Biomedicine

Typhoid vaccine declared a success

Taking a different approach to making vaccines against typhoid fever has produced a winner, scientists announced last week. Researchers at the National Institute of Child Health and Human Development (NICHHD) in Bethesda, Md., reported that a vaccine made from a polysaccharide capsule surrounding the typhoid bacterium appears to be superior to current vaccines made from whole *Salmonella typhi* bacteria.

Scientists at NICHHD collaborated with others in Nepal, Sweden and France during a pilot study and a subsequent clinical trial of the NICHHD-developed vaccine. The two studies involved more than 7,000 Nepalese, who live in an area of the world seriously affected by typhoid fever. Spread through unsanitary conditions, typhoid fever attacks an estimated 50 million people in Asia each year, with high death rates. But currently available vaccines require multiple doses, have side effects and protect for a limited time.

As reported in the Oct. 29 NEW ENGLAND JOURNAL OF MEDICINE, results from the recent Nepal studies indicate that a single injection of the new vaccine lowered the risk of developing the disease approximately four-fold, compared to those not immunized. Such protection is as good as or better than present vaccines. Although the new vaccine produced protective antibodies in only 75 percent of those tested, the authors conclude it is preferable, with fewer side effects.

Inherited membranes predict Alzheimer's?

Isolating the diagnosis of Alzheimer's disease from other forms of dementia can be difficult; a definitive identification still depends on autopsy reports. But a new study suggests that an abnormality of blood-cell membranes found among families with a higher-than-normal incidence of Alzheimer's may help diagnose or even predict the disease. Focusing on the blood-clotting cells called platelets, scientists recently found that — compared to randomly chosen controls — close relatives of Alzheimer patients were 3.2 to 11.5 times more likely to have platelet membranes that were less rigid than normal.

Researchers associated with the University of Pittsburgh, Carnegie-Mellon University in Pittsburgh and Harvard Medical School in Belmont, Mass., report in the Oct. 23 SCIENCE that this increased fluidity of platelet membranes can be found in a characteristic pattern among families affected by Alzheimer's disease. Earlier studies had shown that the disease begins earlier and progresses more rapidly in patients with increased fluidity of these membranes. Other evidence suggests that the risk of developing Alzheimer's is higher among certain families.

By including first-degree relatives of 38 Alzheimer patients, the current study examined the correlation between these physiological and genetic components. The authors say that the pattern of inheritance associated with the membrane abnormality closely matches that reported with Alzheimer's. If further studies confirm the membrane aberration as a specific biological marker for Alzheimer's, laboratory techniques to measure membrane rigidity may be incorporated into diagnostic strategies, say the scientists.

The latest findings also point to a change in research directions, says Zaven S. Khachaturian, director of the National Institute of Aging's Alzheimer research program, in Bethesda, Md. He told SCIENCE NEWS that scientists are beginning to look for Alzheimer-associated effects outside the nervous system. The fact that platelets are not neural tissue is exciting, he says, "because it means the disease may have a systemic effect, [which] creates all kinds of [research] possibilities." He does caution, however, that the simple measure of membrane fluidity may not be adequate, and that useful diagnostic tests may need to include the relative concentrations of various membrane components like phospholipids.

Earth Sciences

Richard Monastersky reports from Phoenix at the annual meeting of the Geological Society of America

An answer to the sphinx's problem

Researchers from the University of Louisville are attempting to save an endangered creature that has sat for almost 5,000 years as a guard to the great Egyptian pyramids. Carved out of a limestone knoll, the sphinx has spent most of the millennia buried up to its neck in the desert sands. But workers cleared away the protective sand in the late 1800s, and weathering has started to claim the lower portion, causing Egyptian officials to fear that the monument might suffer irreparable damage.

For most of the last decade, K. Lal Gauri, director of the Stone Conservation Research Laboratory at the University of Louisville, has studied the decay of limestone at the sphinx. Early on, he discovered that the weakest rock layers contained high salt concentrations. Recently, however, he has discovered *how* salts have contributed to the decay.

During the cool desert nights, moisture condenses inside the pores of the limestone and dissolves the embedded salts. Then when the sun heats the stone in the day, the salts recrystallize, creating pressure in the pores of the stone that can break the limestone apart. Rocks with the smallest pores are the most susceptible to weathering because the tiny pores draw moisture further into the interior of the stone. These findings, says Gauri, are aiding those who are selecting replacement stones for restoration work on the sphinx.

Managing moon math

The moon has undoubtedly accompanied the earth throughout much of our planet's 4.5-billion-year history. But earth scientists have few clues to help detail when this relationship started and how the two bodies have affected each other. To learn more about the relationship, Robert Malcuit of Denison University in Granville, Ohio, has constructed a mathematical model of the earth-moon system.

He started with the long-accepted theory that the moon has slowed the earth's rotation through friction caused by tidal forces. He assumed the rate has dropped by one-thousandth of a second per century. By plugging this into his model, he calculated that 3.8 billion years ago, days would have lasted 14 hours and years would have been over 600 days long.

While these kinds of results were not unexpected, Malcuit was surprised to find that throughout time, the number of days per lunar month would have remained at a relatively constant number between 29 and 31. These results, he says, will alert geologists to the kinds of patterns in the geologic record that might be evidence of ancient tides.

You just can't wear them down

Erosion has leveled the tallest mountains, gouged deep ravines into the hardest rock and even obliterated most meteor craters on earth. But George Boyajian and David Rowley of the University of Chicago believe they have found a match for this ever-grating phenomenon. Using a series of simple calculations, they have found that craters larger than 20 kilometers in diameter are theoretically impervious to erosion.

According to the researchers, large craters escape erosion because the earth's crust floats on a denser, more fluid mantle. The process of erosion is delicately balanced by the forces of buoyancy that keep the crust afloat. Erosion, therefore, can only shave off the top 4 km of the continental crust before the mean height of the crust falls below sea level, at which point erosion stops. Craters larger than 20 km are usually deeper than 4 km, however, which implies that even if the entire continent is worn down, these structures will remain.

This kind of analysis could help those who study the insides of other planets and moons, say the researchers. The ratio of large to small craters may indicate whether a similar buoyancy exists, giving clues about what lies beneath a planet's crust.