

tively new here, Zahm points out, is a pesticide-cancer link affecting children.

Peters says the California researchers, not expecting household chemicals to contribute much to leukemia risk, failed to collect data on specific pesticides used, incense or pesticide use after a baby's delivery and whether incense burning accompanied use of recreational drugs. To resolve some of the questions these data have raised, the researchers are now in the process of conducting a follow-up survey of the original families.

— J. Raloff

## Oral vaccine sought for hepatitis B

Each year in the United States, approximately 300,000 people become infected with the hepatitis B virus—a major cause of acute and chronic hepatitis, cirrhosis of the liver and liver cancer. In the Third World, hepatitis B is even more prevalent, despite the availability of effective hepatitis vaccinations since 1982. Why haven't more people opted for immunization?

Widespread U.S. immunization has been hampered by the high cost of the vaccine (about \$115 for the required three-shot regimen) and an apparent unwillingness, even among high-risk individuals such as health care professionals and drug abusers, to undergo the injection series. Internationally, these problems are exacerbated by the shortage of sterile syringes and the need to keep the vaccine refrigerated.

Now, however, researchers report significant progress toward developing an oral vaccine against hepatitis B—one that would require no special handling or paraphernalia and may be cheaper to produce.

Paul P. Hung and his colleagues at Wyeth Laboratories in Philadelphia published the results of their work in the July PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES (Vol. 84, No. 13). The research team started with a live adenovirus vaccine, which in tablet form has proved effective in inducing immunity against adenovirus respiratory disease in humans. They then spliced into the adenovirus genome the coding sequence for hepatitis B surface antigen—a molecular conformation that, when recognized by the body's immune system, triggers the production of antibodies against hepatitis B. In the experiments, hamsters were inoculated through their noses with the hepatitis-B-spliced viruses, which subsequently replicated in the animals' lungs. Within 33 days, all of the hamsters had produced antibodies to both adenovirus and hepatitis B.

"Our results demonstrate the potential utility of recombinant adenoviruses as live oral vaccines," the authors conclude. And although they are unwilling to pre-

## ELF under suspicion in new report

Exposure to electromagnetic fields like those emitted by appliances and residential power lines apparently can affect behavior in laboratory animals and may increase the risk of childhood cancer, concludes a recently released report on a five-year program funded by the New York State Power Lines Project. But researchers failed to prove a definite cause-and-effect relationship between the extremely low-frequency (ELF) fields studied and the biological and behavioral effects observed, leaving the debate over the danger of ELF exposure still simmering.

Established by the New York Public Service Commission in response to public concern over power line construction, the \$5 million project included 16 studies of possible health effects from 60-hertz electric and magnetic fields, which are commonplace in residential and work environments. As pointed out in the oversight committee's report, most of the research studies found no effects from ELF exposure. There were, however, some thought-provoking results in terms of cancer risk and behavioral changes.

In an epidemiologic study of the Denver area, David A. Savitz of the University of North Carolina in Chapel Hill classified houses on the basis of their proximity to residential power lines and the intensity of ELF exposure (SN: 2/14/87, p. 107). Savitz and his co-workers concluded that the cancer risk among children in higher-exposure homes is 1.7 times greater than that among children in lower-exposure homes, and that

dict when the experiments may progress to human clinical trials, they say that "On the whole, these data indicate a good prospect for developing recombinant adenovirus vaccines that will effectively immunize humans against [hepatitis B]."

"It's certainly an unusual approach," says Stephen C. Hadler, chief of epidemiologic activities at the Centers for Disease Control's hepatitis branch in Atlanta. Because hepatitis is not normally contracted by oral or nasal routes, he told SCIENCE NEWS, "one would anticipate major difficulties" in inducing high levels of hepatitis antibodies in the blood following oral inoculation. If effective, however, "an affordable oral hepatitis vaccine would have major potential advantages," he says, "especially in the Third World, where it is most needed." In comparison to intramuscular injections, oral vaccinations are much more likely to gain wide acceptance, and they cut out the potential for inadvertently transmitting other diseases with syringes, Hadler says. "The market would be huge."

Exactly how much such a vaccine would cost is still a matter of conjecture,

the chances of developing leukemia in particular are 2.1 times greater.

Perhaps even more disturbing are the studies that found learning and neurological effects from ELF exposure, project leader David O. Carpenter of the State University of New York at Albany said in an interview. Among those were rat experiments by Kurt Salzinger and others of Polytechnic Institute of New York in Brooklyn. Pregnant rats exposed to ELF fields for 30 days developed temporary learning problems, detected when the scientists tried to train them to release food by pushing levers. Their offspring, exposed both in the womb and for nine days after birth, developed permanent learning deficits.

Ironically, Klaus-Peter Ossenkopp of the University of Western Ontario in London, Canada, told SCIENCE NEWS he was surprised to find a beneficial effect in rats with epilepsy: Magnetic fields like those associated with ELF exposure may actually decrease the length and severity of epileptic seizures. "One might explore the whole phenomenon as a therapeutic approach," he suggests.

Ossenkopp also discovered that magnetic-field exposure diminishes the painkilling effects of drugs like opium, as well as those of the opiates made by the body—an inhibitory effect seen in the rats only at night.

Carpenter emphasizes that there is no need for panic over the negative findings, but he says the results are significant enough to justify more research, as well as a reevaluation of how electrical power is distributed. — D.D. Edwards

however. A spokesperson for Wyeth says the oral vaccine would "probably be cheaper" than the current vaccinations, but one hepatitis specialist at Merck Sharp & Dohme—makers of the only hepatitis B vaccines currently sold in the United States—says he knows of no data to support that claim.

Meanwhile, other fruits may emerge from Hung's research. For example, the team may have helped settle a long-standing question about the function of a particular gene sequence in the adenovirus genome. That sequence, known as the E3 region, indirectly blocks the expression of immune-cell-attracting antigens on adenovirus-infected cell surfaces, leading scientists to hypothesize that the E3 region is part of the mechanism by which an adenovirus avoids detection by the body's immune system. In accordance with this view, Hung found that adenoviruses whose E3 regions were excised in order to make room for the hepatitis B splice did not survive as long as did adenoviruses whose hepatitis B splices were placed elsewhere, leaving the E3 region intact. — R. Weiss