Biomedicine

Cold secrets only noses know

Gwaltney/UVA Health Sciences Center

CT scan reveals that colds close off channels (left) that normally connect sinuses and nasal passages (right).

Sneezes and sniffles signal that a cold virus has done more than make a nose drip. Most likely, it has also affected the sinuses, says Jack M. Gwaltney Jr., a physician at the University of Virginia Health Sciences Center in Charlottesville.

Until now, most physicians thought sinus problems developed in the aftermath of a cold, probably because of a secondary bacterial infection. But actually, the tiny passages connecting these internal cavities to the nose close off early in the initial infection, he and his colleagues report in the Jan. 6 NEW ENGLAND JOURNAL OF MEDICINE. As with the runny nose, sinus problems typically disappear in a few days.

To understand how to fight colds more effectively, the Virginia scientists used computed tomography (CT) to look deep into the nasal cavities of 31 young adults who had just developed cold symptoms. They also tested nasal function in these and 79 more people with colds.

With a cold, the nostril's shelf-like structures — called turbinates — swell, Gwaltney observed. "They play a large part in giving the feeling of being stopped up," he says. In addition, infected noses tend to move mucus back to the throat more slowly than normal.

The results indicate that cold medicines should quickly destroy the virus and stop the inflammatory response that causes nasal passages to clog, leading to a cold's annoying symptoms. Gwaltney is seeking such treatments with the help of CT. "It's a good way to measure what's going on," he says.

Less-invasive brain imaging in humans

In less than a decade, magnetic resonance imaging (MRI) has made its way from the research laboratory to the hospital as an important tool for detecting tumors and damaged soft tissue. Typically, MRIs provide very clear, detailed images of internal anatomy not revealed in computed tomography scans.

Now, researchers have shown that MRI can monitor blood flow as well. To do this, David A. Roberts and his colleagues at the University of Pennsylvania in Philadelphia subject the blood en route to the organ to be studied to a brief magnetic pulse. The pulse causes the protons in the blood's water to shift their magnetic orientation temporarily. For about a second, that water "looks" different from water elsewhere in the body.

"That creates a natural, endogenous contrast mechanism," says Roberts. In this way, researchers skirt the need to take blood samples and administer special compounds to make blood show up.

Other researchers have used this method to study blood flow in animals. In the Jan. 4 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, the Pennsylvania group shows that the procedure detects differences in blood flow through the human brain's white and gray matter. The researchers also observed blood-flow changes caused when study participants altered their breathing patterns.

The technique works with a typical MRI machine, but the equipment must be very stable, says Roberts. Also, the scientists have yet to develop easy ways of determining how much the protons' magnetic orientations shift, a necessary step for quantifying blood flow. Eventually, Roberts and his colleagues hope the technique will prove useful in detecting vulnerable areas of the brain following a stroke.

Earth Science

Flaws found in global change research

The United States should remedy weaknesses in its expensive global change research program, according to a new report by the congressional Office of Technology Assessment (OTA).

"As currently structured, USGCRP [the U.S. Global Change Research Program] will not be able to provide decision makers and natural resource managers with the information they will need to respond to global change," says the OTA in its analysis, released last month. Such sentiments echo growing concern within Congress and among some scientists that potentially critical flaws plague the research program (SN: 9/4/93, p.158).

The Bush administration launched the USGCRP in 1989 to study global warming, ozone depletion, loss of biodiversity, deforestation, desertification, and other global environmental issues. The program's budget has grown from $660 million in its first year to almost $1.5 billion in fiscal year 1994.

According to the OTA, the research program has focused almost exclusively on climate change and has not devoted enough attention to potentially more pressing global change problems, such as loss of ecosystems and biodiversity, increases in population, and changes in land use. The program has also failed to support research on how climate change will affect society and ecosystems.

Aside from fixing such problems, directors of USGCRP should strive to make the results of research intelligible to Congress and other decision makers, thereby avoiding one of the key weaknesses of a major research effort of the 1980s, the National Acid Precipitation Assessment Program. To make its research findings relevant, the USGCRP should support comprehensive assessments that periodically analyze the state of knowledge concerning global change. According to OTA, such assessments should include not only scientific findings but also the results of research concerning the ecological and socioeconomic impacts of climate change.

The USGCRP devotes a large fraction of its budget to building and launching instrument-laden satellites that monitor Earth from space. While not denying the importance of major satellite missions, OTA stresses the need to enhance relatively inexpensive projects that gather data from the ground, from planes, and even from smaller satellites. Among other uses, such tools can serve in focused research efforts aimed at answering key questions, OTA says.

Although the current plans for the USGCRP do not look much beyond the year 2010, the report argues that the program should support monitoring of important environmental factors to determine how they change over many decades.

Ancient penguin nests tell climate tale

Although best known for its tuxedo-like plumage and ungainly waddle, the comical Adélie penguin is actually one of the world's hardiest birds, able to nest along the harsh Antarctic coastline farther south than most other penguin species. Taking advantage of the Adélie's unusual housing habits, two Italian researchers have developed a record of how the Antarctic coast has warmed and cooled over the last 13,000 years.

The scientists, from the University of Pisa and the University of Milan, used carbon-14 dating to determine the age of ancient Adélie bones, feathers, eggs, and guano. The researchers charted the regional climate history by tracking when the birds abandoned nesting sites. Because the penguins feed in the ocean, they typically set up colonies near open water and must establish new nests when the coastline becomes covered in year-around ice. In the Ross Sea region, the scientists found that Adélies colonized much of the coast between 4,000 and 3,000 years ago, indicating a decrease in sea ice during that period, they report in the January GEOLOGY.