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Yo-Yo Dieting Alters Genes Linked With Stress

Stressed-out mice with a history of dieting ate more high-fat foods than similarly stressed mice not previously on diets, according to a new study in the Dec. 1 issue of The Journal of Neuroscience. The findings suggest that moderate diets change how the brain responds to stress and may make crash dieters more susceptible to weight gain.

In this study, researchers at the University of Pennsylvania led by Tracy Bale, PhD, examined the behavior and hormone levels of mice on limited diets. After three weeks of fewer calories, the mice lost 10 to 15 percent of their body weight, similar to human diet weight loss.

One in every three Americans is now obese. “Yo-yo dieting” -- temporarily losing weight only to regain it, plus more -- is a well-known phenomenon. While previous studies show that mice on lifelong calorie-restricted diets live as much as 50 percent longer than their well-fed peers, little is known about the long-term consequences of quick-fix diets.

Bale and her colleagues found the mice had increased levels of the stress hormone corticosterone and displayed depression-like behavior. The authors also discovered that several genes important in regulating stress and eating had changed. Previous research shows that experiences can alter the form and structure of DNA, an effect known as epigenetics. Even after the mice were fed back to their normal weights, the epigenetic changes remained.

To investigate whether those molecular changes might affect future behavior, the researchers put the mice in stressful situations and monitored, how much fatty foods they ate? The previously restricted mice ate more high-fat food than normal mice.

“These results suggest that dieting not only increases stress, making successful dieting more difficult, but that it may actually ‘reprogram’ how the brain responds to future stress and emotional drives for food,” Bale said.

The findings illustrate the underlying mechanisms for why a piece of pizza is so appealing after a stressful day at work. The authors suggest that future weight loss drugs may target these stress-related molecules.

Jeffrey Zigman, MD, PhD, an expert in endocrinology, diabetes, and metabolism at the University of Texas Southwestern Medical Center who was unaffiliated with the study, said the conditions the mice experienced mimic the type of psychosocial stress that people often experience.

“This study highlights the difficult road that human dieters often travel to attain and maintain their weight loss goals,” Zigman said. “It also suggests that management of stress during dieting may be key to achieving those goals.”

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