

—residence in a U.S. county with a heavy concentration of industry. The study by Robert Hoover and Joseph F. Fraumeni Jr. reveals some possible new links between chemicals and cancer. It will appear in the April ENVIRONMENTAL RESEARCH.

The team studied U.S. counties with the highest percentages of residents employed by chemical industries. These 139 counties represent the top 10 percent of all U.S. counties with chemical-industry employed residents. They analyzed the period from 1950 to 1969, and correlated the incidence of cancer at 35 body sites with various demographic factors. They found that in the 139 chemical industry counties, the rates for bladder, lung, liver and certain other cancers exceed the expected rates for males in those counties. The correlation could not be explained by other factors, they state, such as socioeconomic class, degree of urbanization or employment in nonchemical industries.

They found strong correlations, for example, between a greater-than-expected incidence of bladder cancer and proximity to the manufacture of dyes and pigments, drugs, perfumes, cosmetics and toiletries. They found lung cancer correlated with proximity to the manufacture of industrial gases, pharmaceuticals, soaps and detergents, paints, pigments and synthetic rubber. Liver cancer was correlated with proximity to the manufacture of certain organic chemicals, synthetic rubber, soaps and detergents, cosmetics and printing ink.

In other studies not yet published, they found higher-than-expected bladder cancer levels in areas of heavy auto production and higher rates of lung cancer near copper and lead smelters.

Fraumeni warns that there are limitations to statistical analyses such as these, since unknown intervening variables, rather than the presence of a certain industry, may be responsible for the correlations. "We are not saying that the industries are creating a hazard," Fraumeni says, "just that there is a correlation and the cancer rates are higher than expected." The team suspects that the higher cancer mortality rates are due mainly to industrial exposure of workers in the industries. They are designing studies now to test this hypothesis.

One benefit of this study, Fraumeni says, is that it provides clues to chemicals that may be carcinogenic. Until their study, he says, no correlations had been seen between bladder cancer and the manufacture of industrial gases or soaps and detergents; lung cancer and the manufacturing of drugs, soaps, paints, pigments or synthetic rubber or liver cancer in those close to the manufacture of cosmetics, soaps or printing inks. □

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An earlier test for cervical cancer?

Evidence has been accumulating for several years that a herpes simplex virus is associated with human cervical cancer. One characteristic of this virus is thought to be a long latent phase between infection and the appearance of a tumor in the host. A new method has been developed for finding the "fingerprints" of this virus during what may be the latent phase. This may lead to diagnostic techniques for the detection of cervical cancer even earlier than is possible with the Pap test.

Joseph L. Melnick and co-workers T. Anzai, G. R. Dreesman, R. J. Courtney and E. Adam from Baylor College of Medicine in Houston reported their work at a meeting of the American Society for Microbiology this week in New York. Their technique involves the radioimmune assay of antibodies in the human blood. These antibodies react specifically with herpesvirus proteins perhaps given off during the latent phase.

Herpesvirus can react in two ways after it reaches the cell and injects its genetic material. If the virus's complete genetic code is transcribed and translated, it directs the cell to produce more virus particles. These soon burst forth, killing the cell and infecting many new cells. If, however, the code is incomplete (in some way, as yet unknown, it can become inserted into the host cell DNA and remain there for a long period of time. During this time the host cell can start to produce certain virus enzymes called herpesvirus nonstructural proteins.

These proteins, being foreign to the host organism, function as antigens, meaning they induce the formation of antibodies. It has been found that women with cervical cancer have antibodies to "incomplete" or herpesvirus nonstructural protein (and sometimes to "complete" or herpesvirus structural protein) more often than do normal women. The new analytical technique used in Melnick's laboratory allows the team to detect the presence of tiny amounts of antibodies to the early nonstructural proteins, indicators of latent infection.

The precise relationship of these antibodies and proteins to the appearance of cancer in humans is not known, but such a sensitive method at least opens the way for finding latent herpes infections. The Pap smear, although very useful as an indicator of cervical cancer, does not register positive until altered cells are present. If a woman tested with the new technique was found to have evidences of a latent infection, she could be given Pap tests more frequently so that the chances of catching a tumor early (if one develops)

would be increased along with her chances for survival.

More studies must be completed before the early detection of latent herpesvirus infections can be done clinically, Melnick says. Epidemiological studies must be done on traditionally high-risk groups to test for a correlation between the appearance of these antibodies and an eventual malignancy. Also the technique must be simplified and streamlined for use in the diagnostic laboratory. □

Skin plants: Denying them iron

If you have ever had dermatophytosis—and the chances are good that you have—you know it can be a nuisance. The disease takes lots of forms and has some lively names—athlete's foot, jock itch, jungle rot, ringworm. The itching, inflamed skin lesions associated with this disease are caused by several types of fungi. The formal name of the disease comes, appropriately, from "derma" (skin) and "phyte" (plant). Research on the disease-producing ability of these "skin plants" has yielded new information on a blood factor that is part of a little-understood mechanism of immunity and new information that may lead to more effective ways to treat and prevent disease.

If dermatophytosis is a nuisance for the average weekend athlete, it is the scourge of soldiers serving in tropical areas. Togetherness—Army style—and a hot, humid climate seem to be the ideal conditions for the growth and transmission of jungle rot. In Vietnam the problem was so serious that it caused a significant loss of manpower. It's no surprise, therefore, that an Army researcher has begun to track the problem. Dermatological microbiologist Robert D. King of the Letterman Army Institute of Research at the Presidio of San Francisco reported his work at the annual meeting of the American Society for Microbiology.

