Hemisphere," they add.

If future planes emit larger than expected numbers of particles, they assert, their exhaust will have a correspondingly greater impact on stratospheric ozone. The researchers also observe that to lessen the exhaust particles' ozone-damaging impact, the sulfur concentrations of jet fuel may need to be "controlled to lower values."

While saying that this study demonstrates "good science and operations," Howard L. Wesoky, an aeronautical engineer at NASA in Washington, D.C., nevertheless adds that its significance is "not yet clear.

"This study is only one of many we're performing to understand how high-speed aircraft emissions react chemically and affect the stratosphere."

Using data from NASA's projections for high-speed flight in 2015, Debra K. Weisenstein, a researcher at Atmospheric and Environmental Research in Cambridge, Mass., found that additional exhaust particles could deplete stratospheric ozone by as much as 1 percent.

"It's safe to say that these results come from a state-of-the-art model," she says. "That's significant." —*R. Lipkin*