Biology

Another round in the prion debate

Virus or protein? The answer to that simple query torments researchers looking for the infectious agent that causes illnesses such as Creutzfeldt-Jakob disease in the human brain and similar disorders in sheep, cows, and other animals.

At first, researchers assumed that these neurodegenerative afflictions resulted from viruses—microscopic bundles of DNA or RNA wrapped in a coat of proteins. But all attempts to isolate and identify viruses from infected tissue proved fruitless.

Then in 1982, Stanley B. Prusiner of the University of California, San Francisco, School of Medicine launched a bombshell: He suggested that the infectious agent was a type of protein, which he called a prion. In the face of ridicule, Prusiner went on to identify a protein that could act as the hypothetical prion. His theory has gradually won a strong following (SN: 9/24/94, p.202).

Other scientists persisted in searching for viruses, arguing that prions cannot produce infections. Now, an analysis of brain tissue ravaged by Creutzfeldt-Jakob disease adds weight to that argument, report Laura Manuelidis and her colleagues at Yale University School of Medicine in the May 23 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

The Yale group ground up diseased brain tissue and ran it through sugar-laden gels, a method that separates components of tissue by either size or density. The separated fractions that contained most of the suspected prion proteins were not significantly infectious, whereas fractions with proteins bound to nucleic acids, either DNA or RNA, remained highly infectious. That suggested the presence of a virus.

In an attempt to rid the infectious fractions of any prions that might remain, the Yale team treated the samples with a chemical that breaks down proteins not bound to nucleic acids. The fractions stayed just as infectious. "The simplest explanation for all the data is that there is a virus that hasn't been found," asserts Manuelidis.

Pregnancy increases risk of diabetes

Women who develop diabetes during pregnancy face a somewhat increased risk of developing non-insulin-dependent, or type II, diabetes later in life. Now, a study by researchers at the University of Southern California School of Medicine in Los Angeles indicates that a subsequent pregnancy leaves such women with three times the risk of type II diabetes.

During pregnancy, hormonal changes and weight gain cause a woman's body to become less responsive to insulin. The pancreas therefore produces more insulin to keep sugar concentrations in the blood from becoming too high. Increased sugar may make more nutrients available to the fetus, and most women tolerate the slight insulin-resistance that accompanies pregnancy. But women who develop diabetes "show that they already have some problems with insulin production. Their pancreases may simply wear out sooner," says study leader Thomas Buchanan.

Speculating that additional pregnancies would speed wear and tear on the pancreas, Buchanan and his colleagues tracked 671 Latina women who had suffered diabetes during a first pregnancy. As the team reported at the annual meeting of the American Diabetes Association in Atlanta this week, women who became pregnant again were more than twice as likely to develop type II diabetes as their counterparts who didn't have another child. Their risk was three times that of normal women. The researchers also found that for every 10 pounds gained after a pregnancy with diabetes, the risk of later type II diabetes doubles.

Women who develop diabetes during pregnancy "should be encouraged to lose weight and advised about the risks of a second pregnancy," says Buchanan. He adds that researchers need to investigate ways to prevent diabetes in these women.

Health Physics

Chernobyl's fallout: Childhood cancers

Several weeks after the April 1986 Chernobyl nuclear accident, researchers began screening residents of the most fallout-prone regions for radioactive iodine—a nuclide readily taken up by plants, eaten by cows, and passed on to children through milk. Those initial measurements indicated that children had indeed picked up three times as much of this thyroid-seeking pollutant as adults, prompting the nearby Ukrainian Research Institute of Endocrinology and Metabolism in Kiev to set up a thyroid cancer registry. Now, an international team of researchers from that institute and elsewhere reports in the June 1 NATURE that the rate of thyroid malignancies has increased among individuals who were children at the time of the Soviet nuclear disaster.

Throughout the Ukraine, rates of thyroid cancer have climbed, from about 0.7 per million children in 1986 through 1988, to 3.7 per million in 1993. Rates increased most in regions closest to Chernobyl. For instance, between 1990 and 1992, 6 of the 14,580 people who at the time of the accident had been children in Pripyat—a town 3.5 kilometers from Chernobyl—developed thyroid cancer. This corresponds to an annual incidence of 137 cases per million persons, report I.A. Likhtarev, B.G. Sobolev, and I.A. Kairo of the Scientific Center for Radiation Medicine in Kiev and their coworkers.

Refining risks of residential radon

Though several studies have strongly suggested that relatively low residential concentrations of radon may pose a lung cancer risk, nearly all the data on this natural pollutant's carcinogenicity come from studies of underground miners exposed to very high amounts of this radioactive gas and its carcinogenic decay products. An international team of researchers has now pooled data from 11 populations of such miners—involving 65,000 men and more than 2,700 lung cancers—to tease out even more details on risks that might arise from the lower-dose residential exposures. Their analysis indicates that total accumulated dose isn't the best gauge of radon's danger.

Comparing equivalent total absorbed doses, those delivered more slowly appear more dangerous. This "inverse exposure rate effect could be interpreted as implying that miner-based models underestimate risk in homes, where exposure rates are generally lower," the researchers report in the June 7 JOURNAL OF THE NATIONAL CANCER INSTITUTE. Indeed, some residential exposures will result in total doses equivalent to those linked with cancer in the miners.

However, "there is also evidence—both theoretical and in these data—that that effect should decline as the total exposure goes down," points out Jay H. Lubin of the National Cancer Institute in Bethesda, Md., the report's lead author. That, Lubin says, argues that reducing residential concentrations to a value below EPA's action level—4 picocuries per liter of air—would offer long-term health benefits. The new data also show that risks associated with a given total absorbed dose diminish with time since exposure.

Another bit of reassuring news from the new analysis: Children appear no more vulnerable to radon's effects than adults. These findings derive from a long-term follow-up of workers, some of whom began their mining careers in pre-World War II China at the tender age of 8 or 9.

Finally, the new data indicate that at any dose, people who have never smoked appear more vulnerable to radon than smokers. Though there had been hints of this for many years, Lubin notes, "it's been hard to put a number on how big [that difference] was." The group's new analysis suggests that radon-exposed people who have never smoked may face three times the lung cancer risk of smokers.