

Vaccines—Past to Future

Birth defects caused by German measles will soon join the lengthening list of physical ailments being prevented by life-saving vaccines—By Faye Marley

See Front Cover

► **LOOKING BACK** to the pre-vaccine days of smallpox, cholera, typhoid, typhus, whooping cough, diphtheria, influenza, yellow fever, rabies and polio—to name some of the principal death-dealing or crippling ailments—the hope for yet unattained immunization against other diseases seems realistic.

To paraphrase the cliché, scientists are pounding at prevention, especially when they cannot find a cure.

Ahead lie possible vaccines against leukemia and some other forms of cancer; against multiple sclerosis if a virus is found to be responsible for this central nervous system disease; against hepatitis; against specific respiratory diseases and even against undesirable pregnancy.

A vaccine is a suspension of weakened or killed microorganisms (bacteria, viruses or rickettsiae), administered for the prevention, amelioration or treatment of infectious diseases. The body builds up immunity by manufacturing antibodies.

There is not likely to be one vaccine against all types of cancer any more than there will be one against all the viruses causing the common cold, but specific vaccines are expected to work once a microorganism is proved to exist and is identified.

One of the most recent reports of preliminary work with humans who have cancer has come from Detroit where rabbit gamma globulin was added to a suspension of cancer cells from the individual tumors of 20 patients.

Wayne State University scientists said two of the patients had shown complete regression of their tumors and that eight others, after two years of follow-up, had shown stabilization, regression or retardation of cancer growth. The 10 who died were in an advanced stage of the disease when treatment began, and apparently died of complications such as liver failure and meningitis.

Previous similar reports, omitting the gamma globulin, have come from Roswell Park Memorial Institute, Buffalo, N.Y., and from the Gersten Oncologic Institute in Moscow.

The work of researchers all over the world leads to the hope that viruses will be proved to cause some types of human cancer, thus making it possible for vaccines to be perfected.

Mouse leukemias have been found to be caused by viruses, and vaccines have protected mice from contracting

cancer of the blood-forming organs. Transmission of human leukemia to laboratory animals was a dramatic development in the virus-leukemia story reported by Dr. Michael Epstein and his co-workers at the Middlesex Hospital Medical School, London.

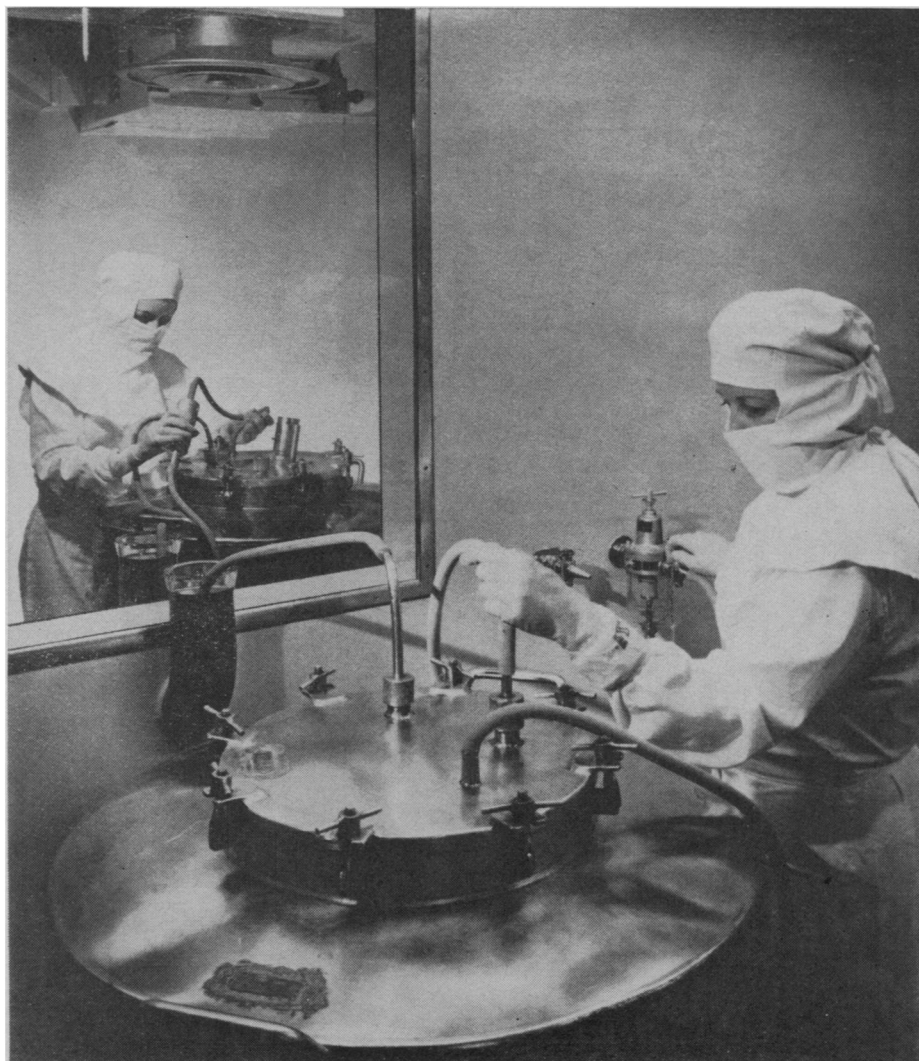
Although the electron microscope has shown virus particles in human leukemic lymph nodes, much more evidence is needed to prove that particles cause human leukemia.

