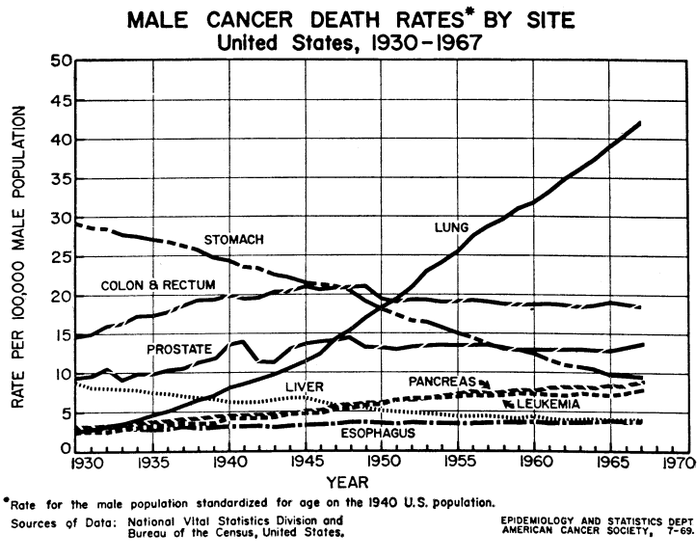
Assessing the state of cancer research

Progress has been made in treating some types of the disease, but cancer cells still usually defeat their victims

by Barbara J. Culliton



Every day in the United States, 175 men and women die from lung cancer. It kills more men than women (the American Cancer Society estimates it will claim 53,000 men and 11,000 women in 1971), occurs 15 times more frequently than it did 40 years ago, is virtually incurable and just as virtually preventable. About 75 percent of all lung cancer cases could probably be prevented if individuals would simply stop smoking.

While lung tumors claim 64,000 lives every year, cancers of all types kill some 323,000 men, women and children a year—fewer Americans died in battle during World War II. Of the 200 million individuals now living in the United States, one in every four can expect to get some form of cancer during his lifetime. The most important questions are whether it can be detected in its early stages and, if so, whether the patient's doctor will be able to help him.

Last month, a Senate panel of eminent scientists and laymen called upon Congress to seek the conquest of cancer with a commitment of money and energy parallel to the commitment that put Neil Armstrong on the moon on July 20, 1969. As a result of their findings from a survey of the state of the art of cancer—of where things stand today in treatment and in basic research—the panel urged and lame-duck Sen. Ralph Yarborough (D-Tex.) introduced legislation that calls for expenditures of no less than $400 million per year for research (double the present funding level) and for creation of a National Cancer Authority. The NCA, as envisioned, would be an independent agency, reporting directly to the White House, and would absorb the existing National Cancer Institute, taking it out of the National Institutes of Health.

The idea has merit; it also raises serious questions (SN: 12/19, p. 459). Conquering cancer is not as direct a project as flying to the moon; scientists do not know as much about the fundamental properties of a cell as they do about principles of flight. Furthermore, scientists outside of the cancer field argue, and even those within agree, that if the proposed cancer budget of $400 million and up were approved at the expense of funds for other areas of biomedical research, results could be devastating.

Nevertheless, there is among scientists, and laymen as well, a growing sense of urgency about conquering cancer. Although it is true that the picture in 1971 is better than it was in 1931, cancer cells still have the upper hand more often than not. In 1931, cancer was fatal to four of every five patients. Today, one of every three persons treated for cancer is cured; that is, he is alive and free of disease five years after diagnosis and treatment.

Clinically, the story of cancer at the present time can be broken into three chapters. First are the cancers that can be prevented. Though the precise mechanism by which cigarette smoking leads to lung cancer is unknown, the connection between the two is clear. Obviously, many lung cancers could be eliminated if cigarettes were too. Skin cancer—about 115,000 new cases are reported annually—is another largely preventable cancer in that its major cause is overexposure to direct sunlight. Similarly, certain so-called occupational cancers are now preventable because the chemical carcinogens that caused them have been identified and can be avoided. Here, for example, chemical industry workers who used to develop bladder cancer because of exposure to betanaphthylamine are now protected. Leukemias and thyroid cancers among radiation workers have also been wiped out because of strict regulations and use of radiation barriers.

