



PENICILLIN IN ACTION—The first photographs to reveal the effect of the mold chemical on disease-causing bacteria, these micrographs show the bacteria *Staphylococcus aureus* magnified about 19,000 times with the electron microscope. The bacteria is shown (left) as a grape-like cluster before penicillin is introduced and (right) after penicillin has affected the germs.

research team who are listed as patentees are Dr. S. A. Thayer, Dr. S. B. Binkley, Dr. R. W. McKee, Dr. D. W. MacCorquodale and Dr. E. A. Doisy, all of the staff of St. Louis University Medical School.

The name "vitamin K" has been used only as a convenience; spelled out in full

chemical longhand the substance is 2-methyl-3-phytyl-1,4-naphthoquinone. It can be obtained from plant substances as a natural source (the inventors mention alfalfa), or it can be made synthetically with coal tar as the original starting point.

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a few hours of the infecting dose of germs. When, however, the phage was given one, three, five or six days before, the mice survived about 10,000 minimum killing doses of the germs.

Bacteriophage, discovered many years ago by French scientists, is believed by some to be a living organism or virus that preys on other, larger germs. Other scientists believe it is a non-living substance like an enzyme or ferment. It destroys its germ victims by a process called lysis or dissolution.

The protective action of the phage in the body is related to this lysis which can be observed in the test tube, Dr. Morton and associates reported. Unless there is lysis of the germs in test-tube experiments, there will not be any immediate protective action in the animal body. Test-tube experiments alone, however, are not sufficient for evaluating the effect of the substance in the body, Dr. Morton pointed out. Even the sulfa drugs and penicillin would have been misjudged if they had been evaluated on the basis of test-tube experiments alone.

The conflicting scientific opinions of bacteriophage resulted, apparently, from the fact that early reports were based on test-tube experiments or on inadequately controlled trials in animals. The Pennsylvania experiments were planned to give more adequate knowledge for evaluating bacteriophage which, on the basis of today's report, appears as an effective weapon against dysentery, at least in mice.

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BACTERIOLOGY

Phage Against Dysentery

One ultramicroscopic bacteriophage particle will protect mice against eight virulent dysentery germs. Is unique among germ-eat-germ substances.

► UNIQUE among the antibiotic or germ-eat-germ substances, of which penicillin is the present champion, is bacteriophage, Dr. Harry E. Morton, of the University of Pennsylvania School of Medicine, told members of the Society of American Bacteriologists at their New York meeting.

The unique feature of bacteriophage is that as it is used to destroy virulent germs in the body more of the active phage is generated.

One ultramicroscopic phage particle

will protect mice against eight virulent dysentery germs, Dr. Morton and associates, Frank B. Engley, Jr., and Juan Enrique Perez-Otoro, found. In one experiment, all mice survived 12,000 minimum deadly doses of dysentery germs when at the same time they were given one cubic centimeter (about a fourth of a teaspoon) containing about 50 billion particles of phage active against these germs.

When used as a treatment for dysentery, the phage had to be given within

New Micrographs Shown

► THE FIRST PICTURES showing penicillin in action against disease germs were shown by Dr. V. K. Zworykin, Dr. James Hillier and Perry C. Smith, of the Radio Corporation of America, at the meeting.

The pictures were made with the electron microscope, which uses a concentrated beam of electrons instead of light and a system of "magnetic lenses" to show objects 100 times smaller than can be seen even with the most powerful optical microscopes.

Staphylococci, life-threatening invaders of war wounds as well as the cause of boils and food poisoning, appeared first as large grapes in the greatly magnified electron microscope pictures. Then they were seen to shrivel under



SUB-MICROSCOPIC EXPLORER—The electron microscope will be available to smaller laboratories, schools, hospitals and factories in this new desk size. Shown in this picture are Dr. V. K. Zworykin (seated left), associate director of the RCA Laboratories, Dr. James Hillier (seated right), young pioneer in electron microscopy, and Perry C. Smith, engineer.

penicillin's action to small wrinkled kernels.

First showing in this country was also given an electron microscope picture of the malaria parasite in the salivary gland of a mosquito at the stage when the next person bitten by the mosquito would get the parasite in his blood.

A slime organism that grows on gasoline along the walls of piping that carries this now precious fuel and causes some trouble was also made visible to the bacteriologists by the electron microscope.

The action of bacteriophage, unique germ-eat-germ substance reported at the meeting as a potent weapon against dysentery, at least in trials on mice, was

seen in another series of electron microscope pictures. One or more phage particles, these pictures showed, become attached to a germ and possibly enter it. There they multiply by a still unknown process. The cell membrane of the germ becomes weakened and destroyed until finally it bursts, throwing out cell contents including about 150 newly formed bacteriophage particles.

An entirely new desk-size electron microscope, smaller, cheaper and easier to operate than the large model, is now in production. This and an improved universal model were introduced at the meeting.

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MEDICINE

Rabbit Cancer Antibody

Tumor growth of non-virus origin can be suppressed in animals. At this stage of the work, no human application, such as vaccination against cancer, can be seen.

➤ **DISCOVERY** of a specific antibody which suppresses the growth of the Brown-Pearce cancer in rabbits is announced by Dr. John K. Kidd, of the Rockefeller Institute for Medical Research. (*Science*, April 28)

No human application, such as vacci-

nation against cancer, can be seen in the work at this stage. In fact, Dr. Kidd stated in an interview that it is "vastly too far away to have any foreseeable effect in human cancer."

The scientific importance of the discovery lies in the fact that the Brown-

Pearce cancer is not caused by a virus. This is probably the first time that an anti-body has been found to suppress such a cancer. Antibodies are substances that develop in the blood in response usually to invasion by a disease germ such as a virus or other microorganism.

Rabbits of the blue-cross breed could be vaccinated, as it were, against the Brown-Pearce cancer by injections of watery, cell-free extracts of the tumor. They developed the specific antibody in their blood after three or four such injections and then proved resistant, generally completely so, to a small dose of Brown-Pearce tumor cells implanted into their muscles a week or 10 days later.

Rabbits that had not developed the antibody did not have this resistance to the cancer. Animals that were resistant to the Brown-Pearce cancer were as susceptible as other rabbits to cells of other types of cancer.

The Brown-Pearce cancer cells have a constituent which has some of the characteristics of a virus, but Dr. Kidd is of the opinion that this cancer is not a virus tumor. Its distinctive constituent, which may be a protein, can be detected in test-tube experiments through its reaction with the antibody that appears in the blood of certain rabbits in whose body the tumor has been implanted.

When the distinctive constituent and blood serum containing the antibody are incubated together for two or three hours and then injected into a rabbit, the animal usually fails to develop a tumor, though it will do so when the distinctive constituent has been incubated with normal rabbit blood serum.

Dr. Kidd is now seeking similar material in other animal tumors. One, he has already found, the V2 carcinoma, yields a distinctive constituent substance that is not detectable in extracts of normal rabbit tissues or in those of other rabbit tumors, including the virus papillomas of the type from which the V2 cancer originally derived.

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ELECTRICAL ENGINEERING

One-Pound Generators Float Weather Balloons

➤ **ONE-POUND** hydrogen generators now furnish the lifting power needed to float into the sub-stratosphere weather-recording balloons used by the Army Signal Corps to chart the weather accurately.

Inflation of these balloons under difficult conditions at the front lines has