Predator Odor-Evoked BOLD Activation in the Awake Rat: Modulation by Oxytocin and V_{1a} Vasopressin Receptor Antagonists

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Introduction

Modulators of unconditioned fear are potential targets for developing treatments for anxiety disorders. Brain regions associated with unconditioned fear overlap to a certain degree with receptors for the neuropeptides oxytocin (OT) and vasopressin (AVP). Given the spatial distribution of the relevant neuroanatomy, we used functional MRI to investigate the role of OT and V_{1a} receptors in modulating odor evoked brain activity in the awake rat.

Experimental

We used blood oxygen level dependent (BOLD) MRI to investigate the pattern of brain activity during the presentation of a predator odor (cat fur) and a repulsive novel odor, butyric acid (BA), to awake rats. We further tested whether odor-evoked BOLD activation involved oxytocin (OT) and vasopressin V_{1a} receptors. Animals were subdivided into groups either administered an intracerebroventricular injection of artificial cerebrospinal fluid (CSF), an OT receptor antagonist or a V_{1a} antagonist (125 ng/10µL each) 90 minutes before studies.

Results and Discussion

BA odor evoked robust brain activation across olfactory, sensory, memory and limbic regions. The magnitude of BOLD activation across these regions was greater for BA than with cat fur. However, blockade of OT and V_{1a} receptors differentially modulated odor evoked neural activity, particularly in the amygdala. OT and V_{1a} antagonism preferentially modulated BOLD responding to BA in the cortical amygdala. While, OT and V_{1a} antagonisms preferentially modulated BOLD responding to cat fur in the central amygdala.

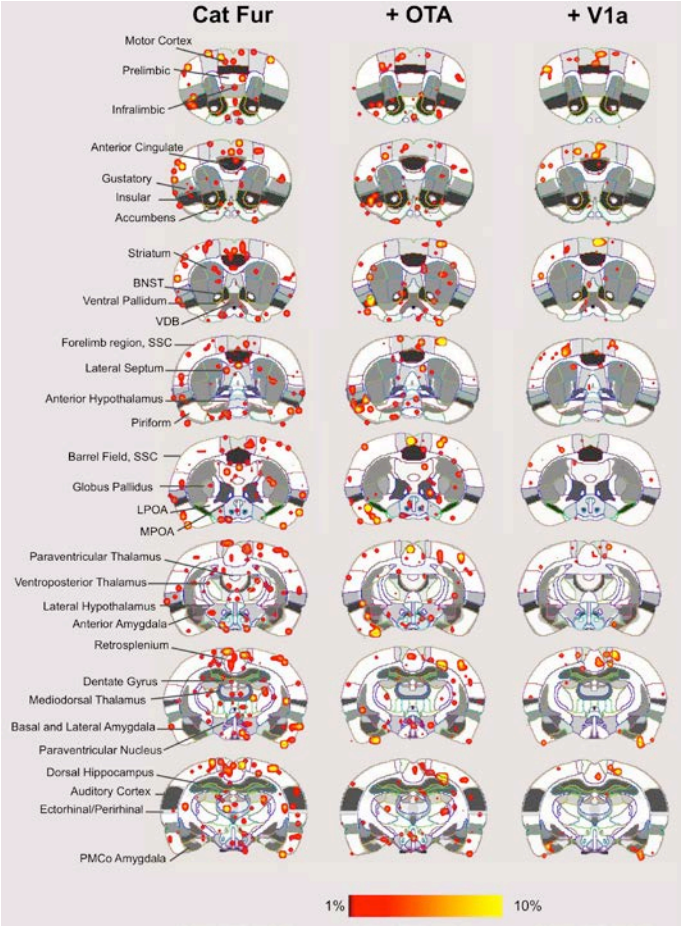

Figure Caption: Cat fur induced neural activity in the awake rat. Overlay coloring threshold is set between 1 and 10% signal changes.

Conclusions

Our fMRI data show that OT receptor blockade reduces BOLD activation in olfactory-related structures. V_{1a} receptor blockade exerted actions that were specific for cat fur odor and not BA. fMRI findings do show reduced BOLD activity that may underscore the role of this neuropeptide receptor within innate fear circuitry.

Acknowledgements

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References

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