The leukemia viruses shown on the front cover are brought into view by the tremendous power of an electron microscope. They are Rauscher leu-

kemia viruses detected in the blood of mice under a negative stain (the dark areas surrounding the virus).

One of the great medical needs for soldiers as well as for civilians is a vaccine against the inflammatory liver disease, hepatitis, says Surgeon General of the Army, Leonard D. Heaton. Studies have shown that there is more than one type of hepatitis virus.

The hepatitis virus isolated several years ago by Dr. Joseph D. Boggs of Children's Memorial Hospital, Chicago, could lead to a vaccine as a result of research with prisoners at the Illinois State Penitentiary, Joliet.



Pitman-Moore

GERM-FREE EQUIPMENT—Technicians at Pitman-Moore Division of the Dow Chemical Company, Indianapolis, Ind., transfer a vaccine from tank to tank in germ-free surroundings.

Dr. Boggs also has been in touch with laboratory work in Covington, La., where the Delta Regional Primate Center of Tulane University has been working with chimpanzees and patas monkeys from Africa. These primates develop hepatitis and afford excellent research opportunities.

In the meantime, research on the nature of both infectious and serum hepatitis continues under grants from the John A. Hartford Foundation in New York, the National Institutes of Health, Bethesda, Md., and other agencies.

One of the most encouraging reports on vaccine progress concerns rubella, or German measles, which causes birth defects in babies when their mothers contract the disease in the first three months of pregnancy.

Drs. Harry M. Meyer Jr., and Paul D. Parkman, both of the Division of Biologics Standards, NIH, working with the department of pediatrics, University of Arkansas Medical School, Little Rock, and the Arkansas Children's Colony, Conway, reported satisfactory results were obtained with 34 vaccinated children. It is expected that in a matter of two or three years, the vaccine may be safe for marketing after necessary testing procedures.

Shots Advised

Each fall, high-risk persons are advised to have flu shots. This includes those over 65 years of age, pregnant women and those of any age who suffer from heart, lung, kidney or metabolic disorders. But influenza viruses can be tricky.

Epidemic influenza is caused by members of a family of closely related but distinct viruses, the most important of which are designated influenza viruses A, A-1, A-2 and B.

The properties of these viruses do not remain constant but change from time to time in unpredictable ways. Unlike vaccines against other virus diseases such as smallpox, yellow fever and poliomyelitis (which are caused by more stable viruses), the protection provided by influenza vaccines depends on the presence of current influenza virus strains.

For example, the A-2 virus that caused the worldwide epidemic in 1957 was so different from the A-2 influenza virus in 1965 that it could not be expected to provide significant protection against the more recently developed strains.

When the U.S. Public Health Service discovers a new type of strain, it makes a complete change of strain composition in the vaccine ordered, thus cutting down on deaths and cases of flu.

The influenza "pandemic" of 1918 is estimated to have killed 15 million persons, almost twice the number in World War I. Even with the progress made in vaccine content, the Asian flu bug in 1957 killed some 60,000 persons in the United States alone.

