

MEDICINE

Breakthrough on Cancer

Scientists are hopeful that today's dread disease, cancer, will yield to the concerted attack now being made through study of cells.

► **CANCER IS** today's dread disease, striking fear in the hearts of people who know it as an awesome plague.

Scientists whose research is sponsored by the American Cancer Society have described to science writers an attack on the disease using the combined efforts of physicians, chemists and physicists.

No cures have been reported, but these men are hopeful, hopeful in the belief that rapidly increasing knowledge about cancer will lead to a breakthrough.

Cancer begins in the cell, the basic element of life. A miniature chemical plant, the cell takes in compounds and produces others in an extremely complicated and delicately controlled manner. A cancer cell, unfortunately, is like the normal cell—only more so.

One way of attacking a tumor is to strike at the supply line to the chemical plant. Living cells need folic acid, so the biochemist works out a method to make the acid unavailable to it. When the folic acid antagonist, called an anti-metabolite, is put in the body, the cells are starved and die.

Acute leukemia has been controlled for varying periods in some patients with aminopterin, which is such an antagonist.

Unfortunately, the story does not end there: normal cells also need folic acid; and eventually a cancer cell develops that is resistant to the drug, and from this cell a resistant tumor grows.

Dr. Arnold Welch, Yale University Medical School, is trying to work out a method of going inside the cell to short-circuit the manufacturing process. He also seeks a twin anti-metabolite approach to eliminate cells that might be resistant to one of the drugs.

To kill, though, a cancer cell must do more than simply manufacture chemicals and grow—it must divide, and some do this very rapidly.

The process of cell division is called mitosis by biologists. At Rutgers University, New Brunswick, N. J., Dr. Moses L. Crossley has been developing drugs that interfere with this little understood part of the cell's life. He has found a class of chemicals derived from a German textile chemical that affect mitosis.

These drugs, TEM, TEPA and MEPA, seem to single out for attack rapidly dividing cells such as cancer. In this case, the physician must use a high protein diet to protect the patient's bone marrow and the male sex organs that also have rapidly dividing cells. Using this treatment, lung cancer in one man has been reduced in size by 35% and today, a year later, the cancer appears to remain halted.

In Boston, physicists and physicians have joined hands to wage a two-pronged war on cancer. Dr. John G. Trump, a Massachusetts Institute of Technology physicist, has trained the powerful electron beam of a 2,000,000-volt Van de Graaff generator on larynx cancers. Working with Drs. I. S. Magnus and Hugh F. Hare of the Lahey Clinic, he reported apparent cures in all 18 cases treated. The patient is slowly rotated as the electron beam bores into the cancer. This cuts down the exposure of normal tissues to the radiation and concentrates on the cancer.

Many scientists are convinced that the hormones play an important role in cancer. Dr. C. C. Little, director of the Jackson Memorial Laboratory, Bar Harbor, Me., believes a complete knowledge of hormone balance would enable scientists to predict who is likely to have cancers and start precautionary measures.

Thyroid Hormone Link

► A **STRANGE** relationship between thyroid hormone and some sex function in causing liver cancer in rats has been discovered by Dr. James H. Leatham, endocrinologist at Rutgers University.

More than 90% of all male rats develop cancer of the liver if they are fed a chemical compound called 2-acetylaminofluorene for several months. Less than 10% of the females develop such cancers under the same condition.

In attempting to find some explanation for this difference between the sexes, Dr. Leatham first removed the sex glands of female mice and gave them male hormone injections. They still did not develop the liver cancer in more than 10% of the cases.

Then he found that thyroid hormone added to their diet increased the cancer incidence of the females to that of the males.

Dr. Leatham cannot explain why the thyroid hormone should have this effect yet. He is investigating several possible causes.

Block Cell Division

► **GROWTH AND** cell division or multiplication processes, which when unrestrained lead to cancer, can be unhooked and separated, a Rutgers University microbiologist has discovered.

Using yeast cells, Dr. Walter J. Nickerson has evidence for the existence of a cellular division enzyme separate from the

processes of cell growth. In these yeast cells, growth continues without cell division.

Similar studies in the past with bacteria showed that these single-celled organisms would grow to 400 to 500 times their normal size without ever dividing if the cell metabolism involving iron or magnesium were interrupted.

