

OBESITY

Cognitive function limited in obesity

Obesity impairs cognitive function and alters brain morphology prior to the development of metabolic disease, according to a new study in rats.

“While there is a detailed literature suggesting there are deficits in cognitive functions such as cognitive flexibility, learning and memory in patients with obesity who have metabolic diseases, such as those with the metabolic syndrome or type 2 diabetes mellitus, literature focusing on obese but otherwise healthy people is lacking,” explains author Miriam Bocarsly. “Recently, studies have emerged indicating that metabolically healthy people with obesity have cognitive deficits, as well as reduced volumes of certain brain regions, including those important in cognition.”

To investigate the effect of obesity without metabolic disease on cognitive function, the researchers fed rats either a palatable high-fat diet or standard chow for 8 weeks. Rats fed a high-fat diet became obese (defined as at least 25% greater body-weight than age-matched rats fed standard chow) and had increased plasma triglyceride levels, yet had a

normal insulin sensitivity index and showed no other signs of metabolic disease. Bocarsly and colleagues then assessed whether obesity impaired performance in behavioural tests that measured specific aspects of cognitive function; obese rats were worse than lean rats at tasks requiring the perirhinal cortex and the prefrontal cortex, which suggests that the function of these brain regions was adversely affected by obesity.

Next, the investigators assessed whether brain morphology was also affected in the obese rats, particularly in regions associated with cognitive function. The obese rats with cognitive deficits also had a decreased density of dendritic spines (the primary sites of excitatory synapses) and decreased expression of synaptic markers in the prefrontal and perirhinal cortices, indicative of a loss of synapses in these regions. “We also found changes in microglial morphology in the prefrontal cortex of obese rats,” says Bocarsly. “We were surprised to find no notable functional or structural abnormalities in the hippocampus, another brain region important for

cognition, further suggesting that the prefrontal and perirhinal cortices are particularly vulnerable in early stage obesity.”

Hugh Thomas

ORIGINAL ARTICLE Bocarsly, M. E. et al. Obesity diminishes synaptic markers, alters microglial morphology, and impairs cognitive function. *Proc. Natl Acad. Sci. USA* <http://dx.doi.org/10.1073/pnas.1511593112>

“
Obese rats were worse than lean rats at tasks requiring the perirhinal and prefrontal cortices”

