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Effects of high-fat diet withdrawal on behavior and striatal opioid gene expression

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The central opioid systems play a critical role in certain aspects of food intake, particularly with regard to the rewarding impact of calorically dense food such as fat and sugar. The striatal opioid enkephalin may be a key component of this system. Infusions of mu opiate agonists into this region greatly increase feeding, while infusions of opiate antagonists decrease food intake. Only recently has enkephalin gene expression in relation to differing motivational states been explored. Recent evidence suggests that expression of striatal preproenkephalin mRNA responds to short-term food motivational states, but not to long-term metabolic responses such as diet restriction. The following study will expand on this and other findings by examining preproenkephalin expression patterns during another important motivational state: withdrawal from a high-fat diet. While it has previously been shown that preproenkephalin expression down regulates following intermittent exposure to a chronic high-fat liquid, the current study will examine the influence of withdrawal from a high-fat diet on preproenkephalin expression, while assessing the motivational state of the subject immediately prior to sacrifice. Rats will be placed in automated behavioral testing chambers and given 2.5 hr limited access to either a high-fat diet or chow for 14 consecutive days. On the 15th day, all rats will again be placed in the same chambers, yet half of the rats from each group will receive their respective diet, while the other half will receive no food (withdrawal state). During all days of the experiment, behavioral measures of both appetitive (approach and seeking), consummatory (amount eaten), and behavioral activity will be assessed. At the end of the 2.5 hr feeding session on the 15th day, all rats will be sacrificed and their brains will be prepared for analysis of preproenkephalin expression in the striatum and other feeding related regions.