Conditioned Stimulus Increases Cell Activity in Dorsal Medial Prefrontal GRADUATE CENTER Cortex Nima Patel¹, Rudolf Nisanov², Robert Ranaldi^{1,2} ¹ Department of Psychology, Queens College of the City University of New York, Queens, NY ² Graduate Center of the City University of New York, NY

Introduction

A previous experiment we conducted shows ...

> AMPA receptors in the dorsal region of the medial prefrontal cortex play a critical role in the expression of conditioned approach, a conditioned behavior in response to a light stimulus previously paired with a food pellet (the reward). The blockade of AMPA receptors in the dorsal medial prefrontal cortex (dmPFC) with the drug CNQX impaired the expression of a learned response.

> As a follow up experiment, in situ hybridization (RNAscope) was conducted to visualize and measure colocalization of AMPA receptors and cFOS (marker for active neurons) in the dmPFC.



TEST



. 10



Paired Rats:

Light would turn on and then food was dispersed. These rats were conditioned to poke for food when the light turned on and learned the behavior.



Dorsal medial prefrontal cortex of the brain was analyzed with the use of a confocal microscope

Figure 1. Performance comparison of the paired versus unpaired (random) rats. Paired rats performed significantly better than unpaired rats on test day since they learned the behavior and unpaired rats did not.

Paired Rats



Unpaired Rats



> Preliminary results reveal more CFOS and AMPA receptors in the paired rats than the unpaired rats. These results suggest that the conditioned stimulus has the capacity to elicit not only the behavioral changes, but neuronal changes as well.

> Moreover, there seems to be greater colocalization of AMPA receptors and CFOS in the paired rats than the unpaired rats.

> In the future, these images will be run through Cell Profiler to properly count the amount of CFOS and AMPA receptors present in unpaired versus paired rats and a finalized conclusion will be made.

Nisanov, Rudolf, et al. "CaMKII Antagonism in the Ventral Tegmental Area Impairs Acquisition of Conditioned Approach Learning in Rats." Neurobiology of Learning and Memory, vol. 175, 2020, p. 107299., doi:10.1016/j.nlm.2020.107299.



Conclusion and Future Directions

References



Figure 2. Close up of cells in the dorsal region of the medial prefrontal cortex. (A) Merged image of a paired rat where all cells can be seen: AMPA receptors (red), CFOS (green), and DAPI (teal). The DAPI is the nucleus of the cells. (**B**) Close up of the CFOS in paired rat. (C) Close up of AMPA receptors in paired rat.

Figure 3. Close up of cells in the dorsal region of the medial prefrontal cortex. (A) Merged image of an unpaired rat where all cells can be seen: AMPA receptors (red), CFOS (green), and DAPI (teal). The DAPI is the nucleus of the cells. (**B**) Close up of the CFOS in unpaired rat. (C) Close up of AMPA receptors in unpaired rat.