

Choline Acetyltransferase expression in the central nervous system of the pond snail *Lymnaea stagnalis*



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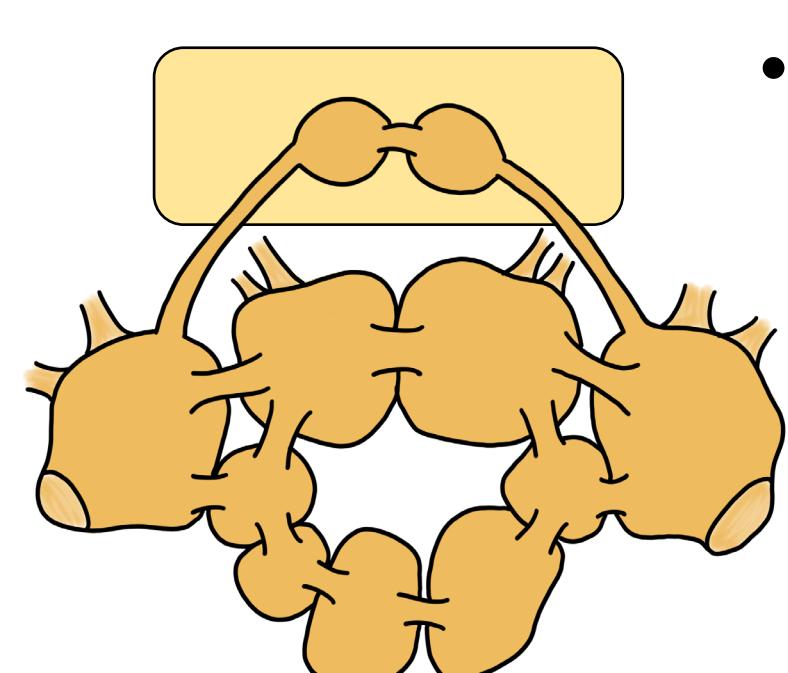
Introduction

Gastropod Neuroanatomy:

- Gastropods have been key models in understanding how nervous systems control behavior
- Neuroanatomy underlies function

L. stagnalis Nervous System

- Central brain
- Focus: Buccal ganglia



Labelling Comparison:

Traditional = IHC

Immunohistochemistry

- Based on protein structure (using an antibody)
- Visualization of protein expression

New = HCR

in situ Hybridization Chain Reaction

- Based on gene sequences
- Visualization of mRNA expression

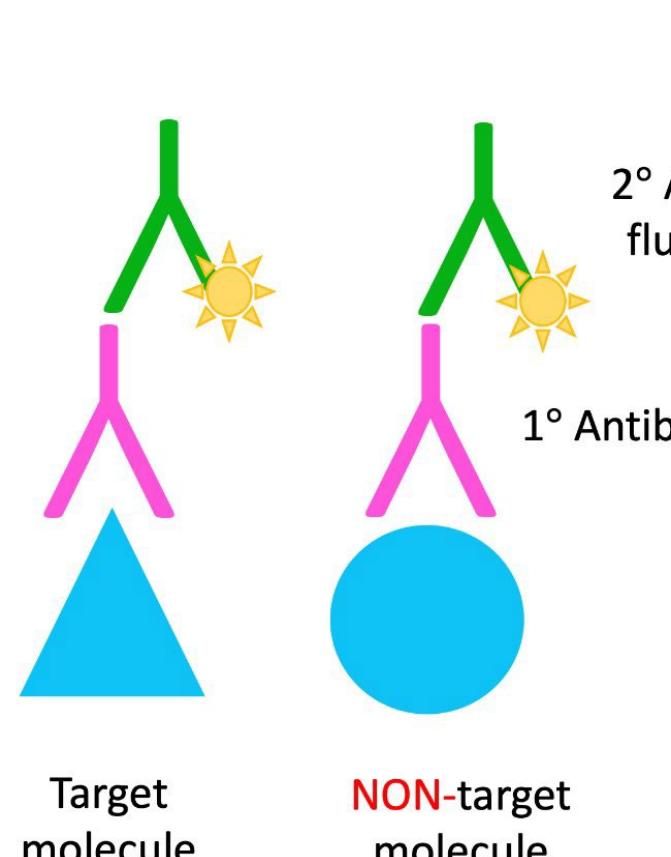
Target:

