Zinc: Moderator in brain cell chatter?

Scientists have had few clues as to why there are high concentrations of zinc in some areas of the brain, but new findings suggest a broad regulatory role for the metal that could have implications for understanding learning mechanisms and treating certain brain disorders. Zinc apparently helps control chemical communication between brain cells by modifying nerve cell receptors to different chemical messages, called neurotransmitters, say researchers at Stanford (Calif.) Medical School. The metal can either block certain receptors or enhance the activity of others, thus influencing how neurotransmitter chemicals affect a neuron, according to a report in the May 1 SCIENCE.

Using cultured mouse brain cells and microelectrodes, Dennis Choi, Steve Peters and Jae-Young Koh recorded the amount of intracellular electric current, which is used as a measurement of neurotransmitter action. They perfused the cell cultures with a variety of substances, particularly those chemicals known to affect the cells' surface receptors for the neurotransmitter glutamate. Neurons have three different types of glutamate receptor on their surface, and data from the Stanford group show that zinc helps control which type binds the neurotransmitter.

Perhaps most important is the metal's influence on the so-called N-methyl-D-aspartate (NMDA) receptor, which is blocked when increased levels of zinc are released into the synapse, or space between nerve cells. The NMDA receptors have been proposed as docking places for chemical mediators of learning and, when overactive, for brain substances that cause seizures as well as nerve cell death like that seen in Huntington's disease. Based on their research, the authors suggest that zinc may suppress overstimulation of these receptors, thereby protecting the brain from injury.

Yeast or human, this gene's the same

In a discovery that could influence laboratory research on human cell growth, scientists in London have cloned human genetic material they say is essentially the same as a gene in yeast that controls cell reproduction. The gene, called *cdc2* in the yeast *Schizosaccharomyces pombe*, is important in regulating the microorganism's cell cycle, and its counterpart in humans may play a similar role, say Melanie G. Lee and Paul Nurse of the Cell Cycle Control Laboratory at the Imperial Cancer Research Fund facility.

By inserting segments from a "library" of human DNA into yeast cells lacking active *cdc2* genes, the researchers isolated human genetic material that could substitute for *cdc2* and initiate cell division in the *cdc2*-deficient yeast cells. Lee and Nurse report in the May 7 NATURE that the human gene has been sequenced, and its structure is very similar to that of the *cdc2* gene. The authors say the *S. pombe* system can be used for isolating other genes that resemble those found in the yeast.

Replacing viruses in gene therapy

Transplanting bone marrow cells infected with gene-carrying viruses is an established method of introducing specific genetic material into an animal, but this approach to gene therapy also has its problems. The viruses may become activated and harm the host, or expression of the gene may not occur. An alternative, say researchers at Massachusetts General Hospital in Boston, is cloned cells derived from others into which genes were inserted without using viruses. In the May 8 SCIENCE, the scientists report that the method, which they call "transkaryotic implantation," circumvents some drawbacks with more established techniques, but they add that transplant usefulness is affected by the implant's location, size and compatibility with the recipient.

When looking sheepish counts as smarts

What would happen if you met a sheep face-to-face in a dark alley, or a darkened room? More important, which area of the sheep's brain would respond? A British study, in which sheep were hung in slings in darkened rooms before a projector screen, tested the responses in the animals' brains to pictures of both friendly and menacing faces of a variety of species.

Scientists at the AFRC Institute of Animal Physiology and Genetics Research in Cambridge took counting sheep a step beyond the usual: They measured the electrical impulses given off by different areas of sheeps' brains when exposed to different visual stimuli. During a study reported in the April 24 SCIENCE, the scientists recorded reponses from 561 types of cells throughout the brain, of which 40 responded consistently to pictures of faces. Previous studies with monkeys had shown that some brain cells respond specifically to faces of certain species, and to specific faces or facial expressions.

How cells in sheep brains respond is affected by the face shown, say the scientists, who divided the responding cells into categories based on their reactions to different types of faces. For example, certain cells (called the predominant type) responded most to pictures of other sheep with large horns, while the "familiar" cell types responded to pictures of sheep that were known to the study subjects. Other cells reacted when the sheep were shown pictures of dogs, pigs and men. Pictures of bodies that did not show the faces elicited no significant neuronal response. Neither, say the scientists, did upside-down faces, unlike the monkey study. Does this mean that, rather than wearing that hot-and-itchy sheep's clothing, the marauding wolf should have stood on his head instead?

Tolerance by process of elimination?

Exactly how the immune system recognizes substances from outside the body as foreign is a mystery immunologists would like to solve. Scientists have hypothesized that groups of T cells potentially capable of reacting with substances in the body are either eliminated early in their development or prevented in some way from becoming activated after maturation.

Recent evidence from scientists at the University of Colorado Health Sciences Center and the National Jewish Center for Immunology and Respiratory Medicine in Denver supports the clonal elimination theory, according to two reports in the April 24 CELL. Using monoclonal antibodies, the researchers measured T cell concentrations of surface receptors for a protein crucial in antigen recognition processes. They found that T cells with the receptor are selectively removed from the body's T cell pool early, in a process that may take place while the lymphocytes are maturing in the thymus.

More field tests given preliminary okay

Outdoor testing of genetically altered bacteria that increase the nitrogen available for use by alfalfa plants received preliminary approval from the Environmental Protection Agency (EPA) last week. A final decision on the field tests, scheduled for Pepin County, Wis., will be made in July, following a public comment period. The tests would be the first under the EPA's Toxic Substances Control Act, part of the agency's new biotechnology policy. According to the act, companies must tell EPA about plans to make or import a new chemical substance, a category that includes altered microorganisms.

Given enhanced nitrogen-fixing capability through recombinant DNA techniques, the *Rhizobium meliloti* bacterial strains approved by the EPA are owned by BioTechnica International, Inc., of Cambridge, Mass. Similar field tests in California—using a bacterium that retards frost formation — were approved by the EPA under a system predating the toxic substances act, and are in progress (SN: 5/2/87, p.277).