By studying this block in yeast and bacteria, Dr. Nickerson hopes to isolate other factors and chemical chains which participate in the division of living cells. Ordinarily these processes are restrained in higher organisms, but a breakdown in the restraining leads to the rapid growth and division which is called cancer.

Hinged Molecules

► **HINGED MOLECULES** in the walls of red blood cells work like swinging doors to control what goes in and what leaves the cell.

Dr. Arthur K. Parpart, chairman of the biology department, Princeton University, has found that the cell wall is mainly composed of fixed protein molecules, but fat-like molecules sprinkled through the wall form adjustable pores.

Television microscope studies of living red blood cells have shown that the membrane, or wall, continuously vibrates. Dr. Parpart has examined the membrane under an electron microscope and calculates that its thickness is about 1/4,000,000 of an inch.

Using this method, he is now working with Dr. I. Wolman of Children's Hospital, Philadelphia, to find what has happened to the membrane of red cells in patients suffering from hereditary anemia.

They have found large numbers of very dense particles in the cells of these patients. The particles have not been identified and their significance is not known.

Dr. Parpart believes that the cell membrane plays an important role in growth and development of cells, in addition to its function as the cell wall.

New Drugs Promising

► **DRUGS THAT** have caused dramatic shrinkage of the prostate gland in rats have been tried on two men with prostatic cancer by Dr. Don McDonald of the University of Washington School of Medicine, Seattle.

Though the final results of the trials are not known, Dr. McDonald said it seemed obvious that the drugs were having an effect on the prostate gland.

One of the patients seemed improved.

A total of 136 drugs was tested on rats. All but 10 of these proved to be poisonous. The drugs were developed from 2-acetylaminofluorene. In using the drugs on the human patients, there did not seem to be any bad side effects.

Dr. McDonald said that one of the patients developed bloody urine but this was an indication of activity in the prostate. The action of the drug seems to strike at

the fermentative type of metabolism in the living cell. Cancer cells, in varying degrees, manifest the fermentative metabolism like bacteria. The drug also suppresses the oxidative metabolism.

The drugs have been applied to human prostatic cancers growing in test tubes. In this experiment, they interfered with the fermentative metabolism.

In another field, Dr. McDonald has found that the agent which causes bladder cancer in dye workers is in the urine when the same agent is tried in dogs.

When part of the dog's bladder was tied off and the cancer-causing agent, beta-naphthylamine, was injected into the dogs, only the part of the bladder which received urine developed cancers. Parts of human urine are now being tested in dogs to find if the same is true in the human. The injections will not work in the rabbit, but in this animal the cancer-causing dye is bound to another chemical in the body and safely excreted.

Whole Body Radiation

► REGULAR TREATMENT of the whole body with X-rays or radioactive phosphorus is doubling the survival time of patients with chronic leukemia, a cancer of the blood involving unrestrained production of immature white corpuscles.

Dr. E. E. Osgood and his associates at the University of Oregon Medical School have designed a program of treatment for each individual leukemia victim which will keep the patient on a continuous level of general good health.

In presenting his method of regular, total body irradiation, Dr. Osgood compared it

with the continuous injections of insulin given diabetics.

The treatment calls for small doses of X-ray to the entire body, or injection into the blood stream of the radioactive phosphorus. The program starts with a treatment every week and, as the disease comes under control, the treatments are spaced out to one every four to 12 weeks, depending on the individual patient.

Conventional treatment involves larger doses of radiation at irregular intervals, following a cycle of remission and relapse in the disease.

Since 1941, when the program started, 163 patients have been treated. Of these, 48 were still living at the end of 1953. The mean survival time of this group is about five years. Surveys of patients under conventional or no treatment indicate that the average survival for patients with chronic leukemia is between three and three and a half years.

Dr. Osgood emphasized that there are more than 70 different kinds of leukemia, with the survival expectancy of victims ranging from a few days to as much as 20 years.

The goal of the Oregon research group is a program of leukemia treatment that will enable the patient to spend most of his time in a normal fashion. In the long series of chronic patients, Dr. Osgood reported that the regular total body irradiation allows the patient to carry on his normal work and recreation about 85% of the time.

