Anthropology

Brawn of humanity

Estimates of human ancestors' body size based on their fossil remains have varied greatly from one study to the next. It's tough to rebuild, from remnants of their bony architecture, creatures that no one has seen in the flesh.

A new examination of fossils from various sources indicates that, on average, the body mass of *Homo* species gradually increased between 1.8 million and 36,000 years ago and exceeded that of modern humans by nearly 13 percent. In addition, large boosts in brain size relative to body size occurred in the *Homo* lineage sometime between 600,000 and 150,000 years ago, assert anatomist Christopher B. Ruff of Johns Hopkins Medical Institutions in Baltimore and his colleagues.

Ruff's group applied two different methods of estimating body mass to 163 fossil individuals found in Africa, Asia, and Europe. One approach focused on the breadth of the knob that attaches the upper leg to the pelvis. The second method calculated body size from the pelvis' maximum width. In both cases, the measures bear a consistent relation to body size in modern human groups.

The two techniques yield comparable estimates of body mass for members of the fossil *Homo* sample, the researchers report in the May 8 NATURE. As in modern populations, human ancestors inhabiting higher latitudes were larger than those living closer to the equator, they note.

Relative brain size in *Homo* remained stable from 1.8 million to 600,000 years ago, according to the scientists. Pronounced brain growth ensued sometime within the next several hundred thousand years. Although European Neandertals in the period from 75,000 to 36,000 years ago were generally 30 percent larger than modern humans, their relative brain size was nearly equal to ours, Ruff's group contends.

Modern humans have experienced parallel declines in absolute brain and body size over the past 35,000 years, the investigators maintain.

The trend toward increasing bulk in much of the *Homo* lineage prior to modern humans "is probably quite robust," writes anthropologist John Kappelman of the University of Texas at Austin in an accompanying comment. Still, he remarks, the new study has limitations. For instance, its fossil sample is confined largely to European and African specimens that date to no more than 200,000 years old. Moreover, Kappelman says, world-class athletes may provide a better model than folks of more modest build for estimating ancient *Homo* body sizes from incomplete fossil evidence. — *B.B.*

Seeds of agriculture in the Americas

A new analysis of squash seeds and other plant remains from a Mexican cave extends plant domestication in the Americas back to around 10,000 years ago, more than 4,000 years before the earliest evidence of maize and bean cultivation. The transition to an agricultural way of life apparently began at about the same time in Mexico as in the Near East and China, contends archaeologist Bruce D. Smith of the Smithsonian Institution in Washington, D.C.

With a radiocarbon method that precisely counts atoms of different forms of carbon in small samples, Smith examined six squash seeds and three stems from squash plants. Age estimates of the specimens ranged from approximately 10,000 to 8,000 years old, Smith reports in the May 9 SCIENCE.

The Mexican finds display crucial signs of domestication, he remarks, such as rinds and stems much thicker than those of wild squash gourds.

The cave in which the specimens were excavated in 1966 also contains evidence of human occupation from about 9,000 years ago. Until now, however, the age and domesticated status of the squash remains had been uncertain. — *B.B.*

Biology

From a meeting in Miami Beach of the American Society for Microbiology

Uncle Sam needs a few good biologists

A few weeks ago, part of Washington, D.C., ground to a halt as a Jewish organization received a mysterious mail package with the word "anthrachs" written on it. Anthrax is a deadly bacterial toxin and just one of many biology-based weapons that several countries and terrorist groups may be developing (SN: 5/18/96, p. 311). The package was a false alarm, but it took many stressful hours to determine that. Military officials now hope to develop more effective sensors for biological weapons.

"You would know quickly, in a matter of minutes, whether it was a real threat," says Lawrence H. Dubois of the Defense Advanced Research Projects Agency (DARPA), the same military funding group that founded the Internet.

Officials of DARPA argue that the threat of biological weapons has been grossly underestimated. They have recently made detection and neutralization of such weapons a high priority. While DARPA has never before funded biological research, it plans to set aside at least $80 million annually over the next few years for biological weapons countermeasures. The agency intends to select projects that are "high-risk, high-payoff."

One such effort supported by DARPA involves injecting, either before or after a military engagement, a chemical that would coat some of a soldier's red blood cells and enable them to bind and clear microorganisms that have been used as weapons. "What we want to do is scrub the blood of pathogens," says DARPA's Shaun B. Jones. — *J.T.*

The benefits of mother's milk

Here's a medical mystery centering upon why babies *don't* get sick. A majority of infants harbor infections of the bacterium *Clostridium difficile*. This microbe makes a toxin that in adults can cause diarrhea or a serious inflammation of the colon. Yet infants seemingly suffer no ill effects, even though tests show that their intestines are exposed to amounts of the toxin that would cause disease in adults.

The explanation may lie in part in the breast milk a mother feeds her child, says Steven D. Dallas of the Texas Tech University Health Sciences Center in Lubbock. Dallas' colleague Rial D. Rolfe had previously found that mother's milk prevents the microbial toxin from binding to intestinal cells. The pair believe they have now identified the protective factor.

Human milk contains large amounts of a protein called secretory component, notes Dallas. In milk, the protein exists by itself or linked to the antibody immunoglobulin A. Both the free form of secretory component and its antibody-bound version can inhibit the binding of the toxin to intestinal cells, apparently by latching onto the toxin itself, says Dallas. — *J.T.*

Morphine's actions outside the brain

Morphine is well recognized as an addictive narcotic whose effects on the brain lend it remarkable pain-killing properties. Less appreciated is the drug's ability to weaken the body's defenses. "It clearly appears that, by a number of parameters, the immune system is depressed," says Toby K. Eisenstein of Temple University School of Medicine in Philadelphia.

Various immune cells bear opioid receptors, the cell surface proteins that morphine uses to convey signals into cells, notes Eisenstein. Moreover, spleen cells taken from mice receiving morphine mount a weaker-than-normal immune response in test-tube studies. Eisenstein says her work suggests that the drug impairs the ability of immune cells called macrophages to communicate with T cells, another arm of the immune system.

Eisenstein has also shown that mice receiving morphine regularly die from bacterial infections that would not be lethal to normal mice. She cautions that patients receiving morphine for postsurgical pain may face increased risk of sepsis, a massive, often fatal bacterial infection. — *J.T.*