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MEETING ABSTRACT

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Different neuronal activation patterns in different amygdala nuclei after fasting and fear extinction

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Background: Anxiety disorders are the most frequent brain disorders imposing a significant burden to affected individuals, their families and the whole society. Dysregulation of fear, anxiety and related behavioral disturbances are hallmarks of anxiety disorders. On the other hand, eating disorders are emotional disorders linked to anxiety and depression. However, how feeding affects cognitive skills and anxiety- or fear-related processes is not known. To investigate this interaction and the underlying neuronal circuitries is the focus of this project.

Methods: Fear was investigated by Pavlovian fear conditioning, in which an initially neutral stimulus, such as a tone (CS), is repetitively paired with an unconditioned stimulus (foot shock, US). The resulting fear memory is characterized by increased freezing behavior to the CS. Importantly, repetitive exposure to the CS in the absence of a US, gradually reduces the acquired fear response, a phenomenon called fear extinction. To identify the involved neuronal ensembles, we accomplished immunohistochemistry against the immediate early gene c-Fos, a marker of neuronal activity. We analyzed changes in neuronal activation patterns in key brain areas of the fear circuitry between fasted and non-fasted animals, exposed to fear extinction or without conditioning.

Results: Interestingly, mice fasted during extinction learning displayed faster fear extinction than non-fasted controls, suggesting a direct relation between feeding and fear circuits in the brain. Fasting during the extinction process increased neuronal activation in the basolateral nucleus of the amygdala, a key structure of the fear response. In addition, we also detected changes in the central nucleus of the amygdala, a pivotal brain area for fear expression and in the paraventricular nucleus of the thalamus, a relay structure of sensory inputs.

Discussion: These experiments suggest several brain structures as possible interaction sites between feeding and fear circuits. We are now planning to manipulate neuronal ensembles in these brain areas to elucidate their role during feeding and fear-dependent challenges.

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