BIOMEDICINE

Mouse leukemia virus: Not one, many

Scientists are coming closer to understanding at least one way viruses can cause cells to become cancerous. In mice harmless viruses that have become part of the genetic blueprint,"proviruses," may exchange genetic material and acquire the know-how to make blood cells leukemic. Moreover, proviruses that are potential gene swappers may number in the hundreds. Instead of one or a few viruses being responsible for leukemia, as was once commonly thought, leukemia viruses may be almost innumerable.

Richard A. Lerner and his colleagues at Scripps Clinic and Research Foundation in La Jolla, Calif., as well as several other research groups, have been studying a strain of mice called AKR that is especially susceptible to cancer. Lerner reported at the recent annual meeting of the Federation of American Societies for Experimental Biology in Atlantic City, N.J., that so far "hundreds" of the proviruses, consisting of a core of ribonucleic acid (RNA) surrounded by a protective protein "overcoat," have been identified in this strain.

A certain glycoprotein, a compound consisting of a protein and a carbohydrate found in the overcoat, determines what kind of cells the virus can infect. Lerner and his colleagues isolated this type of glycoprotein from viruses of normal and leukemic cells. With enzymes, they snipped each glycoprotein into smaller units (polypeptides). They then separated the charged polypeptides with an electrical current (electrophoresis) to determine the "fingerprints" of the different viruses. Each virus has its own characteristic fingerprints.

Comparing the fingerprints of viruses from normal cells with those from tumor cells, Lerner found that a tumor virus had a fingerprint that was a hybrid of the fingerprints of two of the proviruses. This suggests that two harmless proviruses can combine to form a harmful tumor virus. Moreover, the incriminating fingerprints were different for each type of tumor virus studied. This could mean that every individual case of mouse leukemia is caused by a slightly different virus.

Whether the finding will prove applicable to human cancer is uncertain. There is still no evidence that humans harbor proviruses that can be recombined into cancer viruses, Lerner said.

Virus spurs rheumatoid factor output

The Epstein-Barr virus is implicated in several diseases of the immune system. It is found in patients with a cancer of the immune system, Burkitt's lymphoma, and is also associated with a common plague of youth: infectious mononucleosis, a non-malignant infection of the lymph glands, integral parts of the immune defense system.

Laura Slaughter and her colleagues at the Scripps Clinic and Research Foundation in La Jolla, Calif., are using the virus to probe yet another disorder of the immune system—rheumatoid arthritis (RA). In rheumatoid arthritis, an autoimmune disease, the immune system attacks the body's own tissue. Lymphocytes (cells that form antibodies) from patients with RA produce an antibody called Immunoglobulin M-Rheumatoid Factor (IgM-RF). In patients with RA, lymphocytes lodge in the joints and start producing large quantities of IgM-RF.

Slaughter told SCIENCE NEWS that normal lymphocytes exposed in a test tube to Epstein-Barr virus increased their production of IgM-RF from 1 or 2 percent to form 7 percent of the antibody. The virus also caused lymphocytes from persons with RA to increase production of IgM-RF, which was already very high.

Slaughter is planning to study how the virus "turns on" the lymphocytes and why some people may be susceptible to the virus while others apparently are not.

PHYSICAL SCIENCES

Dietrick E. Thomsen reports from the meeting in Washington of the American Physical Society

Uncertain currents in particle physics

Physical theory makes predictions that become questions for experiment. Sometimes experiment gives unexpected answers. The usual completion of this empirical dialectic is an altered theoretical formulation.

It has frequently been neutrinos that have given unexpected answers. Now, at the CERN laboratory in Geneva, they seem to have done it again. Neutrinos are intimately concerned in the doings of the weak interaction, which is one of the four classes of force that physicists recognize in nature. The weak interaction is of particular interest nowadays because of a new theoretical formulation that combines it and electromagnetism (another of the four classes of force) in what a lot of physicists hope will become a truly unified field theory and unite all the forces of nature into a single description.

When subatomic particles interact with each other under the influence of the weak interaction, they may, in the course of their activity, exchange a unit of electric charge (charged-current interaction) or they may not (neutral-current interaction). The older theory of the weak interaction allows only the neutral-current interactions; the new theory requires both kinds and prescribes the ratio of the two.

It hasn't been coming out right in studies of neutrino-electron collisions in CERN's Gargamelle bubble chamber. Clara Matteuzzi of CERN's Gargamelle Group reported that the experiment saw 10 such events of the neutral-current kind where it should have seen two. The result is being widely discussed, and Matteuzzi ("reopens the issue of the interpretation of the neutral current phenomena") is one of many who have suggested a need for theoretical revision.

Unusual cosmic rays

Most of the atomic nuclei found among the cosmic rays are made by nuclear fusion processes inside stars and then thrown out into the interstellar medium by stellar explosions such as supernovas. Such is the most popular current theory of their origin, at any rate. But for a few light nuclei an origin during the flight of the cosmic rays is posited. These, especially beryllium, which should not be able to exist for long at the temperature of a star's interior, result from the breakup of heavier cosmic ray nuclei when the heavier nuclei strike hydrogen nuclei as they fly through space.

Theory leads to the expectation that the ratio of the isotopes beryllium 7 and beryllium 9 should be about three to one. This is in fact observed at low energies, but a recent observation by a team led by Luis Alvarez of the Lawrence Berkeley Laboratory and including Charles Orth, Andrew Buffington and Terry Mast, shows that at high energy the amounts of the two beryllium isotopes become about the same.

So something seems to be getting rid of beryllium 7. There is in fact an easy way to get rid of beryllium 7, which accounts for its relative rarity on earth, but which ought not to happen in space. Namely, a beryllium 7 nucleus will very easily pick up an electron from those that happen to be orbiting around it. The capture of the electron converts a proton to a neutron and turns the beryllium 7 into lithium 7.

But in space the cosmic ray particles are bare nuclei. They have no orbiting electrons, and the high-energy ones are going too fast to pick up electrons that happen to be floating around in space. Yet, says Buffington, "the high-energy beryllium 7 has picked up electrons somewhere, and has done so more often the faster it goes." One possible solution is that supernova explosions, as they send out the high-energy streams of nuclei, send out parallel streams of high-energy electrons, and from these the beryllium 7 pick up its electrons.