

## Stress, emotional eating, and reproductive function

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Stressful situations may elicit either orexia or anorexia and modify energy expenditure, provoking either weight loss or gain depending on fuel availability and individual behavioral responses. To better understand mechanisms mediating stress-induced infertility, we developed a monkey model of social subordination that caused anovulation in association with altered food intake and preferences. When high-fat, high-sugar food was plentiful, subordinated female monkeys ate more than dominant female monkeys. To the extent that social subordination in monkeys and low socioeconomic status in humans represent parallel experiences, our monkey model explains in part why obesity tracks with low socioeconomic status in humans. In contrast, in monkeys, energy deficiency elicited by undernutrition combined with increased energy expenditure synergized with social stress to compromise ovulatory function. Similarly, in women, energy expenditure from exercise acutely amplified hypercortisolism more in those with functional hypothalamic amenorrhea/stress-induced amenorrhea (FHA/SIA) than in eumenorrheic, ovulatory women. While FHA reported attitudes such as perfectionism and high drive for thinness that curb eating, attitudes associated with overeating remain to be better characterized. We posit that obesity and stress are linked because of the neurobiologic reward of overeating partially constrains hypercortisolism. The reproductive consequences of energy deficiency and energy excess are distinct. Stressful circumstances may elicit either the constellation of undernutrition and functional, hypothalamic hypercortisolism, hypothyroidism, and hypogonadism or overnutrition. Sustained overnutrition causes obesity and, in those so prone, metabolic syndrome and secondary ovarian hyperandrogenism. Importantly, both undernutrition and overnutrition reflect behavioral responses to stressful conditions. Interventions to promote better fertility and maternal-fetal health must recognize the panoply of human adaptive responses, and their respective psychoneuroendocrine concomitants, in response to stressful conditions. Cognitive interventions that foster better coping mechanisms may foster fertility and better health in offspring.

Michopoulos V, Loucks T, Berga SL, Rivier J, Wilson ME. Increased ghrelin sensitivity and calorie consumption in subordinate monkeys is affected by short-term astressin B administration. *Endocrine* 2010;38:227.

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