

Hypothalamic Orexin-A and Melanin-Concentrating Hormone Neurons Project to the Mouse Olfactory Bulb

Ellee Harden^{1,2}, Julia Won^{1,2}, Meizhu Qi^{1,2}, Dr. Leticia Leong^{1,2}, Dr. Douglas A. Storace^{1,2,3}

1. Department of Biological Science, Florida State University, Tallahassee, FL 32306
2. Program in Neuroscience, Florida State University, Tallahassee, FL 32306
3. Institute of Molecular Biophysics, Florida State University, Tallahassee, FL 32306



Introduction

The mechanism of sensory processing between the lateral hypothalamus (LH) and olfactory bulb (OB) has yet to be explored.

Orexin-A (OXA), a neuropeptide that regulates hunger, has been shown to project from the LH to the OB.

However, most OB signals do not originate from OXA-expressing neurons, suggesting input from other unknown neurons.

Melanin-concentrating hormone (MCH) is a neuropeptide, also found in the LH, that regulates appetite and energy levels.

Hypothesis: MCH-expressing neurons in the LH provide non-orexinergic inputs to the OB.

Approach

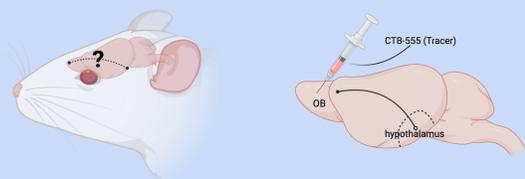


Figure 1. Use of viral injection to trace the neuronal pathways connecting the hypothalamus and the olfactory bulb. Images created with BioRender.com

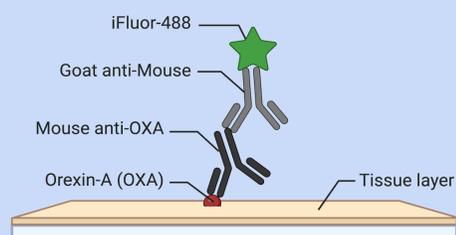


Figure 2. Schematic representation of fluorescent immunohistochemistry (IHC) for orexin-A. Image created with BioRender.com

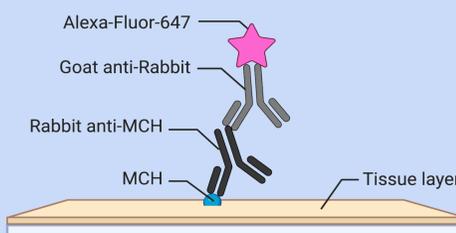


Figure 3. Schematic representation of fluorescent immunohistochemistry (IHC) for melanin-concentrating hormone. Image created with BioRender.com

