

MEDICINE

World Attack on Cancer

From Chicago, Argonne, London and Paris, the latest researches upon the complex of this dread disease are reported by Faye Marley, Science Service Medical Writer, en route to Moscow for the International Cancer Congress.

Scientist Theorizes Why Chemicals Cause Cancer

► CHICAGO—A new theory that promises to explain why chemicals cause cancer has come out of the laboratory of the veteran cancer researcher, Dr. Charles B. Huggins of the University of Chicago, whose world-renowned hormone treatment of cancer of the prostate has kept former cancer patients well for as long as 20 years.

This year with a young chemist on his staff, Dr. Nien-Chu Yang, associate professor, Dr. Huggins put forth a cancer cause theory based on the structural similarity of three kinds of molecules:

1. The aromatic hydrocarbons, found in coal tar and cigarette smoke.
2. The steroid hormones, which promote and regulate growth in the cell.
3. The core of the deoxyribonucleic acid (DNA) molecule, which carries the hereditary information in the cell.

Because of this structural resemblance,

Dr. Huggins' theory suggests that the molecule of a cancer-causing substance may be able to cause cancer either by replacing a hormone molecule, which disturbs the normal pattern of growth, or by slipping into the core of the DNA molecule. This molecule can cause the formation of abnormal cells by distorting the genetic code, as the arrangement of the chemicals in the hereditary materials in the germ cells is called.

Cigarette smoking and hydrocarbons, food additives and sunlight, viruses, hormones, X-rays, radium and fallout are among the "superficial" causes of cancer, Dr. Huggins said. But somatic mutation in which specific change in DNA takes place goes deeper.

Among Dr. Huggins' recommendations for prevention of cancer is early marriage, as early as 13, with children born at 20, but he admits that this is socially unacceptable.

"We could wipe out cancer," he said, "but it's too expensive. Take cigarettes. To make them illegal would deprive the country of taxes, but I'm as sure that they cause lung cancer as I am sure that the world is round.

If filters made cigarettes safe, only hot air would come out if harmful contents were entirely filtered."

Before going to Europe and the International Cancer Congress in Moscow, I was visiting Dr. Huggins.

We looked out over the spires of the University from the windows of the Ben May Laboratory for Cancer Research in the building that also houses patients in the Billings Hospital. "It is people I am interested in," Dr. Huggins said. He keeps in close touch with the cancer patients in Billings, although his research has won him 25 awards, as his office walls testify.

Dr. Huggins introduced me to Dr. Yang and others on his laboratory staff—all of them young men and women. One was a Peruvian girl cuddling a white rat she had taken from a cage.

There are three divisions of work in Ben May: organic chemistry, biochemistry and physiology.

"I have 50 experts here with academic freedom to work on anything they want to do. We talk to one another and sometimes we collaborate but this is not important. We are all friends and that is important.

"I only take people in their 20s—their past must be ahead of them. They all end up as professors."

• Science News Letter, 82:51 July 28, 1962

Effects of Small Doses Of Radiation Studied

► ARGONNE, Ill.—Because the human effects of small doses of atomic radiation are not sufficiently well known, despite much research, a major effort of Argonne National Laboratory here is directed at radiation—its effects on length of life, disease, performance and deterioration of mammals, including man.

"Livingness" is the way the scientists put it, and the effect of the atom upon all this implies is one of the big jobs at Argonne.

Under the auspices of the Atomic Energy Commission and the University of Chicago, this huge, sprawling project on the Illinois plains, through its Division of Biological and Medical Research, is fulfilling an obligation to the public health in the nuclear age.

Dr. Austin M. Brues, senior biologist and former director of the division, told SCIENCE SERVICE that cancer had always been a primary interest with him although the work at Argonne goes beyond this disease.

The crowing of roosters and the cackling of hens kept interrupting our interview, and I saw the experimental section where they were being radiated.