Choline acetyltransferase (ChAT)

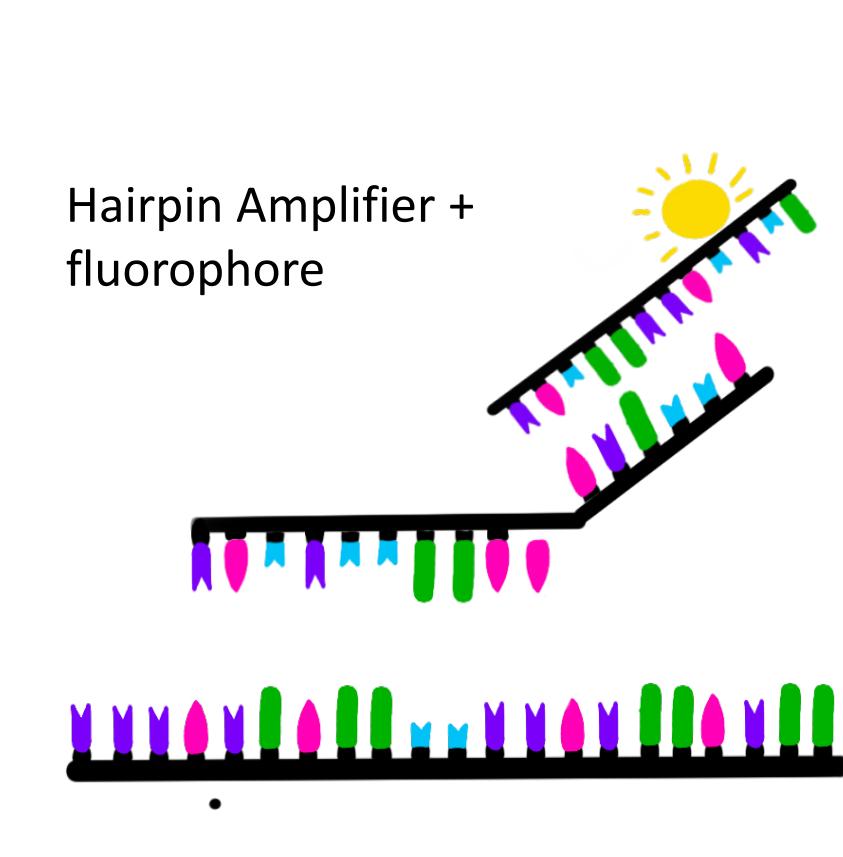
- Enzyme
- Synthesizes acetylcholine (a neurotransmitter)

