

MEDICINE

Sewing on severed limbs

One area of surgery that the Chinese appear to be pursuing with great intensity is the replantation of severed hands, arms and legs. Forty attempts at replantations over an eight-year period are reported in the latest (July) CHINESE MEDICAL JOURNAL by a team of traumatologists and orthopedists at Peking Chishueit'an Hospital. Twenty-seven of their efforts were successful, 13 were not.

Replantation success, the team reports, was higher in clean-cut injury than where amputation was caused by twisting or crushing. The average time of ischemia (lack of oxygen and blood sugar) was seven hours and 15 minutes in the case of completely severed limbs. It was nine hours and 30 minutes in nearly severed limbs. "Precise information is still lacking about the time limit of ischemia tolerable to the tissues," they say. However, "the time limit in a severed thigh is shorter than in the lower forearm because there are more muscles in the thigh which are less tolerant of ischemia."

Successful replantation, they continue, is highest with a severed wrist, next with a severed palm, next with a severed arm, forearm and finally the leg. Different levels of success have much to do with the number of blood vessels and the caliber of blood vessels that need to be reconnected.

Among the 27 cases of successful replantation, 20 had satisfactory or near-satisfactory recovery of both sensory and motor functions. Loss of muscles or nerves and destruction of joints, the team admits, are not yet reversible by replantation.

Viral genes and autoimmune diseases

Genes from cancer viruses and from so-called slow viruses are known to integrate themselves into the genes of human cells. Last year V. M. Zhdanov of the D.I. Kvanovsky Institute in Moscow found that infectious disease viruses, such as measles, can also integrate their genes into the genes of human cells. Now Zhdanov reports in the Aug. 7 NATURE evidence suggesting that the incorporation of measles genes into genes of human cells may also trigger autoimmune diseases.

Systemic lupus erythematosus is a classic autoimmune disease. It consists of tissue inflammation that appears to arise from the victim's immune system attacking these tissues. However, patients with this disease have also been found to have a lot of antibodies to measles virus in their bodies, which suggests that a measles virus may also be a culprit in the disease. Now Zhdanov has found that many of the nucleotide sequences of measles virus genes can be found in the genes of such patients, but not in the genes of other people.

So he theorizes that a measles virus initially triggers lupus by integrating its genes into the genes of a victim's cells. The viral genes make proteins, and the proteins incorporate themselves into the membranes of the victim's cells. These foreign proteins on the surface of cells make the victim's immune system think that the cells are foreign. Hence they attack the cells, and the autoimmune aspect of lupus gets underway.

Music to deliver by

Music by Mozart is being used in the women's clinic of Halmstad Hospital in Sweden to assist expectant mothers through natural childbirth. For months prior to delivery, each of the women practices relaxation exercises to a recording of a Mozart C-Major piano concerto, and as soon as her contractions begin, the music is turned on.

According to a report in AMERICAN FAMILY PHYSICIAN, the death rate of newborns at Halmstad is far below that in other hospitals.

PHYSICAL SCIENCES

Null verdict on gravity waves

In June of 1969, Joseph Weber, a professor of physics at the University of Maryland, announced that he had recorded evidence of the existence of gravitational waves. Predicted by Einstein's general relativity, gravitational waves would be energy-carrying waves in space, generated by gravitational forces in a manner analogous to the way electromagnetic forces generate light and radio waves. They would be important to astronomers because they would bring information about gravitational processes in astronomical bodies.

At the time confirmation was quickly expected, but the years have dragged by with only negative reports from anybody but Weber. The latest null result is from D. H. Douglass and R. Q. Gram of the University of Rochester, J. A. Tyson of Bell Laboratories and R. W. Lee of Stanford University. It was a search for coincident bursts of radiation recorded by detectors at Rochester and at Holmdel, N.J. This particular experiment is regarded as especially significant by some physicists in the field because of its detectors' reputation for sensitivity.

The four observers report in the Aug. 25 PHYSICAL REVIEW LETTERS that they find fewer than one event per day at a wavelength of 710 hertz with a flux (strength) of 20 million ergs per square centimeter per hertz. It does not disprove the existence of the waves; it seems to indicate a need for greater sensitivity. Sensitivity and data interpretation are two topics that are vigorously and even acrimoniously debated, but out of all the smoke and fire, the general expectation is that someday gravitational waves will be unequivocally pinned down.

A fly in the laser-fusion ointment

Theoretically the way to make thermonuclear fusion with laser light goes like this: The light heats the outer surface of a pellet ("microballoon") of fuel. The surface is vaporized and ablates. The ablation causes shock waves and reaction forces that compress the interior of the pellet until a density is reached where large numbers of fusions happen.

Some time ago KMS Fusion of Ann Arbor, Mich., reported experiments in which they claimed fusions had taken place and cited certain neutron fluxes as evidence. Now two theorists from the Los Alamos Scientific Laboratory, G. S. Fraley and R. J. Mason, have taken the data from those experiments and done computer simulations of what seems to have happened. They come up with a caution for laser fusioners.

They report in the Aug. 25 PHYSICAL REVIEW LETTERS that low-energy photons produced in the neighborhood of the ablation surface are preheating the parts that do the pushing, "thereby severely limiting the compression achieved. . . ." This could raise the energy requirements for breakeven (getting as much energy out of fusion as is expended in laser light) 8- to 27-fold unless something is done. A thing that might help, they suggest, is making the outer part of the microballoon out of a light element, specifically beryllium.

Heavy ions in the radiation belts

The orbit of Skylab was such that its cosmic ray detectors should not have been able to record fairly low-energy heavy ions originating outside the magnetosphere. Therefore, J. H. Chan and P. B. Price of the University of California at Berkeley report in the Aug. 25 PHYSICAL REVIEW LETTERS, they were surprised to find a high density of tracks from nuclei of atomic number greater than eight. The elemental composition is similar to that of the solar corona, and the two observers suggest that heavy ions from the solar wind enter the earth's magnetosphere, are accelerated there and populate the inner radiation belt.