Human Growth Displays Ancient Roots

Three unfortunate youths who died about 800,000 years ago have provided a hint that the prolonged period of childhood growth and development in humans has surprisingly old origins.

This form of delayed maturation, accompanied by protracted child care and a complex social life, is often regarded as a hallmark of modern humans. However, the ancient youngsters, who may belong to a species that preceded *Homo sapiens*, exhibit a tooth-development pattern similar to that of people today, contends a research team led by paleobiologist José M. Bermúdez de Castro of the National Museum of Natural Sciences in Madrid.

"This evidence supports the view that as early as [800,000 years ago], at least one *Homo* species shared with modern humans a prolonged pattern of maturation," the researchers report in the March 30 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

Bermúdez de Castro and his team found the fossils in a cave in northern Spain's Atapuerca Mountains. They assign the specimens to a new species, *Homo antecessor*, although other investigators go no further than placing them in the *Homo* line (SN: 5/31/97, p. 333).

For each fossil individual, the scientists noted the relative maturity of pairs of teeth from the front and back of the mouth. The team then compared these data with dental measures obtained by other researchers for living apes and humans, as well as for older fossils in the human evolutionary family.

Only the Spanish fossils exhibited a pattern of dental development much like that of modern humans, with relatively late eruption of many teeth, the investigators say. The third molar in the Atapuerca specimens reached maturity sooner than in current European populations, although the timing of its appearance lies within the worldwide human range, they note.

Analyses did not allow for precise chronological age estimates for the three fossil individuals. Two died in early adolescence and one as a young child, according to the researchers. One of the adolescents exhibited a tooth deformation caused by a severe childhood growth disturbance.

Humanlike dental development in the Atapuerca fossils renders more plausible an earlier report that they had brain-case volumes nearly as large as those of modern *H. sapiens*, Bermúdez de Castro and his coworkers hold. The Spanish scientists had estimated this volume from a cranial fragment believed to have come from one of the fossil teenagers.

"There's still some primitiveness in these teeth, but they also show the delayed system of maturation seen in modern humans," comments anthropologist F. Clark Howell of the University of California, Berkeley. "The Atapuerca individuals seem to have crossed some kind of growth-related Rubicon."

The new study provides "the first substantive evidence" for extended individual development before the emergence of *H. sapiens*, adds anthropologist Tim Bromage of Hunter College in New York City. Intriguingly, major abnormalities from the growth disturbance that afflicted one of the Atapuerca youngsters likely required the child to receive extensive care from adults, in Bromage's view. "I find something human in that," he remarks.

Neandertals, which lived from about 135,000 to 30,000 years ago, also exhibited a modern human life-history pattern, presumably retained from ancestors such as those at Atapuerca, Bromage says.

If the new findings indeed come from an earlier *Homo* species, they challenge the assumption that prolonged individual development can serve as a distinguishing trait of modern humanity, the New York researcher asserts.

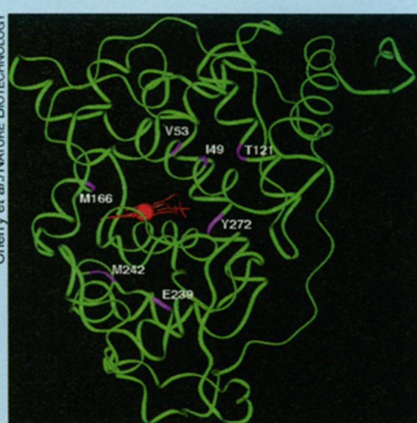
Much remains unknown about the pattern and rate of growth in ancient human ancestors, according to Howell. Other Atapuerca remains, which date to 300,000 years ago and belong to a Neandertal-like species (SN: 4/10/93, p. 228), include juvenile specimens that the researchers now can subject to dental analyses, he says. —B. Bower

Genetic engineering eases laundry woes

Help is on the way for those who occasionally forget the Golden Rule of Laundry: Carefully separate the whites from the colors, lest your underwear emerge tinted pink from a stray red sock.

Researchers at Novo Nordisk Biotech in Davis, Calif., and its parent company in Bagsvaerd, Denmark, report a new detergent additive that can help prevent these laundry accidents. They began with a mushroom enzyme, called heme peroxidase, that can oxidize dyes and thus remove their colors. Then they genetically engineered it to survive in hot, soapy water, even with bleach.

Guided by the enzyme's three-dimensional structure, the Novo Nordisk scientists first changed four amino acids to improve its stability. They also used a technique called directed evolution (SN: 5/9/98, p. 296) to make it more robust.



Cherry et al./NATURE BIOTECHNOLOGY

A model of a mushroom enzyme that destroys dye shows seven amino acids (purple) important for the enzyme's heat and chemical stability.

They searched for other key amino acid locations by randomly mutating the enzyme, creating tens of thousands of variations. They selected the ones that functioned best and repeated the process, eventually yielding a set of about 100 enzymes.

Although improved overall, each of these enzymes could harbor both good and bad mutations, says Novo Nordisk's Joel R. Cherry. To weed out detrimental changes, he and his colleagues cut the enzymes into fragments, each containing one mutation. Using the biochemical machinery of yeast, they randomly recombined the pieces in a process known as DNA shuffling.

Again, they screened tens of thousands of variations to find the best mix of mutations. The final enzyme, having seven amino acid changes, is 174 times more heat resistant and 100 times more chemically stable than the natural version. The group reports its results in the April NATURE BIOTECHNOLOGY.

"It's a nice example of how directed evolution can solve a difficult problem," says Frances H. Arnold of the California Institute of Technology in Pasadena. However, she suspects that in general, this wouldn't be an efficient strategy to engineer enzymes because such a large number of variants must be screened.

The potential laundry additive, like polymers already on the market, only picks up dye from the wash water, not from underwear already turned pink. —C. Wu