Biomedicine

First animal model for cystic fibrosis

Scientists have developed the first animal model for cystic fibrosis (CF), a genetic disease that strikes one out of every 2,000 babies born in the United States. Two papers describing the research appear in the Aug. 21 SCIENCE.

Robert J. Beall, executive vice president for medical affairs at the Cystic Fibrosis Foundation, hails the new work as a major victory in the fight against this disease, which usually kills by age 30.

Two years ago, a U.S.-Canadian research team announced it had identified the defective CF gene on a specific human chromosome (SN: 9/2/89, p.149). That report spurred John N. Snouwaert and his colleagues at the University of North Carolina at Chapel Hill to create a strain of mice carrying a genetic defect comparable to the one that causes CF in humans.

In a series of experiments, the North Carolina team disrupted the chromosome section containing the target gene. Next, the scientists mixed that defective DNA with cells taken from a developing mouse embryo. The DNA with the CF defect inserted itself into the mouse chromosomes. The researchers injected the altered cells into the mouse embryos.

They then implanted the eggs carrying the defective gene into the womb of a "foster mother" mouse. The pregnancies went to term. When the researchers examined the baby mice, they found that some had the CF genetic defect.

When carriers of the CF gene mated, some of their offspring were healthy. Others, however, inherited an illness that appeared similar to the CF that strikes human babies. For example, the diseased pups were smaller at birth and had problems with digestion, including a severe obstruction of the intestines caused by a difficulty moving sodium and chloride ions out of the epithelial cells lining the gut. Indeed, some of these pups died from the intestinal plugs.

That ion-transport defect also plagues epithelial cells lining the passages of the lungs, causing the thick mucus buildup that clogs the airways of children with CF. Further studies must determine whether the diseased mice will develop the abnormal mucus in the respiratory tract and suffer infections that typically strike people with CF, Beall says.

A second study, conducted by Lane L. Clarke and his coworkers at the University of North Carolina, adds to the evidence that the mouse model approximates the illness that strikes humans. Clarke's team demonstrated that intestinal and lung cells taken from CF mice show the abnormal ion transport that is characteristic of the human disease.

Like their human counterparts, mice with CF must inherit a defective gene from each parent. Those who inherit only one

Dan Sears/UNC

White mouse carries only one CF gene. Gray mouse inherited both and is diseased.

copy of the CF gene are called carriers. One in 20 Americans carries this defect but shows no outward symptoms of the flaw.

Earlier work at the University of North Carolina had demonstrated that an aerosol form of a diuretic drug slowed the pace of lung damage in young adults with the disease (SN: 4/28/90, p.260). The mouse model will accelerate the pace of such research by allowing scientists to test combinations of drugs — a step that can be dangerous to take with human volunteers, says Richard C. Boucher, who took part in the drug study as well as the two new mouse studies.

Earth Science

The other half of the Basin and Range

Henry, Aranda-Gomez/GEOLOGY

Evidence in Mexico suggests that the Basin and Range province extends far south of the border.

The Basin and Range province, as all geology students learn, is an area of the western United States — predominantly Nevada and western Utah — that plate-tectonic forces have stretched and thinned, producing a distinctive landscape that lives up to its name. But the province actually covers far more territory than most geologists realize, two researchers now contend.

In the August GEOLOGY, Christopher D. Henry of the University of Texas at Austin and J. Jorge Aranda-Gomez of the Universidad Nacional Autonoma de Mexico in Guanajuato present evidence that much of northern and central Mexico was stretched at the same time as regions in the United States and therefore constitutes part of the Basin and Range. They suggest that the province runs all the way to the city of Oaxaca, south of Mexico City, more than 3,000 kilometers from the far end of the province in northern Nevada.

Geologists believe the distinctive topography of this province formed when extensional forces caused some blocks of crust to drop lower than others, creating high mountain ranges and low basins. Henry says scientists must recognize the true extent of the province before they can begin to understand what caused the extension, beginning about 30 million years ago.

Palm-size dinosaur found in Utah

While prospecting for plant fossils at Dinosaur National Monument last year, a group of researchers discovered the tiny bones of an embryonic dinosaur from 150 million years ago. The accidental find suggests that dinosaur babies and eggs may be more common in this region than previously thought.

The embryo turned up in the Morrison formation, a famous rock layer from Earth's Jurassic period that has yielded some of the largest dinosaurs ever found. But despite more than a century of intense study, researchers have found only one other embryonic dinosaur in the Morrison, says Dan Chure, the park paleontologist at Dinosaur National Monument, which is in Utah and Colorado.

Researchers uncovered the bones last fall and identified them this spring after removing the fragile fossils from their rocky tomb. The find includes vertebrae, a shoulder girdle, ribs, and limb bones. The distinctively shaped shoulder girdle reveals that this plant-eater belonged to the genus *Camptosaurus*, which reached 8 meters in length as an adult. From the available bones, Chure estimates that the embryo was only 22 centimeters long. Curled up, it would have fit in a pair of cupped hands. Aside from the bones' tiny size, their texture and shape suggest they were embryonic, Chure says.

The find hints that the Morrison formation may hold significant remains of baby dinosaurs that researchers have missed in the past while searching for giant bones, Chure adds. Paleontologists working in Montana and in Alberta, Canada, have found many nesting sites of dinosaurs from the Cretaceous period, which followed the Jurassic. The Cretaceous remains reveal that some dinosaurs bred communally, building nests near each other. If further investigations uncover more eggs and embryos from the Morrison, paleontologists can determine whether communal nesting was an early feature of dinosaur life in the Jurassic, or whether it only evolved with the later dinosaurs of the Cretaceous.

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