

## On the trail of a human leukemia virus

Cancer scientists have little doubt that viruses cause, or at least turn on, cancers in animals. Whether viruses also cause, or turn on, cancers in humans is less certain. But the case, at least as far as human leukemia is concerned, is getting stronger.

Several groups of investigators now have ample biochemical and immunological evidence that human leukemia cells contain viral material that is identical, or close to, viral material that causes leukemia in animals. The researchers are Robert C. Gallo and George Todaro of the National Cancer Institute; M. G. Sarngadharan, Prem S. Sari and Marvin S. Reitz of the Bionetics Research Laboratory in Bethesda, Md.; and William Baxt, Rudiger Hehlmann and Sol Spiegelman of Columbia University.

The biochemical evidence centers around the reverse transcriptase enzyme. Howard Temin of the University of Wisconsin, David Baltimore of the Massachusetts Institute of Technology and other researchers have found that the normal transcription of DNA (the genetic material of cells and of some viruses) into RNA (a translator molecule) and then into proteins can be partially reversed by an enzyme dubbed reverse transcriptase. The enzyme has been found in various animal cancer tissues, in the milk from women whose families have a history of breast cancer, and in all the RNA viruses that cause cancers in animals. The RNA that the enzyme transcribes into DNA is an especially large RNA molecule, known as the 70S RNA molecule.

All RNA cancer viruses have a 70S molecule for their genetic material. So the hypothesis of cancer scientists—on the way to being confirmed, they hope—is that a reverse transcriptase enzyme from a cancer virus turns the virus' genetic material (a 70S RNA) into DNA. This DNA product is then incorporated into the DNA of the host cell. The incorporated viral DNA may lie dormant in the host cell, as a "provirus." Or the incorporated viral DNA may express itself partially or completely as new viruses. Or it may turn the host cell into a cancer cell.

Gallo, Sarngadharan, Sari and Reitz report in the Nov. 15 NATURE NEW BIOLOGY that they have found an enzyme in human leukemia cells that has all the known properties of animal cancer virus reverse transcriptase. The enzyme was taken from the cytoplasm of the cells, where it is usually found. When crudely isolated, the enzyme made DNA from RNA (presumably a viral 70S RNA) associated with it. When

the enzyme was purified, and put with 70S RNA that was foreign to it, it made DNA from this RNA.

In the same issue, Baxt, Hehlmann and Spiegelman report that they detected a reverse transcriptase enzyme in human leukemia cells. But they did not purify the enzyme because they knew Gallo and his colleagues were doing that. Instead, they induced the enzyme to make DNA from a 70S RNA associated with it. Then they hybridized (crossed) this DNA with 70S RNA from mouse leukemia virus. The DNA product would not cross with RNA from normal human white blood cells. This evidence suggests that the enzyme is part of, or at least closely associated with, a leukemia virus, and has no relationship with RNA from nonleukemic, that is, normal white blood cells.

Gallo and Todaro have also found, but not yet published, an immunological relationship between the reverse transcriptase enzyme in human leukemia cells and a reverse transcriptase enzyme found in the monkey C-type RNA virus (it causes cancer in the monkey similar to leukemia).

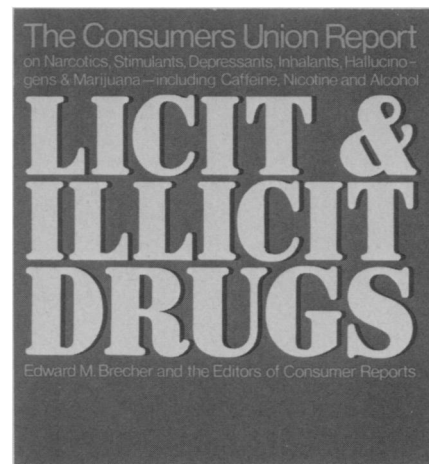
Gallo told SCIENCE NEWS that the next steps are to get more immunological evidence linking the human leukemia enzyme and animal cancer viruses and to see whether injection of leukemia cell material from which the reverse transcriptase enzyme has been isolated might make animals cancerous. Short of infecting human subjects, such evidence would constitute the best proof that human leukemia cells contain a virus that can cause leukemia in animals and presumably in man as well. Then comes the challenge with therapeutic implications: trying to interfere with a virus that has never been seen but, like the abominable snowman, leaves footprints to indicate its presence. □

## The Consumers Union on licit and illicit drugs

Every Sunday afternoon during a football time-out some helmeted gladiator is seen crushing an opposing quarterback. The not-so-gentle giant then gets up and says, "Hi, I'm Sam Tuff. I play rough, and that's the way I'd like to crack down on drug traffic."

