Obesity Induced by a High-Fat Diet is Associated with Markers of Neuroinflammation within the Orbitofrontal Cortex

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Background: A hallmark of obesity is systemic low-grade chronic inflammation mediated, in part, by activation of macrophages in adipose tissue. This leads to increased levels of inflammatory markers infiltrating the brain. The orbitofrontal cortex (OFC) is a region implicated in decision-making and cognitive control of feeding. Diet induced obesity can disrupt OFC neuronal activity leading to an impairment in the control over eating. However, it is unknown if neuroinflammation develops in the OFC in obesity to play a role in maladaptive eating behaviours.

Methods: Immunolabels S100B and IBA1 were used to quantify astrocyte and microglia number and fluorescent integrated density in the OFC of male mice fed a 0, 7 or 90 day high-fat diet (HFD). Cytokine changes in the OFC were quantified using a multiplex assay in obese and lean mice fed a 90 day HFD and low-fat diet (LFD) respectively.

Results: Mice fed a 90 day HFD had an increase in number and integrated fluorescent density of IBA+/- and S100B+ cells in the OFC, suggesting increased expression of microglia and astrocyte with diet exposure. In contrast, these effects were not seen in 0 and 7 days of HFD exposure, suggesting that glial cell changes develop at later stages of diet exposure. No differences were found in OFC cytokine expression between obese and lean mice.

Discussion: These findings enhance our understanding of the effects of diet and obesity on neuroinflammation in a brain region supporting cognitive control of eating and could highlight potential targets that may restore this function.

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