# Biomedicine

## Joint effort yields sound device

An instrument capable of detecting problems in joints is currently being tested by researchers in electrical engineering, radiology, orthopedics, dentistry and veterinary medicine at the University of Minnesota in Minneapolis. The device, called an acoustic arthromodulograph, picks up changes in sound waves as they pass through a joint. If initial human testing pans out, the procedure may provide an alternative to the X-rays, tomograms, fiber optic visualization and exploratory surgery currently used to evaluate joint problems.

A sound-producing transducer is placed on the skin over a bone, and a receiver placed over an adjacent bone picks up the sound. The signal, modulated by its passage through the joint, is then analyzed to determine whether the joint is in good shape.

The technique, says James Holte, an electrical engineer on the team developing it, is "very non-invasive." The sound waves used are less than one would receive from an earphone radio or at a rock concert, he says.

It is currently being tested on patients complaining of pain in the temperomandibular joint (TMJ), "one of the major areas of concern in dental practice," says Myer Leonard, a maxillofacial surgeon working on the arthromodulograph. TMJ problems are difficult to diagnose, he says. "We hope this device will be able to tell us whether the patient has a disturbance within the joint," he says. Next on the researchers' hit list is the hip joint.

## Infant passive smoking

The latest entry in the debate over whether nonsmokers are harmed by breathing ambient smoke brings babies into the picture. Researchers report in the April 28 NEW ENGLAND JOURNAL OF MEDICINE that they found high levels of a nicotine metabolite in babies under 10 months old exposed to cigarette smoke in the home.

Researchers from the University of North Carolina at Chapel Hill looked at urine and saliva levels of cotinine, a metabolite of nicotine, in 19 unexposed infants and 32 infants from homes that contained smokers.

The point of the study was to determine if the test could indicate exposure to tobacco smoke; in determining that it did, the researchers also showed that babies absorb nicotine, a substance present only in tobacco smoke.

The difference in cotinine levels in exposed and nonexposed babies, says Robert A. Greenberg, one of the researchers, is "highly significant." The study doesn't address adverse health effects — cotinine itself is thought to be non-toxic — but the key thing, Greenberg notes, is that the test can distinguish nonexposed babies from exposed babies. "We hope people will see this stuff [tobacco smoke] really does get into the babies — therefore, it's worthwhile to see what it does," he says.

## Back-to-back surgical feat

Surgeons from the Presbyterian-University of Pittsburgh Hospital gave a patient both a heart and kidney last month, apparently the first such double effort on record. The transplantations, using organs from a single unnamed donor, were done within 24 hours of each other. The operations were done at the same hospital where 5-year-old Stormie Jones received a new heart and liver. The patient, 45-year-old Timothy Johnson of Altoona, Pa., was in fair condition at SN's deadline.

"I think that multiple organ transplanting is something that will be occurring more in the future," says Rodney Taylor, a member of the kidney transplant team. Such procedures will open up transplantation for people suffering disease in more than one organ system, he says.

It was the second heart transplant for Johnson, whose first new heart weakened at the same time his kidneys began failing.

# Chemistry

## The garlic smell of success

The pungent smell of garlic that permeates the laboratory of chemists George Barany and Andrew W. Mott at the University of Minnesota in Minneapolis is a good sign. It shows that their new recipe for making allyl methyl trisulfide, the active ingredient in garlic, is working. At a recent American Chemical Society meeting in St. Louis, the researchers described their method for synthesizing this substance and other related compounds described generally as unsymmetrical trisulfides.

The synthesis involves two chemical reactions. In the first, a thiol (a sulfur-containing compound) reacts with methoxycarbonyldisulfanyl chloride. The product of this reaction then combines in the presence of an amine catalyst with a second thiol to yield the desired unsymmetrical trisulfide in yields of 55 to 80 percent.

In the case of allyl methyl trisulfide, the researchers say that making the pure compound more readily available could be useful in medical studies. The substance, which is difficult to isolate in quantity from garlic bulbs, is known to inhibit blood clotting and may have other beneficial medical effects.

## Copper: Whipping egg whites into shape

Few culinary disasters can be as discouraging for aspiring chefs as a soggy soufflé or a misshapen meringue. These dishes depend on the delicate foam of whipped egg whites for their lightness, but the concoctions can be ruined if the foam is beaten for too long. Sophisticated cooks, however, have known for centuries that using a copper bowl reduces the danger of overbeating. In addition, less liquid drains out of the foam when it is left standing for a time.

The recipe for finding an answer to why copper seems to be so effective involved three ingredients: a former Yale University literature professor, Harold J. McGee, now living in Palo Alto, Calif., and writing a book on the science of food and cooking; his wife, Sharon R. Long, a biologist at Stanford University; and Winslow R. Briggs, director of the Carnegie Institution of Washington biology department in Stanford, Calif., who provided access to a spectrophotometer for analyzing protein-metal samples. Their results on the use of "copper reaction vessels" for the "production of albumen foams" appear in the Apr. 12 NATURE.

Creating a foam seems to involve the unfolding of intricately arranged, globular protein molecules found in egg whites. As these proteins mix with air, the molecules break the bonds that hold them in shape and begin to stretch out and form new bonds between each another. The foam is most stable when the molecules are only partly unfolded, and liquid can still be trapped in little pockets within the molecules. Overbeating unfolds the proteins so much that they behave like wet noodles and can no longer hold water. These foams form quickly and decay quickly.

If a copper bowl is used instead of, for example, a glass bowl, the foam takes almost twice as long to form but also turns out to be much more stable and resistant to overbeating. McGee says that his experiments suggest that the protein conalbumin, which binds metal ions like copper and iron, is primarily responsible for the increased stability. "It's clear that conalbumin is taking up copper from the bowl," says McGee. The metal-protein complex that results makes the protein more difficult to unravel.

Egg whites whipped in a copper bowl also look different. McGee says that the product has a golden color and a creamier texture. However, the added copper, a toxic element, may pose a slight health hazard. The average normal daily intake of copper is about 5 milligrams, says McGee, and the amount of copper picked up in beating two egg whites is something like 0.5 milligram. He notes, "It's only a real danger if you're a tremendous lover of meringues and soufflés." Nevertheless, the cheaper and perhaps safer alternative to using copper bowls is to add a little cream of tartar when whipping egg whites. That achieves the same effect, although the chemistry involved is quite different.