In another one-minute television spot the dead bodies of young drug users are flashed across the screen. A catchy jingle, to the tune of "Ten Little Indians," identifies each body with a particular form of drug abuse.

These are typical of the anti-drug commercials that are part of an on-going \$400 million Federal drug fight that uses scare tactics and emphasizes strict law enforcement. But the effort



to frighten people away from illicit drugs has publicized and thus popularized the drugs attacked, says Consumers Union in a report published this week.

*Licit and Illicit Drugs* (see p. 360), by Edward M. Brecher and the editors of the highly respected CONSUMER REPORTS, is an exhaustive study that has been five years in preparation. In 70 chapters the report gives historical perspective and up-to-date research findings on each of the classes of drugs in its subtitle: "narcotics, stimulants, depressants, inhalants, hallucinogens and marijuana—including caffeine, nicotine and alcohol." The report's central theme is the physicians' maxim: *Nihil nocere*. It means that a physician must guard against doing more harm than good. Some particular anti-drug prescriptions are warned against:

- Stop emphasizing measures designed to keep drugs away from people. Prohibition, the report says, pushes prices and crime rates up. It causes users to change from relatively bland, bulky substances to readily smugglable, more hazardous concentrates.

- Stop publicizing the horrors of the "drug menace." Sensationalist publicity, the report claims, is ineffective and counterproductive. Glue sniffing is a prime example. Almost no one had heard of the practice in 1959 when a Denver Post headline proclaimed "some glues are dangerous—heavy inhalation can cause anemia or brain damage." Within 26 months the Denver Juvenile Court was averaging 30 cases a month of glue sniffing. The publicity and the problem spread across the country.

- Stop increasing the damage done by drugs. Current drug laws, the report finds, make drugs more rather than less dangerous. For instance, the sale or possession of hypodermic needles without prescription is a criminal offense. This policy leads to non-sterile needles, the sharing of needles and then to epidemics of hepatitis and other needle-borne diseases. The report even suggests that the establishment of methadone maintenance pro-

grams for heroin addicts is resisted and delayed "in part because some people want heroin addiction to lead to disaster—as a deterrent to others."

- Stop misclassifying drugs. Illogical and capricious classification of drugs destroys credibility. The report calls for distinctions between more hazardous and less hazardous drugs instead of between licit and illicit drugs.

- Stop pursuing the goal of stamping out illicit drug use. Efforts to stamp out one drug shift users to another.

Once these harmful tactics are stopped, a variety of others must be put to use. The report recommends, for example, that the heroin black market be abolished by making methadone, opium, morphine and heroin maintenance programs available under medical auspices on a carefully planned, experimental basis. The report also calls for a total ban on all alcohol and cigarette advertising. LSD, it says, should be objectively evaluated as a therapy for alcoholism and as a palliative for terminal cancer.

Marijuana, the report decides, is here to stay. It recommends the repeal of all Federal laws governing the growing, processing, transportation, sale, possession and use of marijuana. All those serving prison terms for possession or sharing of the drug should be set free. A national commission should be established to help the states monitor production and distribution of marijuana. Taxes on the drug should be kept moderate and used for research on minimizing the danger of drugs.

With the publication of this report, Consumers Union joins the growing ranks of establishment-oriented institutions that have come out against the present, nonscientific handling of the drug problem. The report's conclusions and recommendations are stronger than but similar to those of the President's Commission on Marijuana and Drug Abuse (SN: 3/25/72, p. 197) and the National Institute of Mental Health (SN: 2/19/72, p. 117).

