

Reverse transcriptase: Act II

Some 15 months ago, Howard Temin of the University of Wisconsin and David Baltimore of the Massachusetts Institute of Technology independently discovered that tumor viruses contain an unusual enzyme, reverse transcriptase. Subsequent experiments suggested the enzyme might possibly be used to transfer genetic information from the RNA tumor virus into the DNA of the host animal cell, and thus alter the host cell's replication (SN: 9/19/70, p. 243). Whether this is really what happens, however, was far from certain.

Nonetheless progress is being made in elucidating the action of reverse transcriptase. In the Sept. 29 NATURE NEW BIOLOGY, Baltimore and his colleagues report that reverse transcriptase requires an RNA primer to initiate synthesis of a DNA chain. They describe a series of experiments that prove that the enzyme initiates DNA synthesis by adding a deoxynucleotide to the three prime hydroxyl group of the primer.

The thrust of this work, then, is that reverse transcriptase, like DNA polymerase, requires a primer for synthesis of DNA. Furthermore this primer has been shown to be RNA. Thus an early intermediate in the DNA synthesis is a hybrid DNA-RNA molecule.

Exercise and mental state

Since some studies have suggested that physical activity can trigger anxiety by infusing lactate into the blood, William Morgan and John Roberts of the University of Missouri and Adrian Feinerman of the Medical and Surgical Clinic in Peoria, Ill., studied the psychiatric effects of treadmill walking and bike riding.

Their first experiment showed that subjects exerting 150 and 160 heartbeats a minute on a bike had higher depression scores than treadmill walkers raising somewhat fewer heartbeats a minute, they report in the September ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION. In a second, treadmill-only experiment, subjects evoked considerably less than 150 heartbeats a minute and experienced no more anxiety or depression than controls. These results, the authors say, do not support the popular belief that acute physical activity improves psychological state.

High birth weight and leukemia

Statistical studies linking diseases with possible causes can prove misleading. Nonetheless recent epidemiological studies titillatingly suggest that animals that eat less are less prone to cancer (SN: 8/14/71, p. 108) and that the more the animal or man weighs, the greater his susceptibility to cancer. Now E. Fasal, E. W. Jackson and M. R. Klauber of the State of California Department of Public Health in Berkeley, have found that high birth weight is significantly associated with increased risk of leukemia mortality for children, especially for females and for children of higher social class.

Children dying from leukemia are also known often to come from families with a history of diabetes. It is attractive to hypothesize, they say, in the September JOURNAL OF THE NATIONAL CANCER INSTITUTE, that diabetes and childhood leukemia may have a predisposing factor in common that is inherited and is expressed also by an increase in body size.

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Life out of a primordial oil slick?

Many laboratory experiments have shown that in a primordial reducing earth atmosphere devoid of free oxygen, amino acids and a variety of other building blocks could have been synthesized in electrical discharges. Methane and nitrogen would be the major components of such an atmosphere.

Using this model, Antonio C. Lasaga and H. D. Holland of Princeton University and Michael J. Dwyer of the University of Pennsylvania propose in the Oct. 1 SCIENCE that solar ultraviolet radiation would have polymerized a methane atmosphere—caused the molecules to combine into heavier hydrocarbon molecules—in geologically short periods of time. They suggest that this process rapidly resulted in the accumulation on the oceans of an oil slick one to ten meters thick.

Such an oil slick might have been of considerable importance in the development of life on earth, they speculate. The rich hydrocarbon layer would have acted as a host for prebiotic compounds, allowing them to be exposed to solar ultraviolet light and to lightning discharges. They call for careful evaluation of the possible effects of an oil slick on the chemistry of the prebiologic and earliest biologic periods.

Similar polymerization reactions are surely in progress on the major planets, they believe, but probably do not result in oil slicks because of the high temperatures and excess hydrogen present.

UV camera to the moon

Astronomers envision one day setting up an observatory on the moon, unhindered by the earth's atmosphere and the earth's bow shock. Although cameras in satellites orbit above the atmosphere, they are still inside the earth's bow shock and magnetosheath (created by the interaction of the solar wind with the earth's magnetic field) which emits an intense glow in ultraviolet light and thus hinders observations of UV emissions from space.

Apollo 16 astronauts will take a miniature observatory to the moon in March of 1972—an ultraviolet camera to photograph UV wavelengths from 500 to 1,400 angstroms. The camera will photograph the bow shock and magnetosheath and the geocorona, an extension of the earth's upper atmosphere.

It will also be focused on some 10,000 celestial objects. George Carruthers of the Naval Research Laboratory and Thornton Page of the Manned Spacecraft Center are in charge of the camera.

Service stations in space

Chemical and nuclear reusable shuttles of the future will ferry supplies from earth orbit to geosynchronous and lunar orbits. They will need refueling and servicing, however, and the National Aeronautics and Space Administration thinks that service stations are feasible. NASA has awarded a one-year, \$325,000 contract to the space division of North American Rockwell to study how the stations will be used and operated. NAR will examine how best to transport one million gallons of liquid oxygen and hydrogen to earth orbit, transfer it to the orbiting propellant depot, and then transfer it to the orbit-to-orbit shuttles.

249