BIOMEDICINE

Neurons more in touch with the world

Until recently, it appeared that all neurons in the brain fire spontaneously, that is, in the absence of sensory or motor stimulation. Such evidence suggested that the brain processes information by extracting signals from the background noise of such spontaneous firing.

A large group of neurons that are silent unless provoked by specific stimuli has now been discovered in the brainstem by Jerome M. Siegel and Dennis J. McGinty of the University of California at Los Angeles.

Their findings, reported in the July 16 SCIENCE, suggest that the going theory about brain processing of information may have to be revised. It now appears more likely that the brain processes information from those neurons that don't fire unless provoked by sensory or motor events.

Early diagnosis for multiple sclerosis

When the lymphocytes of multiple sclerosis patients are put in the test tube with cells infected with measles virus, they stick together in a large rosette pattern much more frequently than do lymphocytes from healthy persons, Nelson L. Levy and his team at Duke University have found. This immune test may eventually be used to detect multiple sclerosis in a much earlier stage than is now possible with a physical examination, the researchers believe.

Cancer virus and the cell cycle

To understand the mechanisms of cancer, cancer virologists are pushing techniques to the limits to see how cancer viruses do their dirty work in host cells. The transcription of one DNA cancer virus's genes after integration into the DNA of a host cell depends on the host cell cycle, Claudio Basilico and Dimitris Zouzias of New York University School of Medicine have found.

A monkey DNA cancer virus (SV40) was known to integrate its DNA into the host cell, then to make a protein required for the transformation of the cell into a cancer cell. Basilico and Zouzias wanted to look for regulatory mechanisms that might possibly control viral protein synthesis in the host cell. They studied the antigen and the viral RNA that transcribed it in cells whose early growth phase before DNA synthesis and cell division, the so-called G1 phase, had been arrested.

When the cells are arrested in this phase, the viral antigen can no longer be detected, they report in the June PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES. Also, there is very little viral RNA in the cells. So it looks as if transcription of the virus's DNA into its protein depends on the growth cycle of the host cell.

Selenium and the human diet

Although selenium is one of the rarer elements on earth, it has become obvious since 1957 that traces of it are essential to the diet of some 40 animal species. Selenium is known to make up different proteins and two muscle enzymes, and it appears to work with vitamin E. Showing that traces of selenium are essential to the human diet, however, has been tough.

Now evidence that traces of this element are essential for the growth of human lung cells in culture is reported in the June PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES by Wallace L. McKeehan, W. Gregory Hamilton and Richard G. Ham of the University of Colorado. This is probably the most direct evidence yet that selenium is an essential human nutrient.

PHYSICAL SCIENCES

A supernova in the solar system?

Certain meteorites, especially the Allende meteorite, show samples of xenon that have an unusual enrichment of heavy isotopes compared to xenon found elsewhere. This unusual xenon has been dubbed component X and has been claimed as evidence of the decay of ultraheavy elements that once were present in the meteorites (SN: 1/13/76, p. 4).

Now two chemists, D. D. Sabu of Grambling State University in Grambling, La., and O. K. Manuel of the University of Missouri at Rolla propose an alternate interpretation in the July 1 NATURE. They have studied the distribution of xenon isotopes on the earth and the sun as well as in meteorites. They find that component X is also present in the sun and the earth.

They propose that the source of component X was a supernova explosion near the solar system. This would be consistent with the observation that bodies from farther out (meteorites) contain more of it than inner ones. They expect that the outer planets will be found relatively enriched in component X. In the light of all this they conclude "that our sun was very likely once the smaller member of a binary star system. A supernova explosion of the other member produced debris rich in component X [and certain isotopes of other elements]."

Lifetimes of excited nuclear states

The lifetimes of excited energy states in atomic nuclei have a direct relationship to the details of structure of the nuclei in which the states occur. Information derived from the study of lifetimes is used by nuclear physicists to check the assumptions of theory about such structures. A group of nine physicists from the Chalk River Nuclear Laboratories of Atomic Energy of Canada Limited and the University of Toronto (J. C. Hardy et al. in the July 19 PHYSICAL REVIEW LETTERS) have developed a way to measure shorter lifetimes than previously possible.

In time past, a wide range of times down to 10^{-15} seconds could be measured by a number of techniques. The new method, which goes to times on the order of 10^{-16} involves comparing proton and electron emission.

The method works for nuclei that capture one of their own orbiting electrons to form an excited state of a daughter nucleus. The electron capture causes a vacancy in the so-called K shell of the atom, and this will be filled by another electron dropping in and emitting an X-ray on the way. If the excited nuclear state decays by emitting a proton, comparison of the times of proton and X-ray emission can be used to find the lifetime of the nuclear state.

The experimenters have worked with gallium 65, arsenic 69, bromine 73 and rubidium 77. In the current report they present details of the experiment involving arsenic 65.

Globular-cluster X-ray pulses

X-ray astronomers have discovered a number of globular clusters of stars that emit bursts of X-rays from time to time. Some of the bursts come at periodic intervals, others not. Many astrophysicists attribute the X-rays to a disk of matter falling into a massive black hole.

Now J. N. Bahcall and J. P. Ostriker of the Institute of Advanced Studies in Princeton, N.J., suggest a mechanism that might account for the characteristics of the bursts, especially timing. In the July 1 NATURE they propose that massive stars bound to the black hole and orbiting through the disk of accreting matter may trigger the pulses. The pulses could come from a hot shock generated as the star crashes through the accretion disk or from ripples in the disk proceeding away from the shock.