The last time Consumers Union came out with such an extensive report was in 1963 when the Report on Smoking and the Public Interest was published. That report had a significant impact on public attitudes toward smoking and was used by the Surgeon General's Advisory Committee on Smoking and Health in drafting its 1964 report. Whether the Administration will stick to its present punitive drug policy or will again listen to the conclusions of the Consumers Union will probably be seen next month when Jerome H. Jaffe, director of the President's Special Action Office for Drug Abuse, makes his next strategy statement. □

## The impending fall of the science-budget ax

Watchers of the science-and-government scene in Washington are warning of an impending fall of the budgetary ax on funds for the Federal support of research and development. All the signs seem to point to the inevitability of Administration-ordered cutbacks on agency expenditures in the current fiscal year, and science funds will be particularly vulnerable.

All this will be depressing news for a research community that had earlier been given hope that the rocky period of recent years for Federal financial support was over.

Responsible for the dire forecasts are the major Federal budget deficits for the past three years (the highest since World War II), the need to counteract inflationary pressures in the economy, President Nixon's oft-stated pre-election pledge to forego any further tax increases, and then, of course, that particular susceptibility of science.

Research and development is funded almost entirely out of that portion of the budget called "discretionary." The major part of the budget is tied up in nonreducible funds such as social security and veterans payments, interest on the national debt, etc. So when the need to cut spending arises, R&D funds are among those examined first.

Agencies are learning the hard way that there is nothing sacred about money already appropriated by Congress. Under the Anti-Deficiency Act of 1870, Government agencies must apply to what is now the Office of Management and Budget for permission to spend the money Congress has appropriated. The President can release the funds as he sees fit.

When the directives to hold down current expenditures will go out is not known for sure, but few seem to doubt that the crunch can be avoided for more than the next month or so. Veteran science-policy watcher Howard J. Lewis, in an article entitled "On Budgetary Axes and Damocletian Swords" in the just-published November issue of *sppsg*, the monthly newsletter of the Science and Public Policy Studies Group, headquartered at Massachusetts Institute of Technology, says the guidelines cannot be expected before Dec. 15 at the earliest.

He notes that in the eyes of OMB science is a second-order not a first-order problem and that the Government is showing less and less favor with science for science's sake in comparison with research that shows tangible results. He provides this summation of OMB's point of view: "We can't keep everybody in high-energy physics who

wants to be and not every university can be in the top half. Our task now is to tap our resources rather than to develop new ones. At the same time, we want to make sure that all the really first-rate people are supported, but perhaps not with all the instruments they feel they need."

The message, he and other observers feel, is that research administrators and individual scientists had better get prepared to get along with less money than they had expected this fiscal year. And they shouldn't get up any big hopes for the next fiscal year either. □

## ... Will the ax fall on the Jupiter-Saturn mission?

Every year about this time space scientists get sweaty palms and administrators get nervously quiet as rumors begin to fly about possible further cuts to the NASA budget as well as general cuts across the board in Federal support of science. Last year one rumor was that the Grand Tour—a proposal enthusiastically supported by President Nixon in 1970 (SN: 3/14/70, p. 264) to send spacecraft to Jupiter, Saturn, Neptune, Uranus and Pluto—would be a victim (SN: 10/9/71, p. 246). The Grand Tour was indeed cut from the NASA budget (SN: 1/29/72, p. 71).

In place of the Grand Tour, NASA proposed a less expensive project (and, according to NASA, one more scientifically appealing)—the mini-tour or Mariner Jupiter-Saturn flyby (SN: 3/4/72, p. 152). Spacecraft would be launched in 1977 to fly by Jupiter and use the gravitational force of that planet to propel it on by Saturn three and a half years after launch. Now the rumors are that this project may be in trouble, even though NASA has spent study funds on both the Grand Tour and the Jupiter-Saturn flyby for several years and regards the project as an important scientific investment.

Already this year, spending limitations caused by Federal outlay problems in many areas of government have hit NASA, as well as other agencies. NASA had to find \$200 million to cut in the planned expenditures for this fiscal year. Of the total, \$35 million was cut from space science. The High Energy Astronomical Observatory (HEAO) scheduled to be launched in 1975 was slipped 9 to 12 months. Other smaller programs were cut or postponed.

The money crunch is not unique to NASA, although its budget is half what it was during the peak of the Apollo program. Nor are the cuts unique to space sciences. "Nothing is sacred in the NASA budget," quipped one Government official. "This makes it extremely difficult to run a program." □