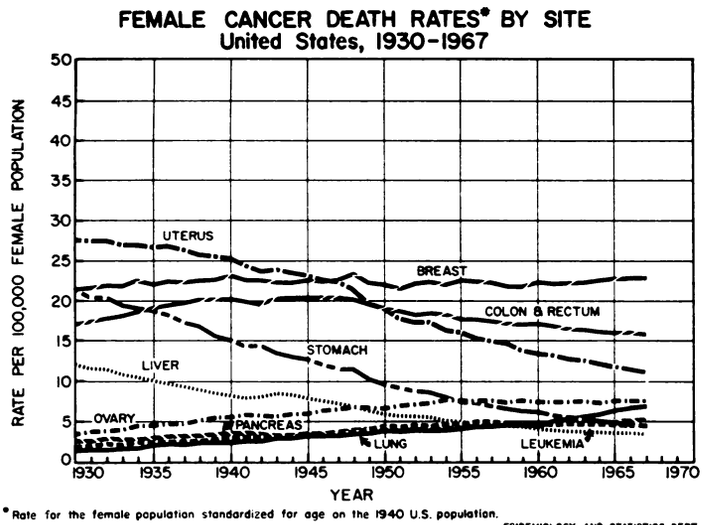
If cancer cannot be prevented, the next best thing is its early detection. Routine screening for cervical cancer in women by use of the Pap smear has made early detection possible and makes this type of cancer curable in about 90 percent of cases. With any type of cancer, the possibility of cure is greatest when the tumor cells are just beginning to grow in the body, before they have spread from their site of origin to invade nearby tissue, before they enter the blood or lymph systems to become essentially uncontrollable.

While a tumor remains localized, it can be treated by surgical removal of the malignant growth; by radiation, which destroys tumor cells by damaging DNA and, therefore, inhibiting cell replication, or by a combination of the two. With early diagnosis, cancers of the cervix, uterus, breast and other organs can be successfully treated by these means.

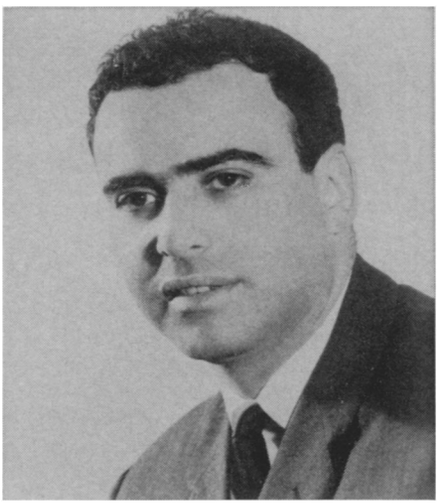
With the exception of the Pap smear and the X-ray, there are few screening tests for cancer that are efficient, simple and inexpensive enough for widespread use. There is, however, considerable interest in what, from preliminary evidence, appears to be a potential mass screen for cancer of the colon, the number two cancer killer among both men and women.

The test, developed by Dr. Phil Gold and his colleagues at the Montreal General Hospital, is based on an antibody-antigen reaction. It was first used experimentally in 1969 when Dr. Gold discovered that individuals with colon cancer also carry in their blood a fetal antigen called CEA—carcinoembryonic antigen (SN: 5/10/69, p. 457). The antigen is not present in healthy individuals and disappears from the blood of persons whose colon cancer has been treated effectively.

According to Dr. Gold, experience with the fetal antigen test in the last two years has been encouraging and evidence is being gathered from several institutions. However, some difficulties,



Despite an increased cure rate, deaths from many cancers hold steady; some, like lung cancer, are increasing.



Gold: Mass test for colonic cancer.

including problems of technique, remain to be solved before the test could be put into widespread use.

Other, similar tests, also based on immunological assay, may be developed for the detection of other cancers. A fetal antigen predictive of liver cancer has been found, as has a fetal antigen system associated with a variety of cancers including breast, lung and ovarian.

