Biomedicine

Hepatitis B shots reduce liver cancer

In July 1984, Taiwan instituted a free, nationwide vaccination campaign against the hepatitis B virus. The program started with infants, but by the end of the 1980s, preschool and school-age children were also getting the shots. Predictably, hepatitis B cases in Taiwanese children declined by more than 90 percent between 1984 and 1994.

Now, a review of Taiwan's national cancer registry shows that the incidence of liver cancer in Taiwanese children has dropped dramatically as well. Researchers had suspected the same virus often underlies both diseases.

To gauge the cancer decline, Taiwanese researchers documented all 294 cases of hepatocellular carcinoma, the most common liver cancer, between 1981 and 1994 in children age 6 to 14. The number of cases fell from 26 in 1982 to 8 in 1993, Mei-Hwei Chang's team at the National Taiwan University in Taipei reports in the June 26 NEW ENGLAND JOURNAL OF MEDICINE. The researchers calculate that the overall rate dropped from seven cases per million children to fewer than four. As a comparison, they tracked brain tumors in children age 6 to 14 during the same period. That number rose slightly.

"It's pretty well accepted that there is a very strong link" between liver cancer and hepatitis B, says T. Jake Liang, chief of liver disease research at the National Institute of Diabetes and Digestive and Kidney Diseases in Bethesda, Md. According to earlier studies, nearly all Taiwanese children who have liver cancer also test positive for a hepatitis B surface antigen, as do 70 to 80 percent of adults with liver cancer.

When liver cancer follows a hepatitis B infection, the cancer may not appear for years, Liang says. "There's a time delay effect," he says. The Taiwanese study shows the effectiveness of universal vaccination for hepatitis B to combat both diseases, he adds. *—N.S.*

Farsighted surgery reaches trial stage

Laser surgery to repair nearsightedness has become common over the past 8 years. In nearsighted people, the cornea of the eye refracts light too strongly and makes nearby objects more clearly visible than distant ones. To fix the problem, surgeons use lasers—precise enough to cut a human hair lengthwise—to shave off the protruding central portion of the cornea, flattening the front of the eyeball slightly and correcting the excessive refraction.

Repairing farsightedness has proved more difficult. The surgeon must shave away portions of the cornea around the front of the eyeball, while leaving the center intact. This procedure makes the refracting surface more conical. Creating troughs indeed improves eyesight, but these areas tend to fill in with scar tissue.

"The body doesn't like a ditch," says Edward E. Manche, an ophthalmologist and director of refractive surgery at Stanford University School of Medicine. In initial trials on animals, scar tissue formed after only 3 months, rendering the procedure useless.

Manche is now employing a new one. "We circumvent, to some degree, the body's healing process," he says. Again using the laser, Manche shaves away a more gradual slope. The result is a shallower trough around the eyeball that allows for some regrowth of the cornea.

After receiving approval from the Food and Drug Administration this spring, Manche and other doctors at Stanford began testing the new technique with 30 farsighted patients. The entire procedure takes less than half an hour, with laser time occupying under a minute.

The Stanford trial is self-supporting. Patients pay $1,900 per treated eye, Manche says. The procedure is likely to remain in trials for 1 or 2 years before getting full approval, he predicts. About 20 percent of the U.S. population is farsighted. *—N.S.*

Chemistry

Element 106 takes a seat at the table

Seaborgium, the heavy element named after Glenn Seaborg, a winner of the 1951 Nobel Prize in Chemistry, has claimed its rightful place on the periodic table. Chemical experiments performed on a mere seven atoms of seaborgium place it firmly in the group that includes chromium, molybdenum, and tungsten.

On the basis of its atomic number, 106, that's exactly where seaborgium belongs. However, after previous experiments on elements 104 and 105—rutherfordium and hahnium (SN: 9/8/90, p. 150)—researchers weren't sure that seaborgium would fall into place so clearly. "In detail, we saw many differences in the behavior [of rutherfordium and hahnium]," says Matthias Schädel of GSI, the heavy ion research center in Darmstadt, Germany. "This made us not so confident that the periodic table was a good ordering scheme for the heavy elements."

Schädel and an international team of scientists from Germany, Switzerland, Russia, and the United States synthesized seaborgium atoms in an accelerator, a painstakingly slow process that produced about one atom per hour, Schädel says. At temperatures of 300°C and 400°C, seaborgium formed the same kind of chemical compounds with thionyl chloride gas that molybdenum and tungsten would have under the same conditions.

The researchers also combined seaborgium with liquid acids, showing that the element remains neutral or forms negatively charged ions, as molybdenum and tungsten do, but not positively charged ions, as uranium does. The findings appear in the July 3 NATURE.

Because researchers can't make bulk measurements of short-lived heavy elements, they must resort to "chemistry by analogy," says Ron Lougheed of the Lawrence Livermore (Calif.) National Laboratory. These first experiments on seaborgium are designed to reveal its gross chemical properties, he notes. Further experiments will reveal the details and any anomalies in its behavior.

So far, Schädel says, seaborgium "behaves as expected, which is nice to see, because then the architecture of the periodic table is still intact." The group is now analyzing data from a second experiment with seaborgium and continuing its work on rutherfordium and hahnium. "Maybe in a few years we will attack the next elements, 107 and 108, and see what we can do there," he says. *—C.W.*

New phosphor for fluorescent bulbs

Although fluorescent light bulbs are bright and energy-efficient, they use toxic mercury vapors and expensive phosphors in producing their characteristic glow. Now, chemists at the University of California, San Diego in La Jolla have found a more environmentally friendly alternative: silicate contaminated with carbon. The material, which shines bright white when excited with low-energy ultraviolet light, could potentially replace the phosphors found in existing bulbs.

To synthesize the material, Michael J. Sailor and his colleagues formed a network of porous silicate, using a sol-gel technique. The building blocks of the network, tetraalkoxysilanes, react together in a solution of carboxylic acid. When the liquid is removed, the rigid network remains (SN: 1/25/97, p.56). Ultraviolet energy excites the carbon atoms in the silicate to produce the visible, white light, Sailor says. The study appears in the June 20 SCIENCE.

Different kinds of silicates and acids produced variations on the material. Some were water-soluble, took the form of colored glasses, or could be drawn into long fibers or cast into thick films. The material needs less energy to glow than existing fluorescent bulbs, making it attractive for battery-powered devices such as the displays on laptop computers. *—C.W.*