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Your brain and hormones may conspire to make you fat

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Why do some people get fat even when they eat relatively little? What creates that irresistible urge for a bag of potato chips or a hunk of chocolate cake, as opposed to a nice crisp apple? Can food urges be irresistible?

Physiologists are unraveling the role that your hormones and brain play in urging you to eat more than you should. Some people's hormones may be signaling their brains to send messages like "Eat a lot now," and "Go for the fat and sugar."

Four physiologists will clarify the latest research on the brain's role in obesity, during the symposium, "Obesity and the Central Nervous System." The symposium will take place at the 120th annual meeting of The American Physiological Society (APS), which coincides with Experimental Biology 2007.

The body has a physiological predisposition to balance its energy needs with its desire for food. The hormones and brain communicate to determine when an individual is full, with the brain issuing the signal that says "Stop eating" with the help of information it receives from hormones. But prolonged food shortages, chronic stress, prenatal nutrition, early exercise patterns and other factors can affect how the brain orchestrates this balance. In places where food is scarce, the brain may encourage higher consumption, especially of high fat and sugary foods, even when the food supply becomes more abundant. That's an adaptive response that helps the body weather periods of food shortages.

But the brain may also respond to stress in the same way, encouraging the intake of high fat and sugary foods – comfort foods - that can result in obesity that is nearly impossible to reverse.

“Why some of us get fat and what we can do it about it,” is the question Barry E. Levin, M.D., a professor at the New Jersey Medical School of the University of Medicine and Dentistry of New Jersey and of the Veterans Affairs Medical Center, East Orange, N.J., will address.

The hormones leptin and insulin inhibit the development of obesity when consumption of fat and calories increases. Some people respond very well to these hormones and they don’t gain weight during these bouts of overeating. But others are less responsive to leptin and insulin, which makes them more at risk to become obese. Why? It appears that the brain can be programmed to accept a higher body weight by early-life factors, including the environment of the womb in late pregnancy and the individual’s activity level in early life. These early factors may alter development of brain pathways which regulate energy homeostasis (balance). Once the tendency to obesity develops, it can be nearly impossible to reverse weight gains. However, these early factors can be manipulated to provide a more desirable outcome and may hold promise for prevention of obesity in human beings.

“Glucocorticoids and insulin both modulate caloric intake through actions on the brain,” is the topic for Mary F. Dallman, Ph.D., a professor at the University of California in San Francisco. Fat that develops in the abdomen to form a pot belly and thick waist has been associated with more negative health outcomes (heart disease, for example) than fat that accumulates in other areas of the body, such as the hips. Glucocorticoids, a group of steroid hormones that includes cortisol, activate a physiological process in the brain that matches the desire for food with physiological need. Under conditions of inadequate food or chronic stress, glucocorticoids prompt a craving for “comfort”

foods – foods high in sugar or fat. Glucocorticoids and insulin act to create abdominal fat. That's a good way to store energy during food shortages but it's also a way to gain too much abdominal fat when food is readily available.

Gregory Morton, Ph.D., assistant professor of medicine at Harborview Medical Center at the University of Washington, Seattle will give a talk entitled "Hypothalamic leptin regulation of energy homeostasis and glucose metabolism." Insulin and leptin are hormones that circulate in proportion to body fat stores. They interact with receptors in key areas of the brain, including in the hypothalamic arcuate nucleus, to regulate food intake and glucose metabolism. Morton and his colleagues have recently shown that leptin signaling selectively in this brain area is sufficient to reduce food intake and body weight and to improve insulin sensitivity. These findings indicate that leptin signaling in the arcuate nucleus is an important determinant of both energy homeostasis and glucose metabolism.

Source: American Physiological Society