

PUBLIC HEALTH

Live Polio Virus Vaccine

Developers must await a Government license that will permit production and eventual use of the oral vaccine, tested on monkeys, in humans in the United States.

By HELEN BUECHL

A BRITISH SOLDIER killed in World War II and five Americans, two little girls and three boys, contributed the original strains of live polio viruses that are used in laboratories today for the manufacture of this latest polio protection.

The British soldier, a member of the Middle East Forces, died in 1940 from paralytic polio. Doctors recovered type II strain of polio virus from his brain.

Type I strain is a combination of viruses. One virus was isolated in 1947 in Akron, Ohio, from a 15-year-old boy who had non-paralytic polio. In Cleveland, in 1941, type I virus was also isolated from two other boys, aged eight and ten, and a three-year-old girl. Each had symptoms of polio. These viruses were mixed to form the type I strain used today.

The type III strain now used was originally isolated from a one-year-old girl in Louisiana who was shedding the virus but was not sick.

These are the original sources of the strains used to produce a live polio virus vaccine at the Lederle Laboratories, Pearl River, N. Y.

Today, all three strains of polio viruses can be mixed into a single oral dose vaccine that gives long-lasting immunity, Dr. Herald R. Cox, developer of the Lederle vaccine, said.

However, there is a big step between isolating the viruses and the final mixing process that produces a dose of polio protection.

Polio is a virus disease, the virus enters the body through the mouth, and passes down the alimentary canal into the intestine where it begins to grow. It is relatively harmless while it remains in the intestinal tract.

Invades Other Cells

But if the virus leaves the intestine it may invade other body cells where it reproduces and kills the cells. These newly reproduced viruses then invade more cells and continue to reproduce. If a sufficient number of nerve cells are destroyed during this process, paralysis may result.

However, the body can produce antibodies against the polio virus and is often able to stem the invasion. It is an established fact that a majority of people have been infected with polio without realizing it. Some may have felt "under the weather" for a few days without ever knowing about the life and death struggle going on inside them.

Others probably had no symptoms at all. Only one person out of perhaps 1,000 who

are infected by polio ever becomes crippled.

The person who has once been infected by polio virus has developed a natural immunity with antibodies. This type of immunity is the best kind. However, it will not last forever.

When Dr. Cox began his work in 1946, his underlying theory was that the most practical and logical way to immunize against polio would be to follow the pattern that takes place under natural conditions. An attenuated, or weak, live virus could be given in a vaccine form by mouth. Thus it could multiply in the intestinal tract and duplicate the antibody response achieved through natural infection, but without the disease itself.

The first problem was one of selection and growth. There are millions of viruses in samples of each of the three types of viruses. Scientists wanted to select the weakest viruses from each type. Yet these viruses had to be strong enough to cause an antibody reaction.

Over the years, and for many generations, these viruses were passed from the original

