News
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***Dr. Ayalla Barnea finds changes in secretion of peptide hormones in the brain with aging

DALLAS--Peptide hormones are known to affect memory and learning in animals and in humans. These peptides, produced in the brain, may also regulate important biological activities of the brain.

"They may affect how we learn, how we think, how we remember, how we perceive pain, how we adjust to cold," says Dr. Ayalla Barnea, associate 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. "If we know how these peptides are produced and secreted, we may understand some processes regulating brain function and know what to do when something goes wrong."

In rats, alpha-melanocyte stimulating hormone (a-MSH) and adrenocorticotropic hormone (ACTH) may have "profound effects" on memory and learning. These brain functions are known to deteriorate markedly in aging animals and humans. Therefore, Barnea and her co-workers want to learn whether the aging process is associated with a decline in the amounts of ACTH and a-MSH produced by the brain.

ACTH and a-MSH are derived from pro-opiocortin, which looks like the "granddaddy" hormone of several other peptide hormones when charted family-tree style. Pro-opiocortin consists basically of a chain of amino acids, and the order of the amino acids is unchanged from "generation to generation."

A molecule of pro-opiocortin is literally broken into pieces that form new hormones, which in turn are broken down again and again until there are three or four generations of peptide hormones, each of which affects the body in a different way.

The important peptide hormones derived from pro-opiocortin are ACTH and beta-endorphin. Beta-endorphin has recently been touted as the body's own anesthetic and is also important in memory and learning. ACTH is further chopped into a-MSH.

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Using radioimmunoassay techniques, Barnea has measured the content of a-MSH, ACTH and their precursors in the rat hypothalamus and thalamus at different ages. She has found that although the concentrations of these peptides are lower in old rats than in young ones, the various derivatives of pro-opiocortin accumulate in these regions of the brain in the same proportion, regardless of age. (Another derivative of pro-opiocortin, beta-endorphin, has been reported by other researchers in the brain of old rats at half the concentration found in young ones.)

Based on her studies, she theorizes that the cause of the decreased levels of a-MSH and ACTH in the brain of aging animals is a decrease in the supply of the "raw material" pro-opiocortin.

Surprisingly, not all peptide hormones are produced in smaller quantities in the aged brain.

Barnea and others have found no decrease in the concentration of some peptide hormones in the hypothalamus of aging female rats. She believes, therefore, that aging has a specific effect on neurons that produce pro-opiocortin and that aging thereby affects the production of ACTH, a-MSH and beta-endorphin. "It is tempting to speculate that the changes in these neurons are related to the altered function of the brain of the aged," says Barnea.

People today are worried about deterioration of brain function with aging. "The life-span is longer. We are confronted with health problems that we didn't see before," she says. "If a biochemical process is faulty in the aged, it could eventually be corrected if we had knowledge of how this process operates in the young, healthy person. If we didn't know the biosynthetic process for dopamine, we couldn't treat Parkinson's disease. In the biosynthesis of peptide hormones, we just have to start from scratch and see what is related."

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