(Continued on p. 53)



ANIMALS AID RESEARCH—Durward D. Banister, chief animal caretaker at the Argonne National Laboratory, and Katherine F. Hamilton, assistant biologist, check a recently born litter of mice in one of the stock rooms from which small mammals are drawn for research.

World Attack on Cancer

(Continued from p. 51)

Warnings of danger from radiation to humans are posted ominously about the animal laboratories where different dosages are being given to determine amounts and their effects.

"We shall soon have a reactor here," Dr. Brues said, "and neutrons will be used in the same way as gamma rays."

Mice are being bred for experiments to find out how small a dosage of radiation can cause cancer.

"It has been well established that large radiation doses cause cancer, but despite what one hears, it has not yet been established that small doses are appreciably dangerous."

Bone marrow protection is one of the aims in treating cancer with radiation. It is possible to give larger doses of radiation to an identical twin, for example, because bone marrow of his same type can replace what is lost.

"Radiation is a two-edged sword," Dr. Brues said. "It can induce tumors and kill malignancy. The basic mechanism is the same."

The medical benefits to be expected from radiotherapy, he believes, justify disregarding the hypothetical risk even in view of the present pessimistic view.

As for diagnostic irradiation, Dr. Brues said people who are worried about genetic effects should realize that the milliroentgen or so delivered to the gonads is the same as would be received in a transatlantic flight at 20,000 feet.

The most disturbing data so far, he said, are those concerning childhood leukemias after irradiation of the fetus. Of the 500 or so leukemia cases found annually in England and Wales in children up to ten years of age, about 50 a year represent damage from diagnostic pelvimetry (pelvic X-ray). Even so, there are times when pelvic X-ray is necessary and should overrule such danger.

• Science News Letter, 82:51 July 28, 1962

Hope Seen for Leukemic Children

► LONDON—Hope for children with leukemia, the fatal cancer affecting the white cells of the blood, is seen here at the Chester Beatty Research Institute, named for an American-born mining engineer now living in retirement in Dublin.

As part of the hundred-year-old Royal Cancer Hospital (also called the Royal Marsden Hospital after Sir William Marsden, who founded it in 1851), the Research Institute has close contact with cancer patients.

When I arrived, Prof. Alexander Haddow, the director, who is president-elect of the International Union Against Cancer, was just leaving for Moscow to help with preliminary plans for the Eighth International Cancer Congress to begin there on July 22.

"Such meetings are important because of the impressive cancer work being done in countries all over the world," he told SCIENCE SERVICE as he introduced his assistant, the director of chemistry, Prof. Franz



ANCIENT AMERICAN MASK—*This mask carved in jade with eyes and teeth made of inlaid shell was buried before the Christian era in the grave of a 50-year-old man. Ashes of burned pine wood, found in the ancient tomb, were given a radiocarbon date of 221 B.C. The tomb was found at Tikal, in Guatemala, ceremonial center of the ancient Mayas, by archaeologists of the University Museum of the University of Pennsylvania. The tomb was found to be vaulted, a fact that pushes back by almost 500 years knowledge concerning the use of the corbelled vault, a major characteristic of Mayan architecture.*

Bergel. It was Prof. Bergel who revealed the hope about leukemia. It is so far only a hope, of course, for clinical trials are only just beginning with leukemic children in London.

"We can't even tell you the names of the drugs being used," the chemist said, "but the treatment is a combination of compounds that have been thoroughly tested in our laboratories."

A new respect for the squirming white rats I saw in the experiment room was inevitable as I realized that the blood painlessly extracted from their tails had been analyzed as a possible preliminary step to curing a tragic childhood disease.

A 32-year-old pharmacologist, Dr. V. M. Rosenoer, who is also a medical doctor, is the newest staff member at Chester Beatty. With his supervisor, Dr. L. A. Elson, biochemist, he explained the experimental work being done on normal blood cells in the effort to find more effective drugs against cancer.