Dermatophytes, unlike most disease-producing microorganisms, are limited to the surface of the skin and only rarely are able to penetrate it and produce internal infections. Other researchers turned up evidence in 1946 that a factor in the blood was responsible for preventing fungal penetration, but the identity of the factor has been a mystery ever since. King and his co-workers decided to look for the factor—and found it. King knew from earlier research that iron added to blood serum encourages the growth of dermatophytes. In normal blood serum all the

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iron is bound to a protein called transferrin that regulates iron metabolism. It seemed likely, therefore, that transferrin might be the factor that denies the dermatophytes the iron that is necessary for growth and skin penetration. King removed the transferrin from blood serum with affinity chromatography and found that without this iron-regulating blood protein, the serum was unable to prevent penetration by the "skin plants."

This immunity to invasion through iron regulation represents the best example yet of "nutritional immunity." This little understood "first line of defense" is separate from the cell-mediated and immunoglobulin systems, King says. Besides providing insight into the nutritional immunity system, the identification of transferrin as the protective blood factor may help King and others design topical agents to treat and prevent the fungal infections. King's team is looking at iron-chelating agents, transferrin included, that could be used to collect the available iron from the skin surface and starve the unwanted "skin plants." □

Endangered list: Ten new animals?

Ten more animals may be added to the endangered species list soon, if an Interior Department suggestion is not disputed by the public within 90 days. Among those animals considered in danger of extinction are the American crocodile, the Mexican wolf and three Hawaiian birds.

There are believed to be only 10 to 20 breeding female crocodiles still in southern Florida, where development has destroyed most of the species' habitat. Commercialization has also destroyed the homes of most of the eastern United States' gray bats, and two fish species, the bayou darter, found only in the Bayou Pierre watershed of western Mississippi, and the Scioto Madtom, a catfish found in Darby Creek in Pickaway County, Ohio. The fish are dying out from pollution and destruction of habitat.

The Mexican wolf, once common in Arizona, New Mexico and Texas, hasn't been seen there since 1960, and, although protected by Mexican law, its numbers may have dwindled to less than 200 in Mexico.

Hawaii's shearwater, a sea bird, is in trouble because of its fatal attraction to light at night, which causes the bird to smash into automobiles and lighted towers. Two other Hawaiian birds, the po'o uli, a creeper, and Newall's manx shearwater, are also endangered, as are the Cedros Island Mule deer and the peninsular pronghorn antelope in Baja California. □

Where have all the primates gone?

There is no denying the importance of nonhuman primates to biomedical and behavioral research. Researchers, however, may soon be denied the primates upon which they depend so heavily. Monkeys and apes have been used extensively for the study of human diseases and for the development of pharmaceuticals ranging from vaccines for poliomyelitis, malaria and hepatitis to birth control drugs. But, according to a soon-to-be-released report of the National Research Council, the long-anticipated shortage of primates is now a reality.

The report, "Nonhuman Primates: Usage and Availability for Biomedical Programs," examines the problem of dwindling supply and concludes that a determined national program is needed to ensure that laboratories have an adequate supply of primates now and in the future. A number of features should be included in such a program, the NRC report says. One goal, for instance, should be an adequate, assured supply of animals derived primarily from the establishment of self-sustaining domestic breeding colonies. "Various political, economic and ecological forces," the report says, "are such that self-sufficiency for the United States within 15 to 20 years is essential." But wherever possible, the report goes on, domestic supplies should be augmented by breeding colonies and production centers in countries of origin and also supported by the application of management techniques to natural populations.

Another goal should be the reduction of waste in the international primate trade by the adoption of sound managerial procedures—closer supervision of trapping, holding and shipping operations and sponsorship of trapping expeditions in which all aspects of collection and transport are monitored. One currently used trapping practice that should be changed is the slaughter of adult female chimpanzees, gibbons and leaf monkeys in order to obtain dependent young.

The report also calls for the establishment of a computerized users' service that would encourage and facilitate multiple use of primates by rapidly matching available surplus animals to existing needs, and would permit accurate estimates of national needs based on usage data. Such an information network would not only provide rapid information on available animals, or conversely, the need for specific animals, but also facilitate the exchange of biological materials derived from primates.

The NRC recommends that the primate program be administered by the National Institutes of Health. NIH

would, among other things, administer contracts for domestic breeding colonies, establish and operate the computer service, develop and distribute guidelines for commercial trapping, shipping and holding of primates and develop contingency plans to deal with shortages and to allocate resources when shortages develop. "It is essential," the report concludes, "that the plan look to meeting the needs of all major biomedical programs and be fully operative within a decade." □

Inventor wins NAE award



Kilby

One of the most significant fruits of the "solid state" electronics revolution, the monolithic integrated circuit, has won for its inventor the prestigious Vladimir K. Zworykin Award of the National Academy of Engineering.

It was in 1958 that Jack S. Kilby, then with Texas Instruments, conceived the idea of forming sequences of electronic components in a single block of semiconductor material, to provide a complete circuit within one monolithic block. Where transistors and other semiconductor components had already replaced vacuum and gas-filled tubes hundreds of times their size, integrated circuits took technology a full step further—whole amplifiers, for example, could be formed in a single "chip" often smaller even than a transistor. The electronic calculator and electronic watch would have been virtually impossible without them.

Kilby, who was granted patents on his basic integrated circuit concepts in 1964, is now a consultant in Dallas. He is the fourth recipient of the Zworykin Award, which honors the pioneer in electronics whose invention of the iconoscope helped lead the way to modern television. Kilby has received numerous other honors, including the 1969 National Medal of Science, the Sarnoff Award, the Ballantine Medal from the Franklin Institute in Philadelphia and the Hall Minuteman Trophy. □