News
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***Dr. John Porter studies aging and dopamine production.

DALLAS--Most hormone research in the past was done with young people and young animals. But Dr. John Porter is interested in what happens to the secretion of dopamine with aging.

"It's no accident that most animal research is done on the young," says Porter, professor of Obstetrics-Gynecology and Physiology in the Cecil H. and Ida Green Center for Reproductive Biology Sciences at The University of Texas Health Science Center at Dallas. "Aging research is expensive. You have to keep animals a long time -- until they are aged. For a rat, that's two or three years. A three-year-old rat is senile, and the number of rats in a colony still alive at two years is greatly reduced."

With more interest now on the aging process, the researcher is studying what happens to the aged rat's secretion of dopamine, a hormone that carries messages throughout the nervous system to ensure coordinated movements of the muscles. Dopamine may also be involved in thought processes, and it is known to affect the pituitary gland by suppressing the secretion of prolactin.

Prolactin is a hormone that stimulates milk production. Porter has found that prolactin also stimulates the secretion of dopamine in the brain of rats. So, at least in the young rat, dopamine and prolactin form a self-regulating cycle. In old rats, this regulation is lost or weakened.

The word "hormone" comes from the Greek word that means "to stir up" or "to excite." In the classical definition, hormones are secreted by endocrine glands, such as the ovary or the putuitary gland. They are carried by the blood stream to other tissues where they produce an effect.

Neurons (certain nerve cells) secrete neurotransmitters. A molecule of a chemical such as dopamine is secreted by one cell. It interacts with the next cell, stimulating or inhibiting secretion, and so on throughout the nervous system. "So the neuron is the ultimate reduction of the endocrine gland," says Porter.

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As people age, their production of dopamine decreases. Even in relatively young people, a dopamine deficiency results in Parkinson's disease, one of the most crippling of the central nervous system disorders. Many elderly people eventually develop symptoms of Parkinson's disease such as tremor, muscle stiffness, slowness of movement or impaired balance.

Porter is using the rat model to study the decline of dopamine production with aging and the effects of drugs on dopamine secretion.

He and his group have measured the secretion of dopamine by neurons in the hypothalamus, a small gland in the brain that controls the body's autonomic (involuntary) function. They have found that the secretion decreases with age. But they do not yet know whether the decreased production is due to the cells' loss of ability to secrete the hormone, the death of secreting cells or both.

The secreting neurons have cell bodies that lie in the hypothalamus with their axonal endings feeding the dopamine into the capillaries that lead into the portal vessels to the pituitary gland. By tapping into these portal vessels, the researchers obtain the highest concentration of dopamine in the blood supply. "At this time these are the only neurons in the brain in which true secretion of a neurotransmitter can be measured," says Porter.

He has narrowed the problem of decreased dopamine production to one specific reaction in the neuron cell body. In this cell, tyrosine is changed into L-Dopa, which is then changed into dopamine. (Tyrosine is an amino acid obtained from dietary protein.) Giving an aged animal L-Dopa increases the production of dopamine, but giving tyrosine does not. Since both the enzyme tyrosine hydroxylase and the co-factor tetrahydrobiopterin are necessary for the conversion of tyrosine into L-Dopa, a deficiency in the enzyme or the co-factor or both may be the cause of reduced dopamine secretion.

This work by Porter and his group increases the possibility of treating nervous disorders with the specific biochemical the body is lacking.

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