4 methods compared:
3 IHC antibodies vs HCR

IHC



HCR

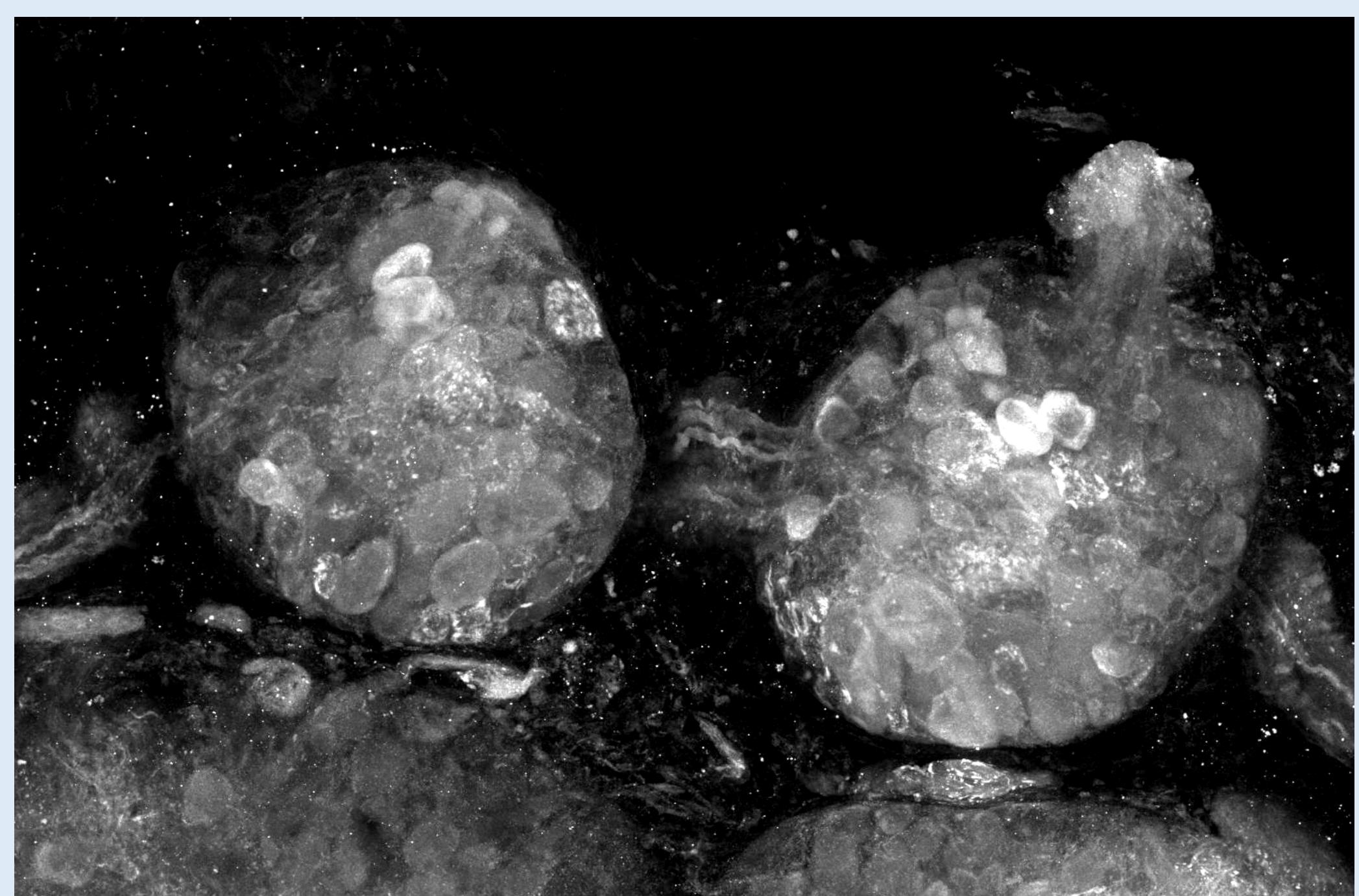


Hypothesis: Labelling in all methods