Life Sciences Notes

CELL BIOLOGY

Anesthetic Intoxicates Cells

Pentobarbital, a commonly used sedative and anesthetic, virtually puts cells to sleep. The drug inhibits nucleic acid synthesis in cells, according to Dr. Renato Baserga of Temple University School of Medicine, Philadelphia.

Dr. Baserga, in experiments on mice, found that pentobarbital, even in low doses, inhibits the incorporation of thymine into DNA. Thymine is one of the eight molecular bases of nucleic acids. Inhibition of DNA synthesis by this anesthetic occurs in both animal and test-tube experiments, he says.

However, Dr. Baserga says, "at the moment it does not seem that there is any correlation between the anesthetic action of pentobarbital and the inhibition of nucleic acid synthesis." And, because the cell intoxication wears off rapidly, there appears to be no danger in temporarily putting human cells to sleep.

Although pentobarbital is widely used, scientists know very little about its mechanism of action. Studies on its inhibitory behavior may uncover other specific ways in which it works.

It may also be possible to use this drug in studies of cell metabolism by synchronizing cell behavior—putting some cells to sleep and then waking them up to be in phase with other cells.

If cells could be made to do the same thing at the same time, it would be much easier to study their activity, Dr. Baserga explains.

BIOCHEMISTRY

New Disease Described

A previously unrecognized disease and its biochemical origins have been identified by scientists at the National Institutes of Health, Bethesda, Md.

Called sulfite oxidase deficiency, it has been diagnosed in only one patient—a two-year-old boy who died last year. Because this boy had three siblings who died within a month of their births, doctors suspect the disease may be hereditary like other metabolic disorders including PKU or phenylketonuria.

However, they are not certain of this fact. Nor do they know how widespread the enzymatic deficiency may be.

The disease, characterized by severe mental retardation, dislocated eye lenses, and early death, occurs when cells in human tissues are unable to carry out normal metabolic activity. Sulfite oxidase is a catalytic enzyme necessary for the conversion of sulfite to sulfate, most of which is excreted in urine. The patient excreted practically no sulfate at all, indicating a breakdown in one of the steps by which sulfur-containing amino acids are normally changed to inorganic sulfate.

Abnormal quantities of sulfite compounds gave away the fact that sulfite was not being converted and that the sulfite oxidase enzyme had lost its catalyzing ability.

The exact nature of the defect is not yet understood, but scientists suspect some structural abnormality in the part of the enzyme that has catalytic properties. Drs. Leonard Laster, Filadelfo Irreverre, S. Harvey Mudd and William D. Heizer conducted the study.

BIOCHEMISTRY

Enzyme Deficiency in Fabry's Disease

Fabry's disease attacks the heart, kidneys, central nervous system, skin and eyes. Its victims, primarily men, usually die in their twenties.

One source of this rare hereditary disease has been identified by scientists at the National Institutes of Health, Bethesda, Md., who discovered an enzymatic deficiency that prevents these patients from normally disposing of aged red blood cell membranes. Lipids or fats in the membranes, therefore accumulate in body tissues.

The lipid material, called ceramidetrihexoside, should be metabolized or digested by an enzyme known as ceramidetrihexosidase.

In patients with Fabry's disease who show less than one percent of normal activity of ceramidetrihexosidase, the deficient enzyme is unable to metabolize the lipid. Death usually results from excess accumulations in the kidneys.

The abnormal gene behind the deficiency is sex linked; that is, it is linked genetically to the X or sex chromosome and is transmitted by mothers to their male children. Occasionally, however, women carriers may have mild disease symptoms involving the skin and eyes, but are less likely to develop serious complications. When they do it is late in life.

The research was reported by Dr. Roscoe O. Brady.

ENDOCRINOLOGY

Thyroid Hormone Lowers Calcium

From the thyroid glands of pigs, scientists have isolated a hormone that shows promise in treating certain presently incurable forms of bone disease.

The hormone, called thyrocalcitonin, prevents the loss of calcium from bones into the blood and may eventually be useful therapy in cases of osteoporosis—rapid bone destruction in older persons. Although widespread use of the hormone, which appears to be a small protein, is several years away, it has been tested successfully on humans in England and France. Injections of thyrocalcitonin caused a marked reduction in the amount of calcium in the blood.

Blood calcium often rises drastically in cases of medical emergency, such as accidents, and when the thyroid gland becomes overactive.

Thyrocalcitonin, present in human as well as animal thyroids, was first discovered three years ago in British Columbia. This year, after two and a half years of effort, pure isolates of the hormone were extracted from pigs by Dr. Charles D. Hawker and his colleagues at the University of Pennsylvania. Its secretion from the thyroid gland normally operates by a feedback system regulated by the amount of calcium in the blood.

When blood calcium is high, the thyroid is stimulated to secrete thyrocalcitonin, and then shuts off when the calcium level drops.