Biomedicine

Risky drug interaction confirmed

Two commonly prescribed drugs, when taken together, can cause a rare type of heartbeat abnormality that may lead to a heart attack. One of the drugs is terfenadine (trade name Seldane), which doctors prescribe to clear up congestion. The other is ketoconazole (Nizoral), an antifungal agent.

In 1990, after reviewing reports of cardiac problems in people using both drugs, the Food and Drug Administration warned physicians about the risky combo. However, doctors continued to prescribe this potentially fatal combination, says Peter K. Honig of the Uniformed Services University of the Health Sciences in Bethesda, Md.

Honig and his colleagues have now confirmed the heart jeopardy posed by this drug duo. In the March 24/31 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION, they report that terfenadine is not metabolized properly when taken with the oral form of ketoconazole. The result: a buildup of a substance in the bloodstream that can cause a potentially fatal heart-rhythm disturbance in otherwise healthy people.

Tooth-friendly sweetener

As unbelievable as it may sound, some chewing gum may actually halt the progress of tooth decay. Gum sweetened with xylitol, a caloric sweetener made from cornstalks and found in small amounts in fruits and vegetables, promotes the sealing of new cavities, says Kauko K. Makinen, a biochemist at the University of Michigan in Ann Arbor.

Makinen's three-year study involved 1,200 children age 9 to 11 in Belize. First, dentists counted the cavities, as well as missing and filled teeth, in each child's mouth to come up with a "DMFT" score. They reexamined the teeth after 16, 28, and 40 months.

Under their teachers' guidance, these children chewed gum for several minutes three to five times a day. The children received gum sweetened with sucrose, xylitol, or sorbitol (another sugar-free sweetener). DMFT scores increased from an average of 5.5 to 6.5 for children chewing gum containing sorbitol, to 8.0 for children chewing sucrose gum, and to 7.5 for a control group of children who chewed no gum. But in children chewing xylitol gum, the score dropped to 4.0.

Bacteria do not readily break down xylitol, so chewing that gum yields little of the acid that causes cavities, Makinen says. He reported the results in Chicago last month at a meeting of the International Association for Dental Research.

Vaccine shows promise against malaria

Colombian scientists have scored a victory in the never-ending war against malaria. They used a vaccine called SPf66, which combines protein fragments from several stages of a malaria-causing parasite's life cycle. Over a 6-month period, 1,540 volunteers from Colombia's southern Pacific Coast took three doses of the experimental vaccine or a placebo. For the next year, researchers monitored how often the volunteers suffered a bout of malaria. Neither the participants nor the clinics treating them knew who was taking the real vaccine.

The two groups of people suffered equally from malaria caused by *Plasmodium vivax*, but the vaccine did decrease the number of cases caused by *Plasmodium falciparum* by about 40 percent, says M.V. Valero of the National University of Colombia in Bogotá. Of the 738 volunteers who received the vaccine, 152 developed *P. falciparum* malaria at least once, for a total of 168 episodes. But 242 of the 819 people taking the dummy drug came down with a total of 297 cases of this more common malarial infection. The results indicate that the vaccine works best after one bout of malaria and in children under age 5 and adults older than 45, Valero and his colleagues report in the March 20 LANCET.

Physics

Ivars Peterson reports from Seattle at an American Physical Society meeting

Wandering into virtual physics

Thomas P. Pearsall, an electrical engineer at the University of Washington in Seattle, had a problem. Studies of the way light reflects off a semiconductor lattice made up of silicon and germanium atoms had revealed that three factors play crucial roles in characterizing the interaction between light and lattice: the light's wavelength (or photon energy), the strength of the applied electric field, and the intensity of the reflected light. To see the effect of all three factors at once, Pearsall and his co-workers had to plot their 14,000 individual measurements as a three-dimensional surface. But that gave them only a limited view of the data.

To try out an alternative approach, Pearsall turned to researchers at the University of Washington's Human Interface Technology Laboratory (HITL), who have been developing techniques for creating "virtual worlds." In such settings, suitably equipped users can explore computer-generated landscapes, using head, hand, and body movements to control what they see and, in some cases, to manipulate "objects" that exist only as data stored in a computer (SN: 1/4/92, p.8).

The HITL group converted the electroreflectance data into a virtual world. By donning a helmet equipped with magnetic sensors for determining head position and goggles consisting of a pair of small liquid-crystal displays for producing a stereoscopic image of a computer-generated scene, a user could fly over, under, into, and around the plotted data. "We can look at all of the data at once," Pearsall says. "We can even blow up a local region and wander around and explore it in detail."

By coupling this novel display technique with quantitative analysis based on theory, his team could obtain evidence — which otherwise might be quite difficult to see — of how much the substrate on which a lattice is grown contributes to the observed electroreflectance spectrum from such a material. Despite glitches and low-resolution images, the technique worked well enough that Pearsall is eager to try it in other situations.

At a demonstration at the American Physical Society meeting, users could wander and fly around not only Pearsall's landscape but also a crystal lattice, a mathematical structure called a strange attractor, and scanning tunneling microscope images of an integrated circuit and the surface of a garnet crystal.

Getting a liquid bounce

To the naked eye, a liquid's surface appears extremely smooth. But to an atom or a small molecule crashing into such a surface, the microscopic, undulating contours of the molecules making up the liquid present a bumpy landing field. As a result of precisely where they make contact, the incoming missiles may bounce off, stick to, or even react with the liquid's molecules.

By studying the way bombarding atoms and molecules interact with liquid surfaces, researchers can gain insights into the factors that determine how liquids and gases interact. "Our goal is to understand what the surfaces of liquids look like and feel like on an atomic scale," says Gilbert M. Nathanson, a chemist at the University of Wisconsin-Madison.

In one set of experiments, Nathanson and his co-workers have discovered that the old notion that "like dissolves like" — which suggests why water mixes with alcohol but not with oil — also applies in some sense to the interaction between gases and liquids. For example, molecules of heavy water, in which deuterium replaces hydrogen, readily get trapped in concentrated sulfuric acid. Nonetheless, despite the great affinity of sulfuric acid for water, a significant fraction of the bombarding molecules of heavy water bounce off instead of sticking. Even molecules coming in at relatively slow speeds sometimes survive collisions and rebound. This suggests that solubility by itself may not be the key factor in determining what happens in a collision, Nathanson says.