will produce similar expression

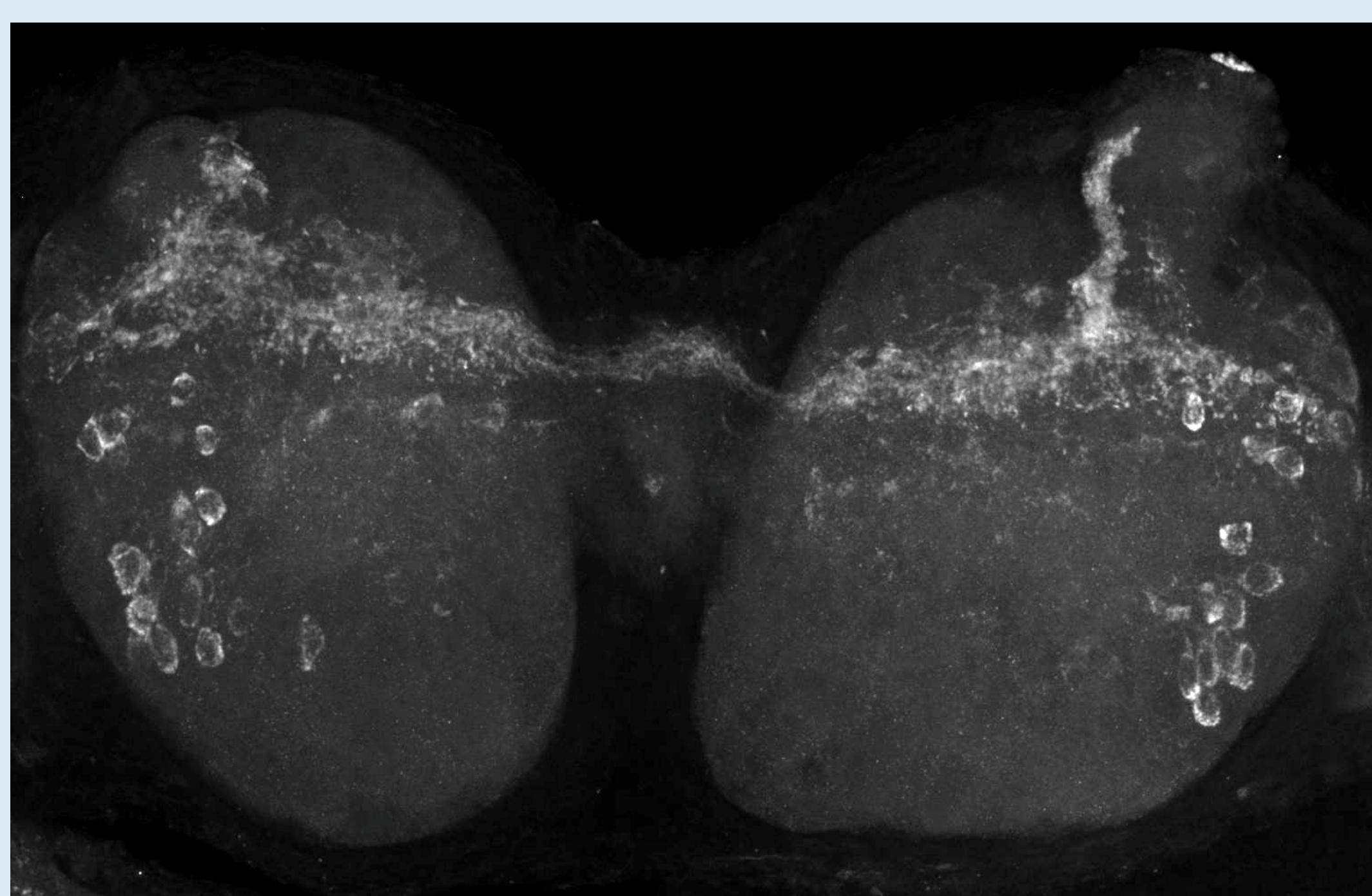
Results

Central Nervous System: Buccal Ganglia