Science News Letter, April 10, 1954

A rapid method for determining fat content in *meat* has been tested; it takes 20 to 30 minutes as compared with 16 hours required by the standard method.

BACTERIOLOGY

Virus in Sweet Clover Also Grows in Insect

► A PLANT virus that causes tumors on sweet clover also grows in an insect, Drs. L. M. Black and M. K. Brakke and A. E. Vatter of the University of Illinois have discovered.

Electron microscope pictures showed that the virus in sweet clover tumors and the insect leafhopper were physically the same. Few plant viruses can grow in animals. The scientists have not yet determined if the viruses in the plant and insect are chemically identical. The leafhopper transports the virus from plant to plant with a two-week incubation period within the insect. Discovery of the virus was announced by the American Cancer Society which supported the research.

Science News Letter, April 10, 1954

TECHNOLOGY

New Airport Radar for Bad Weather Landings

► THE WATCHFUL eye of new radar sets will be going into 24-hour-a-day operation at more than 25 airports around the country, the Civil Aeronautics Administration and the Bendix Aviation Corporation have announced.

Using recent developments, the devices promise elimination of most landing delays due to fog and bad weather. With the new system, as soon as radio contact is made with a plane, a line is drawn on the radar screen from the scope's center to that plane. This assures the radar operator that he is talking to the same plane he is watching on his screen.

Another new development electronically reproduces a map of the area on the radar scope, showing local hazards such as tall buildings and power lines, in relation to airplanes in the vicinity.

Science News Letter, April 10, 1954

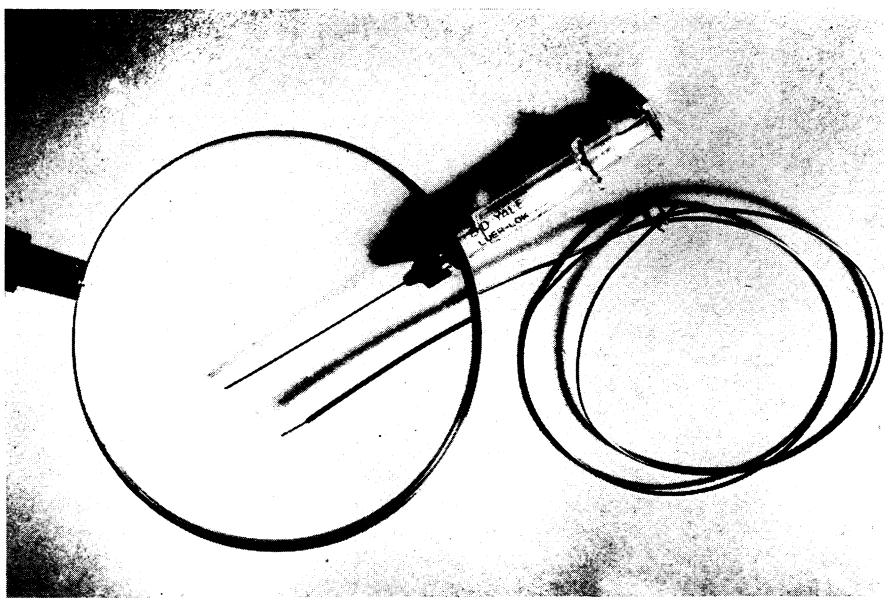
TECHNOLOGY

Develop Thermometer For Nuclear Reactor

► A WIRY thermometer that takes the temperature of fuel elements in operating atomic reactors has been developed at the Atomic Energy Commission's Argonne National Laboratory, Lemont, Ill., by Dr. W. Gerard Rausch.

Slightly thicker than a standard hypodermic needle, the thermometer actually is a thermocouple made with a copper-nickel-manganese alloy wire inserted in a special type of stainless steel tube. It generates tiny voltages in proportion to the heat it measures. These voltages are read on a sensitive voltmeter and are converted into temperature degrees. It has measured temperatures as high as 1,250 degrees Fahrenheit.

Science News Letter, April 10, 1954



TINY THERMOCOUPLE—Comparison of a thermocouple, developed at Argonne National Laboratory, to standard hypodermic needle. The magnified portion shows the lead end into which a wire has been inserted through its entire length. Couples of any length are possible, but those produced at Argonne have been limited to 20 feet.