medical sciences

Lysozymes and calcification

During the past 50 years lysozymes—huge proteins—have been found in tissues from plants, animals and humans. The physiological roles of lysozymes are being slowly unraveled. Lysozymes released by macrophages have immunological activity. Lysozymes released by white blood cells may contribute to rheumatoid arthritis (SN: 9/16/72, p. 181). Lysozymes can make cancer cells stop growing in culture. In the December ARCHIVES OF PATHOLOGY, Reuben Eisenstein and his team at the University of Illinois College of Medicine report that lysozymes are also involved in the calcification of cartilage.

Experiments with rats showed that vitamin D deficiency reduced both lysozymes in cartilage and the laying down of calcium in the cartilage, Vitamin D injections increased the lysozymes and calcification. They concluded that the lysozymes contributed, in a yet unidentified manner, to this calcification. Their experiments also showed that calcification of the aorta of the heart included the laying down of calcium, followed by an accumulation of phosphate, mucopolysaccharides and lysozymes in the aorta.

The molecular basis of memory

Short-term memory is known to take place in 10 milliseconds to a few hours, long-term memory in minutes to hours. Their molecular basis is obscure. In the November PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, Edward M. Kosower of the University of Tel Aviv, Israel, rallies available evidence to support his theories of short-term and long-term memory.

Disulfide bonds on the presynaptic end of a nerve fiber are known to accumulate vesicles that release nerve chemicals that are in turn received by the postsynaptic end of the adjoining nerve fiber. The Israeli chemist hypothesizes that disulfide bonds constitute short-term memory. They form fast enough to fill the bill, he attests. Since nerve chemicals are known to make the postsynaptic ends of nerve fibers bigger, he also theorizes that these chemicals can enlarge presynaptic ends. Enlarged presynaptic ends, he argues, might constitute long-term memory, because they would enhance communication between nerve cells and represent a stable information store.

Immunologic response to blood transfusion

Three to six weeks after transfusion blood recipients may develop atypical lymphocytes in response to viral contaminants in the blood. In the Dec. 7 NEW ENGLAND JOURNAL OF MEDICINE, Geraldine P. Schechter and her hematology colleagues at the Veterans Administration Hospital in Washington report they found atypical lymphocytes in blood recipients only a week after transfusion. They believe these lymphocytes were responding to white blood cells, platelets or other factors in the donor blood. The lymphocytes returned to normal several weeks later.

This finding, Schechter and her colleagues state, is relevant to blood transfusion therapy. It appears that giving even a small amount of blood to a recipient causes a definite immunologic stimulation. Such a stimulation could be particularly risky for a patient about to undergo an organ, skin or bone marrow transplant.

astronomy

A second optical pulsar

Several dozen radio pulsars are known, but in spite of many searches only one of these, the Crab nebula pulsar, has been seen to emit pulsed radiation in the visible-light portion of the spectrum. A number of X-ray pulsars have been discovered by the X-ray astronomy satellite Uhuru. These are somewhat more complicated phenomena than the radio pulsars. In addition to rapid pulses like those of the radio pulsars, the X-ray signals show long-period pulses that appear to be the effect of eclipses like those of a binary star system, and astronomers tend to believe that X-ray pulsars are members of binary systems.

In the Nov. 1 ASTROPHYSICAL JOURNAL LETTERS (just received) one of these X-ray pulsars, Hercules X-1 is identified with the visible star HZ Herculis by Arthur Davidsen, J. Patrick Henry, John Middleditch and Harding E. Smith of the University of California at Berkeley. The group reports that they recorded optical pulses from HZ Herculis at a frequency of 1.2379 ± 0.0002 seconds, identical to the period of the X-ray pulses. HZ Herculis thus becomes the second known optical pulsar.

The members of Hercules X-1

Optical observations by William Forman, Christine A. Jones and William Liller of the Harvard College Observatory confirm the identification of Hercules X-1 with the star HZ Herculis and lead to a suggestion of the nature of its members. In the Nov. 1 ASTROPHYSICAL JOURNAL LETTERS the Harvard group suggests that the X-ray source is on the surface of a condensed object, perhaps a neutron star, revolving around an A- or F-type subgiant. Tidal effects of the collapsed object on the subgiant can explain some peculiarities of the optical radiation. The two bodies would be as close to each other as they could be without having one of them disrupted by the gravity of the other.

Astrochemistry of carbon and hydrogen

The radical CH is one of the common molecules found in the interstellar gas clouds. It appears in both the electrically neutral form and in the ionized form CH^+. A question for astrochemists is: What are the chemical reactions that produce it?

In the Nov. 1 ASTROPHYSICAL JOURNAL LETTERS two scientists from the Goddard Space Flight Center in Greenbelt, Md., Theodore P. Stechen and David A. Williams, suggest that reactions between carbon ions (C^+) and hydrogen molecules (H_2) are the source. Normally such reactions are endothermic, requiring heat from the outside to make them go. By analogy with chemically similar systems, Stecher and Williams argue that they can become exothermic (supplying heat to the outside) when vibration of the hydrogen molecule has been excited, and when the energy of the vibration exceeds the amount of heat that would normally have to be added. The reactions would proceed at high rates when such vibrational energy was present.

Stecher and Williams remark that ultraviolet light in the spectral range of the so-called Werner and Lyman bands excites hydrogen molecules vibrationally. Since such light is present in interstellar space, the reactions could thus take place and supply the CH.