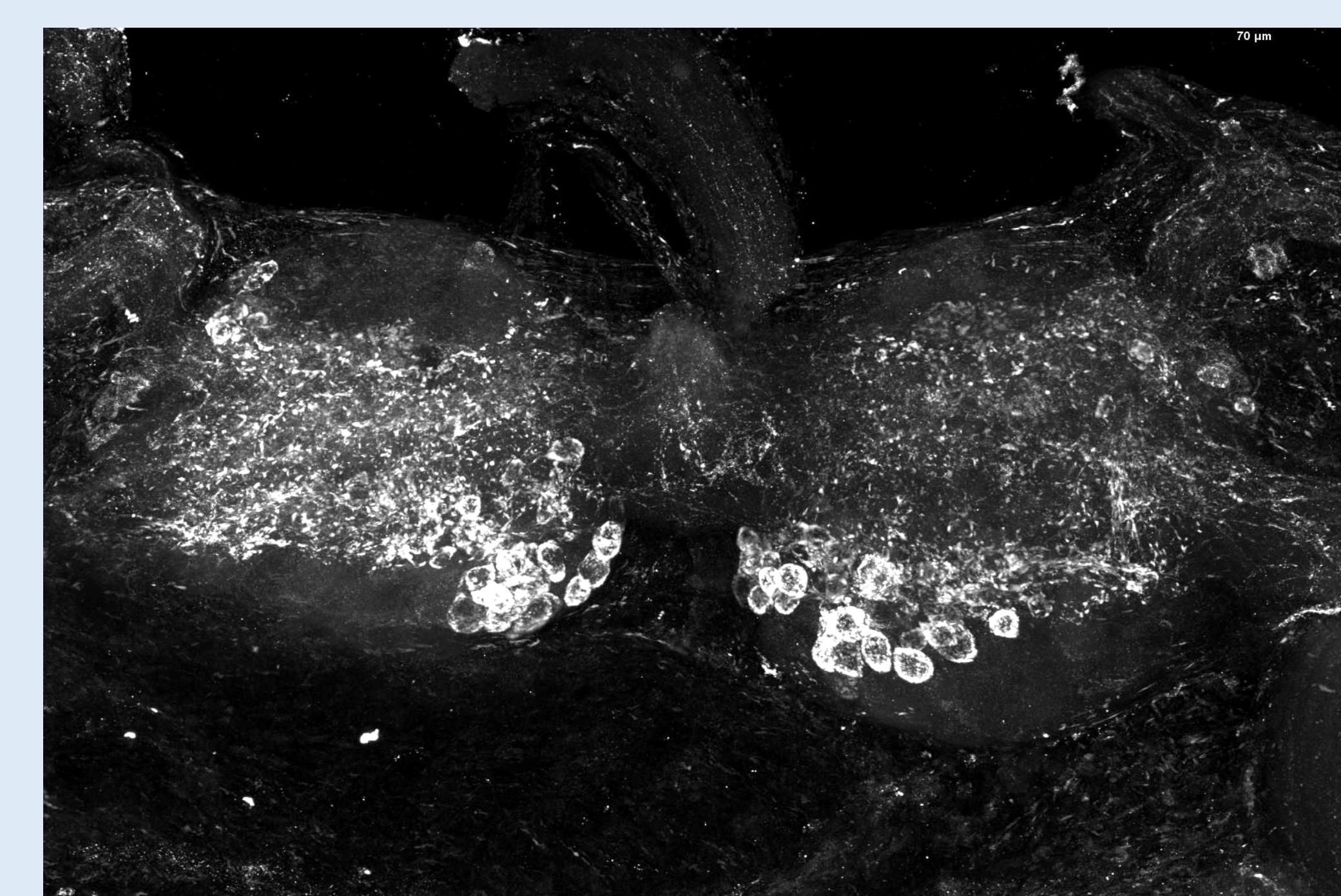
IHC



ChAT1

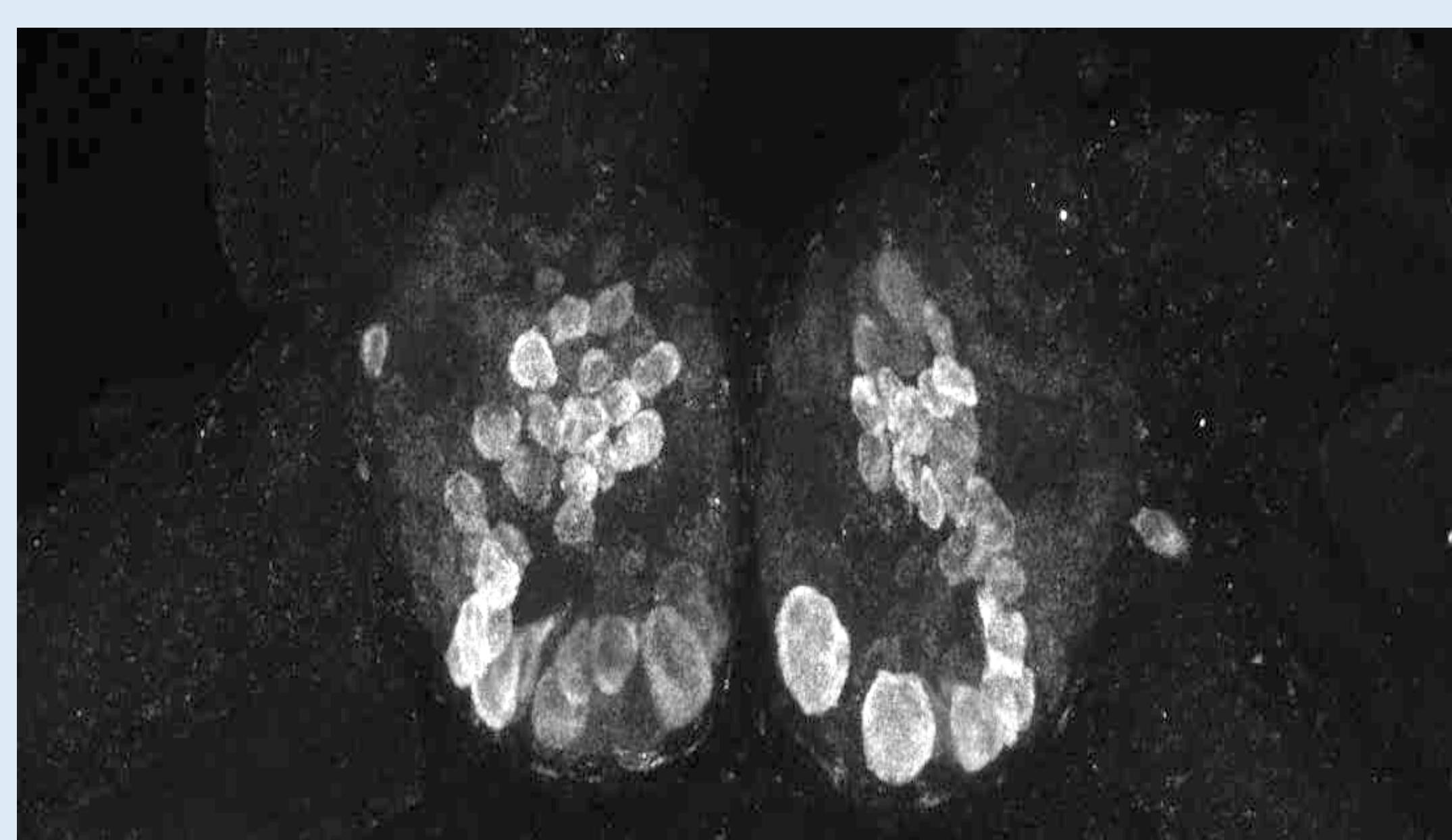


ChAT2



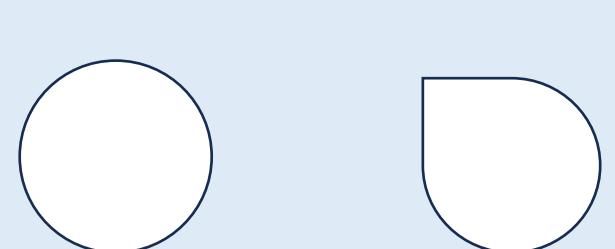
ChATCB