While early detection and surgical or radiological treatment have proved effective in handling certain solid, localized tumors, dealing with leukemia, and other cancers of the blood and lymph systems has proved more difficult.

According to Dr. C. Gordon Zubrod of the National Cancer Institute, sophisticated drug therapy now means that a leukemic child who would have died within months a few years ago can now be kept alive, and reasonably functional, for three to five years. But even so, he points out, such an extension of life is limited to those who are patients in large medical or university centers equipped with the newest drugs and scientists skilled in their use, and in no case can it be said to be a cure.

Through chemotherapy used to be considered a poor cousin to surgery and radiology as a cancer therapy, advances in recent years have emerged as scientists have learned more about the life cycles of various cancer cells. Approaching the problem of cancer from the standpoint of kinetics—the study of motion—investigators find that some cells divide more frequently than others and that use of a combination of drugs, each with special properties for attacking cells at various stages in the replicative cycle, can be effective in destroying cell (SN: 12/21/68, p. 626).

To date, drug therapy is about 75 percent effective in curing choriocarcinoma, a relatively rare cancer of the placenta, even if it has begun to spread. Combination drug therapy has raised the cure rate of Burkitt's lymphoma, frequently seen in children, from zero to 50 percent. Similarly, there has been progress in inducing long-term regressions in cases of Hodgkin's disease, in which the spleen, liver, lymph nodes and bone marrow can become affected, even in moderately advanced cases. But generally, as yet, chemotherapy is more a palliative than curative measure.

Although drug therapy has come to the forefront in the last decade, even more recently immunotherapy has emerged as a new frontier in cancer treatment. Dr. Robert A. Good of the University of Minnesota is among those who believe that many cancers grow only in the absence of a strong immune response to hold proliferating cells in check. "The seeds of cancer may be always with us," he says. "Every day we may develop some cancer cells, and every day we may reject them. Just as we reject foreign tissue—as long as the immune system is working at full capacity."

Among evidence supporting an association between the immune system and cancer are data accumulated by Dr. Thomas E. Starzl of the University of Colorado at Denver. Dr. Starzl, who has performed a considerable number of kidney transplants, finds an unusually high incidence of tumors developing in patients receiving immunosuppressive drugs, even though there was no prior indication that either the patient or the kidney donor had cancer (SN: 9/28/68, p. 319).

Thus, investigators are attempting to treat cancer by enhancing the patient's ability to mount an immune response. Bone marrow transplantation is among the most dramatic of these attempts (SN: 10/18/69, p. 358). In many patients with leukemia and other blood and lymph cancers, marrow cells, which produce the lymphocytes of the immune systems, are destroyed. By transplanting new marrow cells, scientists hope to reconstitute the immune system, which may then be able to fight cancer cells.

While there has been marked progress in treating cancer in recent years, and though new avenues of clinical approach, such as immunotherapy, have already been charted, the fact remains that the war against cancer is still far from won. Until the cancer process is understood at a fundamental level, until scientists can explain in molecular detail what happens to allow aberrant cell proliferation to occur, it is unlikely that cancer of any form will be routinely and thoroughly curable.

Hence, the call for $400 million a year or more to support basic research in carcinogensis. Should such funds become available, which is by no means certain, a number of areas of basic study, already under investigation will come in for more intense and widespread research. Among those the Senate panel cites for priority are:

- The association between immunity and cancer;
- The question of whether viruses cause human cancer (SN: 10/4/69, p. 308);
- Teminism, a theory that supports the viral carcinogenesis idea by showing that in some cases viral RNA can be used as a template for making DNA. This is important because many viruses known to induce tumors in animals have an RNA core (SN: 9/19, p. 243).

In any case, whether or not the United States decides to embark on an all-out anticancer attack in the style of the Apollo program, no one is willing to put a timetable on the endeavor. In preparing its report for the Senate, the panel of consultants for the conquest of cancer rejected a proposal that 1976 be set as a target date to coincide with the nation's bicentennial. The only view with which most investigators agree is that with more research, the answers will come sooner rather than later. □