

MEDICINE

Start of Cancer Cells

Two phases involved when normal cells change to cancer cells, Prof. Otto Warburg suggests. First is irreversible damage to the respiration, followed by fermentation process.

➤ **NORMAL CELLS** change into cancer cells in two phases.

The first phase is when something, either a chemical or X-rays or prolonged irritation, irreversibly damages their breathing process through which they get energy for survival and growth.

The second phase comes when, after a long struggle to survive and keep their normal structure, the injured cells succeed in replacing the energy from breathing, or respiration, by fermentation.

Energy from fermentation, however, is inferior. Cells cannot keep differentiating into skin tissue or liver tissue or bone tissue, for example, on fermentation energy. So the originally highly differentiated cells are converted into "undifferentiated cells that grow wildly—the cancer cells."

This explanation for the origin of cancer, based on thousands of experiments over many years, is given by Prof. Otto Warburg, director of the Max Planck Institute for Cell Physiology, Berlin-Dahlem, Germany, in *Science* (Feb. 24).

For advancing cancer treatment, Prof. Warburg suggests that scientists pay attention to "sleeping cancer cells." These are cells somewhere between the normal cells and the cancer cells in the process of change-over from one kind of energy to another. They look like cancer cells but they have not yet reached the stage of getting enough energy from fermentation instead of from respiration, or normal cell breathing.

Sleeping cancer cells have recently been found in the prostate gland in men and in the lungs, kidneys and stomach of elderly persons.

These sleeping cancer cells, Prof. Warburg thinks, could be killed more readily than cancer cells that have started growing in the body. Sleeping cancer cells of the skin, that is, precancerous skin, would make the "most suitable test object" for finding effective cancer-killing agents.

The continual discovery of miscellaneous cancer agents and cancer viruses can hamper the fight against cancer and even become responsible for cancer cases, Prof. Warburg states. The reason, he explains, is that such discoveries hide the underlying phenomena and so may hinder necessary preventive measures.

"Mutation" and "carcinogenic agent," or cancer-causing agents, are "empty words," unless their role in fundamental body processes are specified, Prof. Warburg states.

The "mysterious latency period of the production of cancer," for example, the years between exposure to irradiation and

appearance of cancer, is, Prof. Warburg says, the time in which the fermentation increases after a damaging of the respiration of normal cells.

He declares there is "today no other explanation for the origin of cancer cells, either special or general," than irreversible damage to respiration from which normal cells get energy and the subsequent change-over of some surviving cells to fermentation as a source of energy, with consequent loss of ability to differentiate.

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TECHNOLOGY

Radar Station Chain Will Track Missiles

➤ **THE WORLD'S LARGEST** chain radar tracking system, capable of checking supersonic rockets and missiles over the full length of the U. S. Air Force Air Research and Development Command's Florida Guided Missile Range, will be completed early in 1956.

This chain of 21 radar installations on eight islands was designed and built by Reeves Instrument Corporation, a subsidiary of Dynamics Corporation of America, at a cost of some \$10,000,000.

Grand Bahama, Eleuthera, San Salvador, Mayaguana, Grand Turk, the Dominican

Republic, Puerto Rico and St. Lucia are the islands linked by the system.

The radars have an accuracy within two one-hundredths of a degree. They "lock" on the missile the instant it is fired and continuously track its position, course, velocity and accelerations without delay or interruption until the missile hits the target or is itself destroyed.

If the test missile deflects the merest fraction from its course or if there is any other evidence of erratic behavior of any kind, an in-flight safety officer flicks a control to destroy the missile.

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CHEMISTRY

TB Remedy Labeled With Tritium for Test

➤ **TRITIUM**, the triple hydrogen considered by some to be an H-bomb chemical, has now been incorporated in streptomycin, mold chemical famous as a tuberculosis remedy.

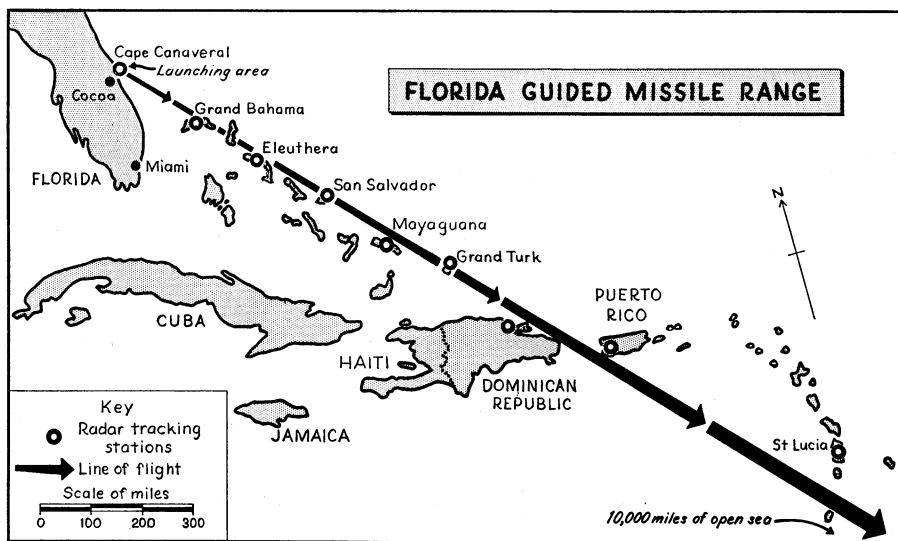
The object is to get radioactive streptomycin that can be followed in its course through the body.

The feat of tagging the streptomycin molecule with tritium was accomplished by Dr. Torsten Andre of the Royal Veterinary College, Stockholm. The streptomycin had to be hydrogenated, that is, made to pick up two hydrogen molecules, which turned it into dihydrostreptomycin.

Radioactive streptomycin has heretofore been prepared by making it with carbon-14. This has been done to study the body chemical processes of the mold that makes streptomycin.

Dr. Andre reports his method of labeling streptomycin with tritium in *Nature* (Feb. 25).

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WHERE THE MISSILES WILL ROAR—This map shows the long chain of radar stations for tracking guided missiles being tested from a Florida launching site for hundreds of miles over the southern Atlantic. Instantaneous controls destroy any missile straying off course.