

a \$250 million effort to promote sales.

"We believe the next step is the publication of tar and nicotine content," Gardner said. The Federal Trade Commission has a laboratory in which it plans to test all cigarettes for tar and nicotine content. Its findings will be published quarterly, indicating results by brand name. Hopefully, this will stimulate competition among tobacco companies for a "safer" cigarette, Government officials say.

Another Government report issued last week linked smoking to loss of work time. Smoking workers spend a third more time away from their jobs because of illness than nonsmokers, according to a survey conducted in 1964 and 1965 by the National Center for Health Statistics.

Surgeon General William H. Stewart announced the survey of 42,000 homes. It shows for the first time, he says, the extent of the relationship between illness, disability and smoking. Survey statistics show that smokers and former smokers of both sexes are more likely to suffer from heart disease, emphysema, sinusitis and peptic ulcers.

The Tobacco Institute, Inc. of Washington, D.C. was quick to criticize the survey, charging "most of the information in the report is based on self-diagnosis and secondhand information."

Viruses and Cancer

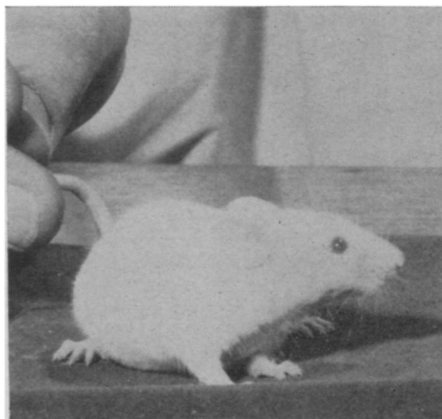
Cancer researchers have entered a new round in their fight against the still elusive human leukemia.

By pitting one type of cancer virus against another, they have found new techniques that enable them to isolate and identify leukemia-causing viruses in chickens and mice. Now, they plan to use these sophisticated methods to study viruses in dogs and cats; they are moving up the mammalian ladder to their eventual goal—man.

Striking similarities between leukemias in chickens and mice were reported at the annual meeting of the National Academy of Sciences in Washington, D.C. "We have everything going for us to indicate that leukemias and sarcomas in several species of animals are likely to make a common pattern in the mammalian kingdom," says Dr. Robert J. Huebner of the National Institute of Allergy and Infectious Diseases. The trick is to use the sarcoma virus to reveal the presence of the evasive leukemia virus.

Leukemia is a cancer of the blood-forming organs. A sarcoma is a malignant tumor made up of connective tissue such as muscle. It is only within the last few years that scientists have shown certain sarcoma viruses, such as

the Rous Sarcoma Virus, are defective—that is, they lack some genetic component essential to their ability to reproduce. The defect can be compensated by a helper virus that completes the defective virus by becoming its coat or envelope, thereby enabling it to replicate. Apparently, some leukemia viruses can play the role of helper to the defective Rous Sarcoma.



University of Wisconsin

The bottom of the research ladder.

This knowledge, verified by tests on chickens and mice, lies behind methods used to discover elusive leukemias. The defective sarcoma virus reproduces when wrapped in the viral coat of the leukemia virus. Dr. Huebner and others have used this test to hunt for various leukemia viruses. On a limited scale, Dr. Huebner plans to study human leukemias and sarcomas in tissue culture, though chances are slim there will be a pay off in human studies until more is learned from animal work.

Time Reversal Search

The idea that time's direction of flow cannot be determined by any physical experiment was once deeply ingrained in the thought and theories of scientists.

That was the case until, in 1964, physicists found that time might sometimes be a one-way street. Since then, they have searched long and hard for confirmation or disproof of the indirect evidence that, under certain conditions, time has a preferred direction of flow.

Scientists say that time is a sequence of events that customarily follow one another. If this sequence can be made to reverse itself, as was suggested by the 1964 experiments, then to physicists and the subatomic world in which they work, time would be running backward.

Equipment is not yet sufficiently sensitive to make a direct test for time irreversibility, but experiments now

underway are seeking additional, although still indirect, evidence.

At Howard University last week Nobelist Dr. C. N. Yang of the State University of New York at Stony Brook outlined four kinds of experiments being conducted at various laboratories for proof or disproof of time reversal invariance among the so-called weak interactions, such as occur in radioactive decay or when some subnuclear particles disintegrate.

All four involve the breakup of the K-2 meson, a member of the family of particles that act as nuclear glue, binding neutrons and protons together so that they form nuclei.

A different kind of an experiment looking for time reversal invariance, but in electromagnetic interactions, is underway at Los Alamos Scientific Laboratory. The electromagnetic force acts between charged particles, as in holding negative electrons in orbits around a positive nucleus.

Dr. Enloe T. Ritter reported to the American Physical Society meeting in Washington (SN: 5/6) preliminary results of experiments he and Dr. Roger B. Perkins are conducting to test time reversal in the radioactive decay of rhenium. He said that the first results from a month's run suggested that time was not reversible in this electromagnetic reaction. The experiment will last a total of six months.

All the fundamental laws of physics, including relativity and quantum mechanics, are time-reversible. That is, the same physical laws apply whether the sequence of events runs backward or forward, in somewhat the same sense that actions in a motion picture are reversed when the film is run backward.

That time is not reversible is difficult for scientists to believe. There is "no conceivable proposal" to cover such an eventuality, says Dr. Yang.

Until 1957, scientists had considered three symmetries to be inviolate. They believed reactions between nuclear particles could not be distinguished from their time-reversed, antimatter or mirror images. This is called the CPT theory.

The C, or electric charge, is a way of distinguishing matter from antimatter. The P, or parity, tells right-handed from left-handed, and the T, or time, distinguishes the direction in which a sequence of events occurs.

Then scientists discovered in 1957 that a particle and its mirror image do not follow exactly the same rules—parity is not invariant in all cases. Dr. Yang and Dr. T. D. Lee of Columbia University shared the 1957 Nobel Prize in Physics for suggesting the search for examples of nonconservation of parity.

The shock wave following this dis-