There are two types of white blood cells, the lymphocytes and the granulocytes. Working with rats, which had been fed liquid drugs dripping onto their food from bottles all day long, the experimenters discovered that certain drugs have different effects on these two types of white blood cells.

Myleran, for instance, which is one of the leading treatments for chronic leukemia,

has more effect on the granulocytes than on the lymphocytes.

The nitrogen mustards, however, show predominant effects on the lymphocytes. Through patient tests with animals, drugs—and there are between 1,000 and 2,000 of them tested at Chester Beatty every year—are being sought that will be more specific for the various types of cancer.

Dr. Bergel, who worked with Dr. Heinrich Wieland, the Nobelist in chemistry, at the University of Freiburg in Germany until the Hitler regime led him to go to Edinburgh, is enthusiastic about a little-considered possibility in cancer assault.

Instead of directing all treatment to killing the malignant cells and unfortunately including the host in many cases, with lethal drugs thought of as magic bullets, Dr. Bergel has a theory that delinquent cells can be converted back to normal ones.

"At least it might be possible to restrain a tumor in its three main activities," he said, explaining that cell division, invasiveness and metastasizing activities were the things he had in mind.

The answer, Dr. Bergel believes, lies in enzymes. He has recently written a book, following a leave of absence as a visiting lecturer in the Department of Biological Chemistry, Harvard Medical School, titled "Chemistry of Enzymes in Cancer," which explains his theories.

Among his experiments, Dr. Bergel has been encouraged by results with one of the "degrading" purines, xanthine oxidase, used with animals in an attempt to replace deficient enzymes. The differences between cancer and normal tissue, he pointed out, are largely of a quantitative nature.

"In view of the great success of replacement therapy in the case of nutritional deficiencies (vitamins, minerals and amino acids), along with hormonal shortcomings shown in the action of insulin versus diabetes, and in the action of cortisone in various ailments, we are speculating that malignancy can be controlled by supplying natural factors found to be at lower level in tumor tissue."

Dr. Bergel interrupted his enzyme theories to point out that the American Medical Association is all wrong in thinking that Britain has anything like socialized medicine.

"Our national health program is for socialized benefit but it is not socialized medicine," he said emphatically. "This was shown back in 1951 when the Chester Beatty Institute became a part of the British Postgraduate Medical Federation, which is under the government and a school of London University."

"There was no confiscation of Chester Beatty funds or property at that time. That would have been socialized medicine."

Many of the research funds are being given to the Chester Beatty Institute by the voluntary British Empire Cancer Campaign. Many legacies and voluntary donations are also given for the use of the Institute, and some grants have come from the National Institutes of Health through the National Cancer Institute in Bethesda, Md.

The work at Chester Beatty embraces many aspects of the assault on cancer, including radiobiology, experimental path-

ology (Dr. Haddow has specialized in this field), cytogenetics, immunology and other fields. Through all the research, Dr. Haddow has pointed out, the main purpose is to clarify the physiological mechanisms of growth regulation, their loss in the cancerous process, and the essential differences between normal and cancer cells.

• Science News Letter, 82:53 July 28, 1962

Curies' Spirit Guides Institute in Paris Today

► PARIS—The Curies would have nodded approval a few weeks ago when the big new Swiss-made betatron machine operating at 35 million electron volts began operation on various types of cancer here at the Radium Institute of the Curie Foundation.

I walked through long basement corridors to see the betatron after lingering outside the old office and laboratory of Madame Curie and seeing the double-bust statue of her and Pierre Curie that had been given by grateful Poles.

A new building is almost ready to open after being built with Canadian donations, and this will house the research laboratories of the Foundation, now crowded with hospital units.

But one of the advantages of the Foundation, which is a part of the University of Paris and a few blocks from the Sorbonne, is that the Curie Hospital with outpatient clinics—all free, of course—is nearby.

Prof. Antoine Lacassagne, the "grand old man of cancer" in France, still maintains a laboratory at the Foundation although his

work as director of the department of medical application has been taken over by Dr. Raymond Laterjet.

