Biology

From our reporter at the annual meeting of the Federation of American Societies for Experimental Biology in Atlantic City

Subway stress and fertility

People who are dissatisfied with available methods of birth control might try standing in the subway. Arthur M. Sackler and colleagues at the Research Institute of the Brooklyn College of Pharmacy have found that the stress of subway noises can impair testes function in male rats and fertility in female rats.

Sackler and his co-workers exposed male rats twice daily on weekdays for one hour to simulated subway train noises during 53 weeks. As a result, the males experienced decreased body weights, enlarged adrenal glands and decreased testes weights. Then the investigators exposed male and female rats twice daily on weekdays to subway train noises for four weeks and for 21 days after mating. Only 2 of the 16 stressed females conceived, yielding an average litter size of three pups. In contrast 8 of 16 control females were fertile with an average litter size of 7.1 pups at birth.

Cocaine and the nervous system

Ever since "Cocaine Bill and Morphine Sue walked down the avenue two by two" (as the song says), hard drug users have considered cocaine one of the ultimate trips. It is a powerful central nervous system stimulant with a relatively short duration, and is capable of producing euphoric excitement and hallucinatory effects at high doses. But exactly how cocaine acts on the central nervous system has been unclear.

Masaji Matsuzaki of the New York State Drug Abuse Control Commission in Brooklyn has explored the effects of cocaine on the central nervous system by comparing the effects of cocaine, and of a similar, noneuphoria-producing compound, pseudococaine, on the electrical activities of the brains of rhesus monkeys.

He reports that cocaine produced an excitatory effect on spontaneous EEG activities and behavior, while pseudococaine produced an inhibitory effect on these activities. Cocaine had an inhibitory effect on hippocampal and amygdaloid seizure discharges evoked by electrical stimulation, while pseudococaine failed to show a similar effect on these activities.

Proteins as gene regulators

In cells of higher organisms, the genes (DNA) are arranged in chromosomes (complexes of DNA and chromosomal proteins). Investigators have suspected that certain proteins in chromosomes might help regulate gene expression. Now evidence reported by Heiko Sakuma and his team at the University of Texas and at the M. D. Anderson Hospital and Tumor Institute suggests that this is the case.

The proteins that serve as gene regulators appear to be nonhistone proteins that the Houston team has dubbed the "NP fraction." Histone proteins in chromosomes had already been ruled out as gene regulators.

First Sakuma and his colleagues developed a scheme for fractionating out nonhistone proteins from chromosomes. Then they zeroed in on those proteins that interested them—the NP fraction. The proteins in this fraction constitute about three percent of total chromosome protein content. They found that these proteins bind to DNA of the same kinds of cells, but not to DNA of other kinds of cells. This was their first evidence that the proteins might work as gene regulators.

They next discovered that the proteins regulate gene transcription in the test tube, something other nonhistone proteins from chromosomes can't do. This was further evidence that the proteins of interest serve as gene regulators.

Finally the investigators studied the influence of cell transformation (cancer) on the proteins. Cancer altered them, further verifying that the proteins serve as gene regulators.

Why blood clots

When blood platelets are exposed to collagen, a major protein component of blood vessel walls, the platelets clump together to form platelet clots. Thomas M. Chiang and Andrew H. Kang of the Veterans Administration Hospital in Memphis have studied the mechanism whereby platelets clump together upon contact with collagen.

They have found that the platelets, upon exposure to collagen, rapidly accumulate cyclic GMP—a cousin of the intracellular messenger cyclic AMP. Collagen causes this accumulation by stimulating the enzyme that makes cyclic GMP. Previous studies have shown that collagen causes a diminution in the platelet content of cyclic AMP by interfering with the enzyme that makes it. These observations together suggest that collagen leads to platelet clumping by altering the balance between cyclic AMP and cyclic GMP within the platelet cell.

Nerves and axoplasmic transport

The electrical activity of nerve cells is well known. But nerve cells also possess another crucial property. This is axoplasmic transport—the synthesis of proteins in the nerve cell body and their movement down the axon of the cell toward the synapse. These proteins help keep the cell in tip-top shape. Deficiencies in their transport could easily provoke dystrophies, senility and perhaps mental illnesses.

William O. McClure and Doris J. Schlichter, biochemists at the University of Illinois, studied the way axoplasmic transport works. They have found that the proteins are carried as lipoprotein aggregates, and the properties of the aggregates are similar to those of membranes. Thus axoplasmic transport may well be a membrane-related phenomenon.

Embryonic and cancer cells

Embryonic and cancer cells are known to share a number of properties—rapid growth, antigens, invasion of host tissue without immunologic rejection. Now it appears that they may also share abnormalities in those enzymes that help make transfer RNA's. Transfer RNA's are some of the RNA molecules that help produce proteins.

Several investigators have reported that the enzymes that help make transfer RNA's—the methyltransferases—have increased activity in cancer cells. Now Ethel Ashworth-Tsutsui and her biochemistry colleagues at Texas A&M University have found that the same enzymes are also engaged in increased activity in embryo cells.

Abnormal methyltransferase activity would be expected to lead to changes in transfer RNA structure and in turn to alter protein synthesis. Exactly how such activity might fit into embryonic or cancer development remains to be seen.