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Central administration of palmitic acid increases food intake and body temperature in male Sprague Dawley rats

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Aims: Obesity is a major health problem linked to a number of diseases including type 2 diabetes. Diets containing high levels of the saturated fatty acid, palmitic acid (PA), promote the development of obesity, and associated inflammation of various tissues including the central nervous system (CNS). The CNS plays an important role in regulating energy balance, however the effect of PA on the regions of the brain involved in these functions is unclear. This study examined the metabolic and inflammatory effects of PA directly administered to the CNS of rats.

Methods: Twenty four Sprague Dawley rats were administered intracerebroventricular injections of PA (120 nmol, n=12) or vehicle (45% 2-hydroxypropyl β-cyclodextrin, n=12) for 3 consecutive days. Following PA treatment, food intake and body temperature of the animals was monitored. Body temperature was measured using a hand held RFID scanner to detect a temperature sensor microchip, implanted subcutaneously a week prior to commencement of the experiment. Plasma, brain, white adipose tissue, brown adipose tissue and liver were harvested for further analysis. Currently, levels of inflammatory and energy expenditure proteins are being examined using western blotting. Statistical significance between groups was determined using one and two way ANOVA and the post-hoc Turkey-HSD.

Results: Rats administered PA centrally showed significant increases in food intake and body temperature compared to vehicle injected rats. There was a significant increase in 1 hour food intake (+88%, p<0.05) and a smaller increase at 24 hours (+11%, p<0.10), following PA injection. PA also significantly increased heat generation, demonstrated by an increase in body temperature at 20 (+0.2 °C, p<0.01), 40 (+0.3 °C, p<0.05), and 60 minutes (+0.3 °C, p<0.05) after injection. Tissue analysis currently underway to further examine the central and peripheral effects of centrally administered PA.

Conclusions: PA acts on the CNS to increase food intake and body temperature in Sprague Dawley rats, consistent with its role in promoting obesity. The elevation of body temperature by PA may be related to the proinflammatory effect of this saturated fatty acid. Further research will help unravel the role of PA in CNS dysfunction during obesity, as well as downstream effects in the periphery.