Neuronal Expression in the Lateral Hypothalamus

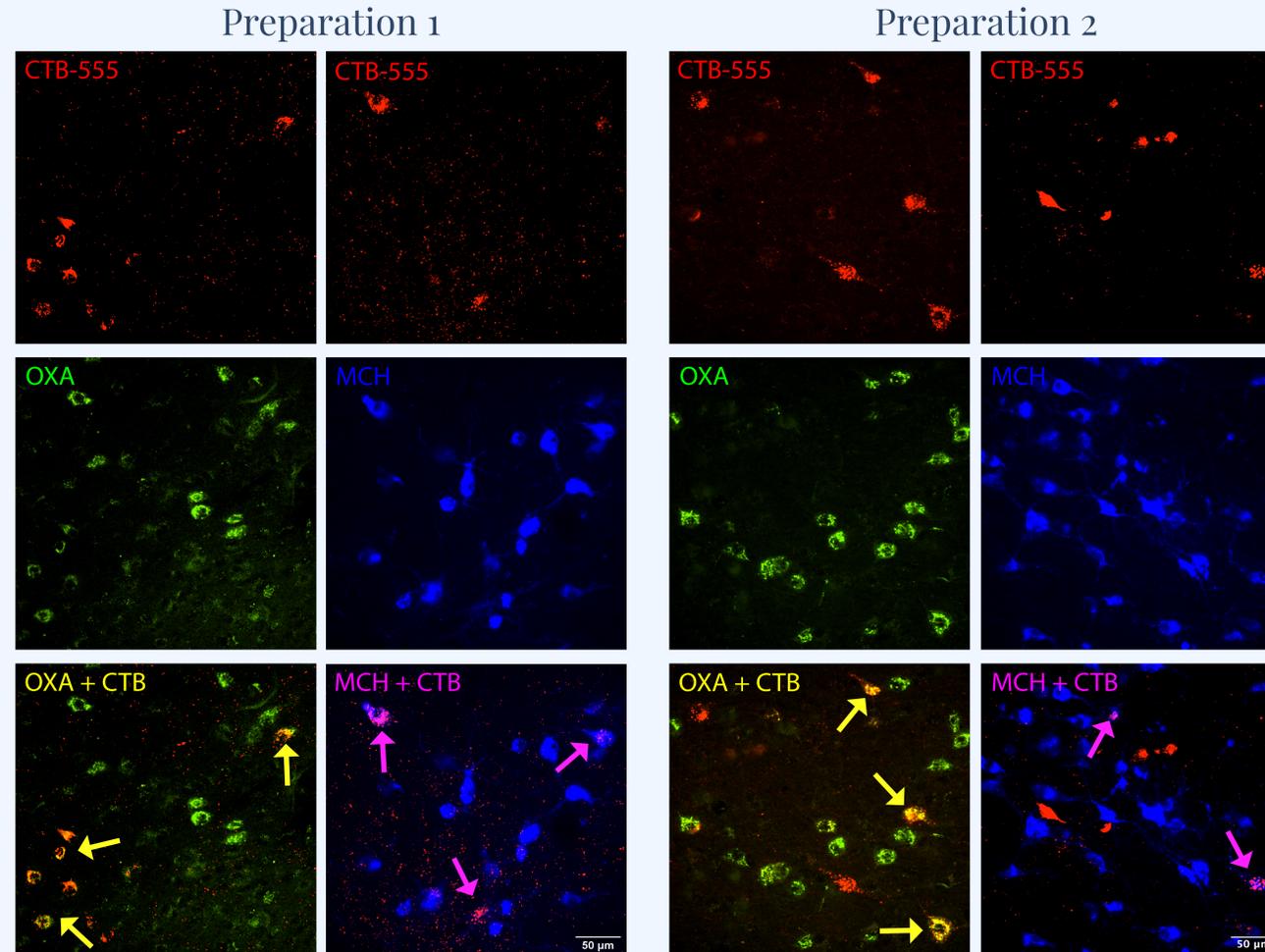


Figure 4. Confocal images of hypothalamic sections in preparation 1 injected with CTB-555 and IHC for OXA and MCH.

Figure 5. Confocal images of hypothalamic sections in preparation 2 injected with CTB-555 and IHC for OXA and MCH.

Quantification of Immunolabeled Neurons

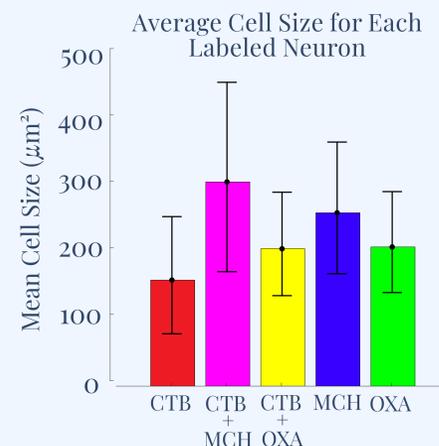


Figure 6. Labeled neuronal cell sizes with error bars representing standard deviation. Graph generated with MatLab code.

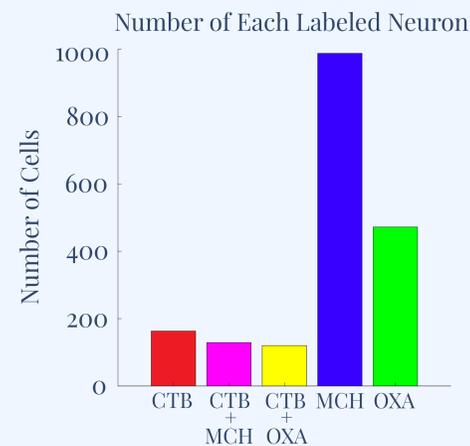
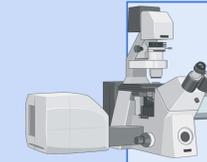


Figure 7. Quantification of labeled neurons. Graph generated with MatLab code.

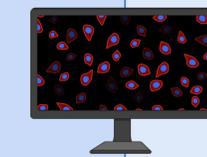
Methods



Preparation of hypothalamus sections



Imaging using confocal microscope



Quantifying cells using Stereo Investigator and MatLab

Images created with BioRender.com

Conclusions

There are overlaps of CTB-555 with both OXA and MCH, indicating that the OB receives projections from both OXA and MCH neurons in the LH.

However, there are some CTB-555 labels that are neither OXA nor MCH overlapping, suggesting that there might be another population of hypothalamic neurons projecting into the OB, that still need identification. (see Figure 7).

A morphological study was also conducted to find a possible correlation between cell size and cell type. A statistical analysis has yet to be conducted to see its significance (see Figure 6).

Future studies are necessary to discover other populations of neurons that project to the OB. An ongoing study in the lab suggests that one population may be GABA neurons.

Acknowledgments & References

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