

Biomedicine

From San Diego at the 59th Annual Scientific Sessions of the American Diabetes Association

Device could end diabetes pinpricks

Nearly 16 million people in the United States have diabetes, and most need to prick a finger daily with a sterile pin to monitor their blood-glucose concentrations. A new experimental device may take the sting out of this ritual by absorbing moisture through the skin and analyzing it for glucose. The gadget, called GlucoWatch, looks something like a wristwatch with an absorbent pad underneath it.

When tested on 28 individuals who have diabetes, the GlucoWatch readings closely tracked those obtained by pinpricks, says Satish K. Garg of the University of Colorado Health Science Center in Denver. A valuable attribute of the GlucoWatch, he says, is its ability to sense a sudden drop in blood sugar.

No device now on the market can continuously monitor blood glucose without penetrating the skin, Garg says. "I think the major advance [in monitoring] in the next 5 years is going to be in this technology," he says. The GlucoWatch, made by Cygnus of Redwood City, Calif., is expected to sell for about \$300, with the pad costing \$4 per day to replace.

The diabetes patients reported some mild itching and irritation under the pad. Garg notes that the watch, which uses a AAA battery, can be moved each day to minimize this side effect. Cygnus has sent data from 600 patients to the Food and Drug Administration as part of an application for marketing approval. —N.S.

Diabetes patients skipping aspirin

Even though diabetes is one of the top risk factors for heart disease, fewer than one in five diabetes patients take aspirin, an anticoagulant that is widely used to fend off heart attacks.

In a study conducted between 1988 and 1994, researchers at the Centers for Disease Control and Prevention (CDC) in Atlanta surveyed 1,503 adults in the United States over age 20 who had diabetes. Nearly a third of these patients had heart disease, yet of this subgroup only 37 percent were taking aspirin regularly, says Deborah B. Rolka, a CDC statistician.

Besides having diabetes, nearly all study participants without heart disease had at least one other cardiovascular risk factor, such as obesity, a smoking habit, high cholesterol, or a family history of heart disease. Among this group, only 13 percent were taking aspirin.

"People with diabetes are taking so many medications... that there was probably some concern on the part of [physicians] about adding another medication," Rolka says. Older patients with heart disease were most likely to take aspirin regularly.

The American Diabetes Association started recommending an aspirin a day for most diabetes patients in 1997. —N.S.

Type 2 diabetes appearing in youths

The disease once called adult-onset diabetes is showing up with surprising frequency in youngsters, several studies show.

Researchers at the University of California, San Diego report diagnosing 58 overweight children and adolescents with the disease in recent years. Scientists at the Columbia Presbyterian Center in New York report that 19 youngsters with type 2 diabetes have come to their clinic in the past 2 years. All patients in both groups showed signs of insulin resistance, a hallmark of type 2 diabetes that indicates the cells fail to process insulin properly.

In a Canadian study, doctors in Manitoba have seen the incidence of type 2 diabetes in Cree-speaking Native American children rise from less than one case per year in the early 1980s to more than eight a year in the mid-1990s.

If there were organized screening programs for diabetes, many more cases would be picked up, says study coauthor Heather J. Dean of the University of Manitoba in Winnipeg. "We must assume that type 2 diabetes is being very much underdiagnosed in youngsters," she says. —N.S.

Materials Science

Strong metal parts made by microwaving

A metal plate or piece of aluminum foil placed in a microwave oven gives off a frightening shower of sparks. Surprisingly, though, researchers at Pennsylvania State University in State College have found that microwaving can be a fast, inexpensive way to make metal parts such as gears.

By pressing metal powder into a mold and heating the object in an insulated microwave chamber, the researchers can fuse, or sinter, the particles into complex shapes. "People had always thought that metals wouldn't work in microwaves," says Dinesh K. Agrawal, but powdered metals absorb rather than reflect the energy, obviating the sparking problem.

Compared with sintering done in a furnace, microwaving can save both time and money. "In a conventional furnace, you heat the entire chamber before you heat the product, so you waste a lot of energy," says Agrawal. "In microwave sintering, we are heating the part only."

An object that would take 5 to 10 hours to make in a furnace requires only 90 minutes in the microwave oven. The microwave energy absorbed by the powder instantly converts to thermal energy, thus heating the product, says Agrawal. "The whole process is very rapid and very efficient," he concludes. He and his colleagues describe the technique in the June 17 NATURE.

Moreover, the parts have much better mechanical properties than conventionally sintered ones. The powder particles fuse into a dense solid with a fine microstructure. The quick process doesn't allow enough time for individual metal grains to grow, and "the finer the grains in the product, the stronger it will be," Agrawal explains. The researchers are now developing the technique for use on a large scale. —C.W.

Juice put the bounce in ancient rubber

Rubber makers in ancient Mesoamerica were 3,500 years ahead of Charles Goodyear and his vulcanization. Early processes that turned gummy latex into bouncy rubber relied on chemistry similar to that of modern techniques, a new study finds.

Games played with rubber balls on a stone court held an important ritual and cultural role in societies in ancient Mesoamerica, a region encompassing most of Mexico and Central America (SN: 5/16/98, p. 315). Researchers from the Massachusetts Institute of Technology analyzed both new rubber made using a traditional method and samples taken from preserved artifacts. Dorothy Hosler, Sandra L. Burkett, and Michael J. Tarkanian report their findings in the June 18 SCIENCE.

For the study, workers from a rubber plantation in southern Mexico collected latex from the *Castilla elastica* tree and mixed it with juice squeezed from a morning glory vine, causing it to coagulate into a solid white mass that could be shaped into a ball. "It was quite amazing," says Hosler.

Sixteenth-century Spanish invaders described this very process. The Spaniards were "amazed at rubber because it was so bouncy," Hosler says. In Europe, balls often consisted of pigskin filled with feathers—a decidedly less responsive design.

The researchers determined the composition of the fresh rubber and samples of 3,500-year-old balls recovered from a swamp on the coast of Veracruz, Mexico. They found sulfur compounds in the juice of the vine that can cause cross-linking of polymer molecules, Hosler says. The juice also makes polymer molecules separate from the rest of the latex liquid, allowing them to cross-link more readily.

Cross-linking gives modern rubber its bounciness. In vulcanization, developed in the 1800s, sulfur compounds and heat generate molecular connections similar to those created by the traditional process. Although ancient rubber-producing techniques have been passed down from one generation to the next, modern convenience often triumphs in Mexico today, Hosler notes. "Now, they buy their balls from Taiwan." —C.W.