

Turtle genes upset reptilian family tree

Paleontologists have long viewed turtles as evolutionary slowpokes, the sole survivors of an ancient group that later gave rise to other reptiles, birds, and mammals. A new genetic analysis, however, dramatically redraws the evolutionary tree of vertebrates and challenges conventional wisdom on turtle origins.

"The slow-moving turtles that everyone thinks are slow in terms of evolution turn out to be fast evolvers," says Axel Meyer of the University of Konstanz in Germany, who collaborated in the study with Rafael Zardoya of the National Museum of Natural Sciences in Madrid.

Turtles have always stood apart from lizards, snakes, crocodiles, and other reptiles because of their skulls. Most reptiles, together with birds, have two holes on each side of their skull, to the rear of their eyes. Paleontologists label these animals diapsids. Turtles lack any such holes and so are the only living anapsids, a group that includes fossils of the most primitive vertebrates capable of living entirely on land. Mammals are termed synapsids because they evolved from animals with

one skull opening behind each eye.

According to the standard evolutionary story, turtles retain some characteristics of the ancient anapsids. As such, biologists have regarded them as an example of the stock from which reptiles, birds, and mammals later evolved.

Zardoya and Meyer explored this hypothesis by comparing the sequences of two mitochondrial genes from turtles to those of iguanas, tuataras, alligators, chickens, and mammals. Turtles fell squarely within the modern diapsids rather than in their expected position on a branch outside the group, the scientists report in the Nov. 24 *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES*.

Their results lend support to a 1996 analysis of reptile fossils, which also suggested that turtles evolved from diapsids, says Olivier C. Rieppel of the Field Museum of Natural History in Chicago. The two studies do not agree in their details, though. Rieppel and a colleague found that turtles were closest to snakes and lizards, whereas Zardoya and Meyer place turtles nearest to alligators and birds.



Turtles: An evolutionary enigma.

Both cases suggest that turtles evolved from diapsids and then lost the characteristic skull holes. If so, turtles would not make a good model for early land-dwelling vertebrates.

Critics counter, however, that both studies have major flaws. The new gene analysis, for example, included only a few types of animals. "If you sample only a limited number, you tend to get very, very wrong [evolutionary] trees," says Michael S.Y. Lee of Monash University in Melbourne, Australia. —R. Monastersky

Newer pennies pose a special toddler risk

Toddlers have a habit of mouthing anything within reach, including coins. Last year alone, some 21,000 youngsters ended up in emergency rooms throughout the United States after ingesting these candy-shaped disks—mostly pennies. New evidence indicates that swallowing pennies minted after 1981 poses an especially dangerous threat to children and pets.

Apart from the obvious choking hazard, the pennies can trigger stomach ulcers and erode into circular blades of tissue-ripping zinc, a physician reported this week in Chicago at the annual meeting of the Radiological Society of North America.

Pediatric radiologist Sara M. O'Hara stumbled upon the problem in March 1997, when parents brought a 2 1/2-year-old boy into the Duke University Medical Center in Durham, N.C. Having watched in horror as their child ate a penny and nearly choked, they wanted to know what to do next. Once O'Hara X-rayed the boy and confirmed that the penny was in his stomach, the emergency room staff advised the parents just to wait for the penny to pass in the stool.

But 4 days later, the boy was unwilling to eat, had a persistent stomach ache, and was vomiting blood. When O'Hara X-rayed the boy again, she saw a perforated,

"moth-eaten disc" with irregular edges that looked "like something had been nibbling on it." Suspecting it was a piece from some toy, she had another doctor remove it with a tool inserted down the child's throat.

To her shock, what emerged was the penny. She says, "You could just make out the date, 1989, on what was left."

"We had always thought pennies were innocuous visitors [to a child's gastrointestinal tract]," O'Hara explains. However, after 4 days in a child's stomach, this penny had lost one-quarter of its weight, developed dangerously ragged edges, and induced an ulcer in the stomach lining.

Though most pennies will pass through a child safely, O'Hara has since encountered a second eroding penny.

Pennies were once 95 percent copper and relatively inert. In 1982, however, the U.S. Mint began stamping pennies out of zinc coated with a thin veneer of copper.

O'Hara suspects that through normal wear and tear, this copper skin can crack, allowing the stomach's hydrochloric acid to dissolve some of the zinc into a toxic, ulcerating soup. She notes that other U.S. coins, made mostly of nickel, pose no similar risk. —J. Raloff



A 1989 penny after 4 days in a child's stomach.

Premie diets linked to IQ

What a premature infant eats in the first month of life can have lasting intellectual impact—at least in boys—a new study finds.

In the early 1980s, researchers at the Medical Research Council (MRC) in London randomly assigned more than 400 preterm babies born in Norwich and Sheffield, England, to receive either a standard infant formula or one that MRC had designed to meet a preemie's unusually high nutritional demands. At that time, special preemie formulas were just being developed. The special feeding lasted until an infant reached 4.4 lb or left the hospital, so most babies ingested the formula for only 4 weeks.

In the Nov. 28 *BRITISH MEDICAL JOURNAL*, Alan Lucas and his colleagues at MRC report IQ scores for the two groups of formula-fed children, tested when they were about 8 years old. While girls from the two groups performed about equally, boys from the preemie-formula group scored an average of 12 points higher on verbal tests than boys who had received standard formula. Animal data have shown that males exhibit a heightened vulnerability to effects of neonatal malnutrition on learning and behavior, Lucas' team says.

Cerebral palsy also was much less common among infants getting the MRC-designed formula. Today, most preemies are fed such a special formula. —J. Raloff