Biochemistry

Paternal smokers' cancer legacy

Children whose fathers smoke face a significantly higher risk of developing cancer than children of nonsmoking dads, according to a new Chinese study.

Cigarette smoke is a rich source of free radicals. These chemically reactive molecular fragments can damage DNA, making affected cells more susceptible to cancer (SN: 2/22/97, p. 126). Most studies looking into the role of parental smoking in childhood cancers have focused on mom's habits. Because smoke-generated free radicals can also alter DNA in sperm, an international team of researchers investigated cigarettes' potential genetic fallout in 1,284 Shanghai families in which the mother didn't smoke. In half of these families, the father did.

By age 5, children whose fathers had smoked an average of a pack a day or more for 5 years prior to conception faced a 70 percent higher risk of developing cancer than did the offspring of nonsmoking men. Bu-Tian Ji of the Shanghai Cancer Institute and his colleagues report their findings in the Feb. 5 JOURNAL OF THE NATIONAL CANCER INSTITUTE.

Though they cannot rule out some contribution from passive smoke, Ji and his coworkers note that if this were the major factor, the amount a man had smoked prior to his child's conception shouldn't affect risk much. In fact, however, the more and longer a man had smoked prior to that conception, the greater the risk that his preschooler would develop cancer.

Certain malignancies were more likely to develop than others. Youngsters of the men who had smoked the most and longest proved 4.5 times as likely to develop lymphoma, almost 4.0 times as likely to develop acute lymphocytic leukemia, and 2.7 times as likely to get brain tumors. —*J.R.*

Vitamin E helps—but don't overdose

A host of pollutants and biological processes unleash free radicals. Indeed, the body generates these reactive agents to destroy unwanted cells and materials. With age, natural systems for protecting healthy cells from bombardment by these deleterious agents become impaired. The resulting growth in exposure to free radicals has been linked to a host of chronic degenerative diseases, including heart disease.

One way to fight the oxidative damage caused by free radicals—from smoking, aging, or other factors—is to arm the body with an ample supply of antioxidants, such as vitamin E.

How much might one need? To find out, nutritional biochemist Katrina M. Brown and her colleagues at the Rowett Research Institute in Aberdeen, Scotland, randomly assigned 40 male smokers and an equal number of nonsmokers to take capsules containing 70, 140, 560, or 1,050 milligrams of vitamin E daily. After 20 weeks, the researchers sampled red blood cells from each man and incubated them for 1 hour with hydrogen peroxide, one of the body's natural free radicals. They then measured the oxidation that had occurred.

Cells from men taking the three lower doses sustained far less damage from free radicals than did cells from men not taking supplements, they report in the February AMERICAN JOURNAL OF CLINICAL NUTRITION. Moreover, all three lower doses provided fairly comparable protection to nonsmokers and smokers alike. "I think the big message," Brown told SCIENCE NEWS, "is that you don't need to take high-dose supplements, as many people now do."

Indeed, too much E appeared to be detrimental. Among nonsmokers, she notes, the highest-dose supplementation "did not offer protection. In fact, there was a definite hint things were going the other way"—that the vitamin was actually fostering the production of free radicals. Blood cells from heavily supplemented smokers didn't show the same effect, presumably, she says, because any excess vitamin was being used up in detoxifying radicals generated by smoking. —*J.R.*

Physics

Report from the American Association for the Advancement of Science meeting in Seattle

Satellite makes solar wind count

Like water from a spinning lawn sprinkler, electrically charged particles in the solar wind spiral outward from the sun's corona in continuous streams. Hydrogen and helium make up about 99.9 percent of the wind, with a medley of heavy elements filling in the rest. Now, measurements from the Solar and Heliospheric Observatory (SOHO) satellite have provided the most detailed picture to date of these so-called minor elements, which carry major information about processes occurring in the sun's corona.

Antoinette B. Galvin of the University of Maryland in College Park presented data from the Charge, Element, and Isotope Analysis System (CELIAS), a group of instruments aboard SOHO that counts and evaluates particles in the solar wind.

Scientists recognized some of the chemical isotopes from previous satellite observations of the solar wind, but CELIAS also detected many that had not been reported there before. These include isotopes of silicon, sulfur, calcium, chromium, iron, and nickel. Isotopes of neon and argon were measured by SOHO but not by earlier satellites, although they had been detected in solar wind during the Apollo lunar landings more than 20 years ago, Galvin says.

Compared to instruments on previous satellites, SOHO's mass spectrometer collects more particles and can distinguish more accurately between them. This power enables the scientists to see the detailed time distribution of isotopes. "Before, we'd just grossly average over days or months," Galvin says. "Now, we can do it on a time scale of hours, occasionally minutes, so we're getting structures we didn't see before. It's very new and exciting."

The isotopes provide clues to where the solar wind originates, indicating how particles move to the corona from the sun's surface and the temperature in the corona, Galvin says.

Right now, most of the solar wind is coming from coronal holes, or openings in the sun's magnetic field, but later in the year, the scientists expect coronal mass ejections (SN: 2/1/97, p. 68) to step up. "There will be a lot to show with time," Galvin says. —*C.W.*

Atoms as the smallest quantum bits

Quantum computers could perform calculations that today's machines can only dream of—if only quantum computers themselves weren't dreams. Still, researchers are beginning to develop ways to encode quantum bits and combine them into logic gates. Arrays of these gates form the basis of computer chips.

Christopher Monroe of the National Institute of Standards and Technology in Boulder, Colo., described a scheme to use single atoms as the bits in a quantum computer. He and his colleagues have demonstrated that they can trap a beryllium ion electromagnetically (SN: 5/25/96, p. 325). When a combination of fast laser pulses excites that ion, it flouresces, emitting photons. The wavelength of these photons indicates the state of a simple logic gate.

Teams doing research on quantum computation have approached the problem from different angles. Neil A. Gershenfeld of the Massachusetts Institute of Technology also presented his group's recent work on using nuclear magnetic resonance (NMR) to create quantum bits among groups of molecules in a liquid (SN: 1/18/97, p. 37). Although the single-atom approach is more flexible, Gershenfeld says, the NMR approach should enable his group to achieve a 10-quantum-bit system by summer. "If we can demonstrate quantum computation, that's all we need."

All lines of research should contribute to a greater understanding of the problem, the scientists say. According to Monroe, "we need at least another decade to understand the limits of quantum computation." —*C.W.*