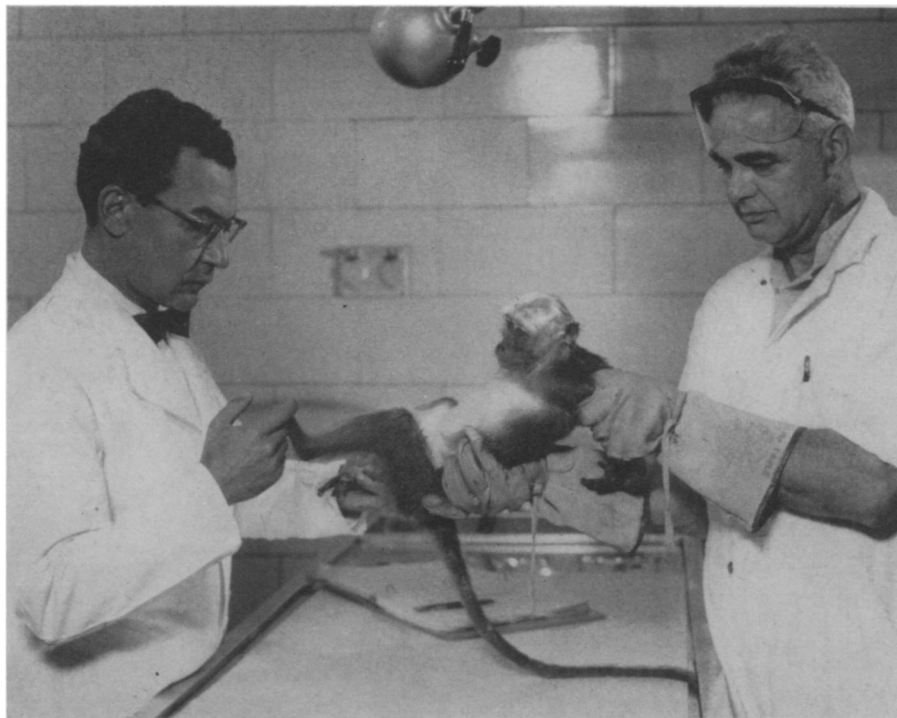
source to monkeys, to the hamster, injected into chick embryos, and finally grown in the test tube in a medium consisting of monkey kidney tissue. The "weak" viruses were separated and allowed to multiply. Their effectiveness was constantly tested on monkeys. In the laboratory the procedure consists of spilling the viruses onto glass dishes, where they grow in a thin solution of kidney culture.

Stable Virus

Each virus on the glass dish spreads into a colony as it grows. Each colony is then tested for its performance in a monkey until researchers can get a stable virus. A stable virus is one which will constantly reproduce itself without reverting to a wild type that is capable of actually paralyzing.

Then the weak viruses of types I, II and III are refrigerated in separate flat-sided glass jars that contain a red-colored growing medium. While the vaccine is stored in these containers, the refrigerator appears to be filled with glass dishes of cherry gelatin.

Then each batch of the vaccine is chemically tested for its effectiveness in man. When it passes all of the rigid tests and standards of the Lederle team, a cherry flavoring is added and each batch of each type is stored at 38 degrees Fahrenheit in



NO MORE MONKEYING AROUND—It is serious business from now on for this monkey from the Philippines. Here, Dr. Victor J. Cabasso, left, assistant to Dr. Herald R. Cox, developer of the single-dose live polio vaccine, examines the little fellow by one of the methods that determines his health meets the exacting standards required for testing the vaccine. A laboratory assistant at Lederle Laboratories where the vaccine is produced holds the monkey.

large vat-like glass jars that contain 20,000 doses each.

At the recent world conference on live virus vaccine in Washington, D. C., Dr. Cox announced that his team had successfully immunized 241 persons with a three-in-one vaccine. This was the first announcement of such an accomplishment, other investigators having tried and failed.

It had been presumed that the three types of virus would interfere with each other's growth in the intestinal tract if swallowed at the same time. Dr. Cox combined the three doses into a single effective trivalent cherry-flavored syrup.

To date, more than 700,000 persons throughout the world have successfully received the Lederle vaccine in separate doses of Types I, II and III.

Other researchers in the field of live polio virus vaccine include Dr. Albert B. Sabin of the University of Cincinnati and Dr. Hilary Koprowski of Philadelphia's Wistar Institute.

Dr. Sabin's vaccine has successfully immunized more than 6,000,000 persons in Russia, Czechoslovakia and Poland. Dr. Koprowski has vaccinated thousands in the Belgian Congo with his strains, with equal success.

Unanswered Questions

Despite the success of the vaccine program to date, there are a few questions that remain unanswered. These unanswered questions prevent the United States Public Health Service from recommending the use of the vaccine for the general public. Until a recommendation is given, the three developers, Drs. Sabin, Koprowski and Lederle's Cox, must await a license to begin full production of the vaccine.

First, it is a well known fact that the vaccine can cause paralysis in monkeys. The Lederle Laboratories have rooms of monkeys in the prime of life. Some of these animals, when they receive the vaccine in the spine or brain, develop polio lesions. Others actually become paralyzed. Can this same tragedy occur among humans who have received the oral vaccine? As yet, there have been no reported cases of polio that could have been caused by the vaccine.

