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, Sarngadharn, 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).

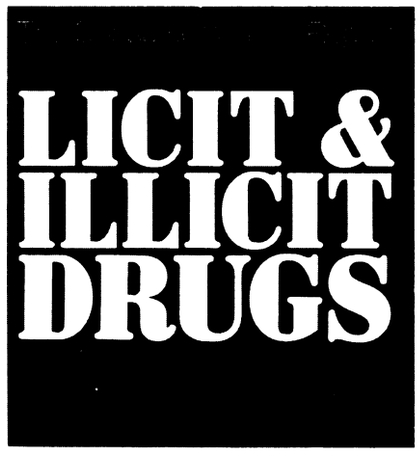
Gallo told SCIENCE NEWS that the next steps are to get more immunological evidence linking the human leukemia enzyme and animal cancer viruses and to see whether injection of leukemia cell material from which the reverse transcriptase enzyme has been isolated might make animals cancerous. Short of infecting 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 nonsterile 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-