On the wall of Dr. Laterjet's office hangs a picture of the Curies, and he keeps a garden near their statue.

"We started with 30 people working here in 1919," Dr. Laterjet told SCIENCE SERVICE, "and now we have 1,000 with laboratories also in the suburbs."

Deep uterine cancer is treated with gamma rays from the betatron, directed from the front, back and either side of the patient.

Electron treatment is given to patients with skin growths, breast and lung cancer. The electrons are accelerated in a circular orbit in a changing magnetic field.

Before such an apparatus was available, large radium units were used, but these were expensive and had some technical disadvantages. Cobalt machines are also in constant use here. A disadvantage of low-voltage X-ray treatment is that it is not possible to get large enough doses to the tumor through the skin and normal tissues. Radiotherapy to be successful must damage the abnormal cells with as little as possible danger to normal ones.

I asked Dr. Laterjet what percentage of "cures" came out of the hospital and he replied that if cancer specialists were honest today they would not claim to cure more than 15% of all types of cancer.

"The incidence of cancer is about the same in most civilized countries," he said, "and cures are about the same."

Cancer of the liver is extremely rare in France, but in Japan it is common, perhaps

due to genetic or dietary differences, Dr. Laterjet said. Lung cancer is going up in France, and although he said air pollution was partly to blame he had a very definite feeling that cigarettes share responsibility for 95% of this type of malignancy.

"We have a state monopoly of tobacco here," he told SCIENCE SERVICE, "and although the scientific research of the monopoly is fairly honest, too much money is paid to the government to stop selling tobacco. If it could be demonstrated that treatment of tobacco would reduce the incidence of lung cancer, of course it would be given. No one here disclaims the bad effects of benzpyrene in tobacco."

Prof. Lacassagne believes there should be caution shown in the use of X-rays for diagnosis, both of lungs and of the female pelvis of pregnant women, but in many cases the need for X-ray pictures outweighs any possible danger.

His work has shifted between clinical and experimental in the 50 years of his career.

In 1932 he discovered that the injection of female sex hormone produced cancer of the breast in male mice. His work was the first in which a naturally occurring compound produced cancer.

"I did clinical work in the first part of my life," he said, "but now I am doing basic research. In Moscow at the International Cancer Congress this month, I will discuss work I have been doing on adrenal relationship to carcinoma of the liver and take part in two discussions." He has found that "butter yellow," a dye prohibited in food in the United States as early as 1919 because of its toxicity, exerts the same effect on wild and laboratory rats in producing cancer.

"I am trying to understand the mechanisms by which normal cells become cancerous in animals," he said, adding that "the field of science is never finished, fortunately for human beings."

• Science News Letter, 82:54 July 28, 1962

TECHNOLOGY

Underwater Sound Source To Be Used in Research

► A POWERFUL UNDERWATER noise-maker is undergoing trials at the test and evaluation center of General Dynamics/Electronics on Seneca Lake, N. Y.

The underwater acoustic system differs from conventional sound generators, which are powered electronically, because it uses hydraulic fluid under pressure as an energy source. It is to be used as a massive source of sound in anti-submarine warfare research.

The hydroacoustic transducer converts hydraulic fluid under pressure into vibratory energy, which is transmitted in the water as acoustic waves. It can be made to operate at any frequency in the audio range. The new transducer is a broadband sound generator made to operate at low frequencies built for the United States Navy Underwater Sound Laboratory.

Transducers using the hydroacoustic principle have a number of advantages over conventional types. They are inexpensive, rugged and require no special materials.

• Science News Letter, 82:54 July 28, 1962



KING-SIZED KLAXON—Experimental six-ton hydroacoustic transducer, developed by General Dynamics/Electronics-Rochester for U.S. Navy Underwater Sound Laboratory, is hauled from the waters of Seneca Lake, New York, where it is undergoing trials at the company's test and evaluation center on Seneca Lake.