Second, since the viruses used are "weak," Public Health officials want to be sure that the viruses are not capable of reverting to a wilder, more active type as they pass through the digestive tract. It is a well known fact that persons who receive the vaccine actually shed the weakened viruses from the vaccine and pass them on to immediate family members, thereby "accidentally" immunizing others. To date, the viruses have not caused any paralysis in persons immunized in this indirect manner.

Mass Vaccination Unwise

Meanwhile, the National Foundation's vaccine advisory committee has suggested that mass vaccinations with the live, weakened viruses would be unwise at this time. They did recommend, however, that a group of American scientists be formed to study the research and field trials still being conducted.

If and when these problems with the live virus vaccine are settled, medical scientists will have given the world another significant achievement in the battle against diseases—polio vaccine more effective than the Salk. The live virus vaccine offers longer immunity, ease of administration since it can be taken orally, and adequate protection from the three types of polio by taking a single combined dose.

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GENERAL SCIENCE

Light Atoms Specialty of AEC Commissioner

DR. JOHN H. WILLIAMS, newly nominated by President Eisenhower as a member of the Atomic Energy Commission, is a nuclear physicist specializing in the study of lightweight particles such as hydrogen and helium, the two most abundant elements in the universe.

Dr. Williams was named to the remainder of the term left by Dr. Willard F. Libby's resignation on June 30, which will expire June 30, 1961. He is now on leave of absence from the University of Minnesota to serve as director of the AEC's division of research.

In 1933, Dr. Williams reported news in the physical sciences for SCIENCE SERVICE.

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ELECTRIC "EEL"—A snake-like assembly of tiny battery cells that can be wound on a drum along with the cable, is activated when unreeled into water. Rubber rings separate silver chloride links from zinc segments. Developed for the U.S. Army Signal Corps by Aerojet-General Corporation, Azusa, Calif., the snake batteries are spliced into cable every mile to boost voice or teletypewriter signals.

BIOLOGY

New Sea Worm Found Off Central America

A NEW SPECIES of sea worm has been discovered in the deep ocean waters off Central America.

Other species of the same phylum, small sausage-shaped worms known as *Priapuloida* have been considered by scientists to be classic cases of bi-polar distribution. This means that they were known to exist in both North and South polar areas, but not anywhere in between.

The new worm was discovered by Dr. Robert Menzies, director of marine biology at Lamont Geological Observatory, Palisades, N. Y., on a recent expedition of Lamont's research vessel, *Vema*.

Dr. Menzies said that the newly discovered species differs only slightly from one of the other three existing species of *Priapuloida*, and that further searching in the same waters should yield additional specimens of the new species.

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MEDICINE

Plastic Tube Restores Hearing in Some

PLASTIC TUBING and skin grafts are restoring hearing to the deaf suffering conduction disorders.

The plastic tubes can be used safely in the middle ear as a functioning part of the conduction apparatus. And most ear drum punctures can be closed with grafts of outside skin.

Such measures are not effective where there is nerve involvement.

The surgical techniques are described in *Medical Annals of the District of Columbia* (July) by Dr. G. W. Taylor of the U. S. Naval Hospital, Bethesda, Md.

"The past five years have seen remarkable changes in . . . the treatment of deafness," Dr. Taylor says. "There is hardly a case of conduction deafness (now) which cannot be helped by surgery."

Where hearing is impaired due to bone damage in the middle ear, the plastic tube is inserted as a bypass. The middle ear bones form a "bridge," transmitting sound from the ear drum to the nerve-bearing inner ear. In order to bypass the damaged bridge, the tube is fitted over the stapes in such a way that it projects up against the drum. Sound, then, is conducted from the drum along the tube directly to the stapes (the final bone of the bridge) and into the inner ear.

Badly perforated ear drums, Dr. Taylor reports, were formerly thought untreatable. Now, however, it is possible to reconstruct almost an entire drum.

Under a high-power surgical microscope, the outer layer of the ear drum is peeled off. This leaves a bed of blood vessels to which the skin graft is applied. As the graft "takes," it grows thinner and eventually resembles a normal ear drum.

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