To Edward Jenner, the Gloucestershire, England, country doctor goes

the credit for the first vaccination against smallpox. The word itself was derived from the Latin "vacca," meaning cow, because in 1796 Dr. Jenner inoculated an eight-year-old boy with cowpox obtained from a blister on a milkmaid's hand, a beginning that led to a perfected vaccine.

Today, vaccination has come to apply to inoculation by various methods against any disease. The Sabin vaccine for polio, for example, is taken by mouth.

Louis Pasteur made the discovery that microbes could be weakened, thus weakening the severity of a disease. The story of his work on cholera with chickens is familiar. He was using a bacterium in a culture that would kill a chicken in one day when injected under its skin. He gave the chickens a culture that had been standing for a week, however, and they lived to survive a strong fresh preparation later on because they had been accidentally inoculated.

Earlier successes in the development and use of vaccines in the prevention of smallpox, anthrax and rabies encouraged efforts to develop actively immunizing agents against many other diseases. Among them are typhoid and paratyphoid fevers, cholera, plague, tuberculosis, undulant fever, whooping cough, tularemia, chronic staphylococcal and streptococcal infections, diphtheria, tetanus, yellow fever, Japanese B. encephalitis, Russian tick-borne encephalitis, St. Louis encephalitis, equine encephalitis, Rocky Mountain spotted fever, typhus and several animal diseases.

The principles of active immunization can be applied to both prevention and treatment of infectious diseases. Regardless of whether the desired result of active immunization is prophylaxis or therapy, the procedures of vaccine preparation and immunization are basically the same.

Two Vaccine Types

There are two main types of vaccine—stock, or heterogenous, and auto-genous. Stock vaccines are prepared from microorganisms previously isolated from persons having a particular infectious disease. The vaccines may be composed of several different strains of the same species, thus rendering the vaccine "polyvalent." Auto-genous vaccine comes from microorganisms isolated from the actual patient being treated.

Modified toxins or "toxoids" make up the vaccine for the prevention of tetanus and diphtheria, diseases resulting from the effects of bacterial toxins in the body. There is no longer any excuse for risks of either of these dangerous diseases.

Vaccines have reduced the death rate and disease rate of many infections enormously, but availability is not enough: it is up to the public to use them.

(Cover photograph by Chas. Pfizer & Co., Inc.)

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MEDICINE

Male Sex Hormone Helps Make Red Blood Cells

► SEX HORMONES affect the body's red blood cell production.

The male sex hormone testosterone injected into the kidneys of rabbits and other animals causes the kidneys to produce a greater supply of the hormone erythropoietin, which speeds up red blood cell production by the bone marrow.

The female sex hormone, estradiol, however, seems to slow up the manufacture of erythropoietin, Dr. Albert S. Gordon of New York University told the Conference on Erythropoietin sponsored by the New York Academy of Sciences.

Dr. Gordon and his co-workers from Roswell Park Memorial Institute, Buffalo, N.Y., combined the male hormone treatment with reduced oxygen pressures.

Testosterone also increased synthesis of DNA, short for deoxyribonucleic acid, in children's bone marrow, Dr. L. K. Diamond of the Children's Medical Center, Boston, reported.

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MEDICINE

Severe Muscle Cramps Reported in Alcoholics

► TO DELIRIUM tremens and other terrors of alcoholism has been added muscle disease.

Two alcoholics with severe muscle cramps due to a drinking bout are reported in the *New England Journal of Medicine*, 274:1277, 1966. They were treated by physicians of Washington University Medical Service, St. Louis City Hospital.

One of the patients had drunk alcoholic beverages since he was 10 years old, drank every day after work and on binges over prolonged holidays and week ends. After a four-day drinking bout he returned to work and while lifting a heavy object he suffered such severe muscle cramps in the upper arms, abdomen, thighs and legs that he had to be taken to the hospital.

The second alcoholic also had been on a drinking bout of several days' duration. He complained bitterly of muscle cramps, and said he had previously suffered in this way after an alcoholic binge.

Only a few such cases have been reported in this country, the St. Louis researchers said, although European investigators have found a number of alcoholics with acute muscular syndromes.

Drs. Gerald T. Perkoff, Patrick Hardy and Enrique Velez-Garcia reported the study, which was in connection with research on another group of patients with cirrhosis of the liver.

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