HCR



Cell Analysis

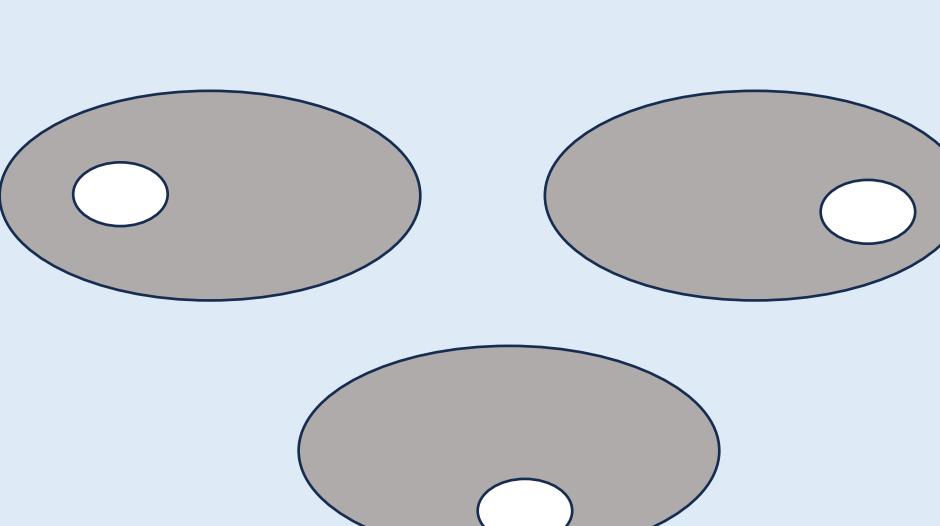
i. Cell shape



ii. Cell size



iii. Cell location



Cell Characteristics

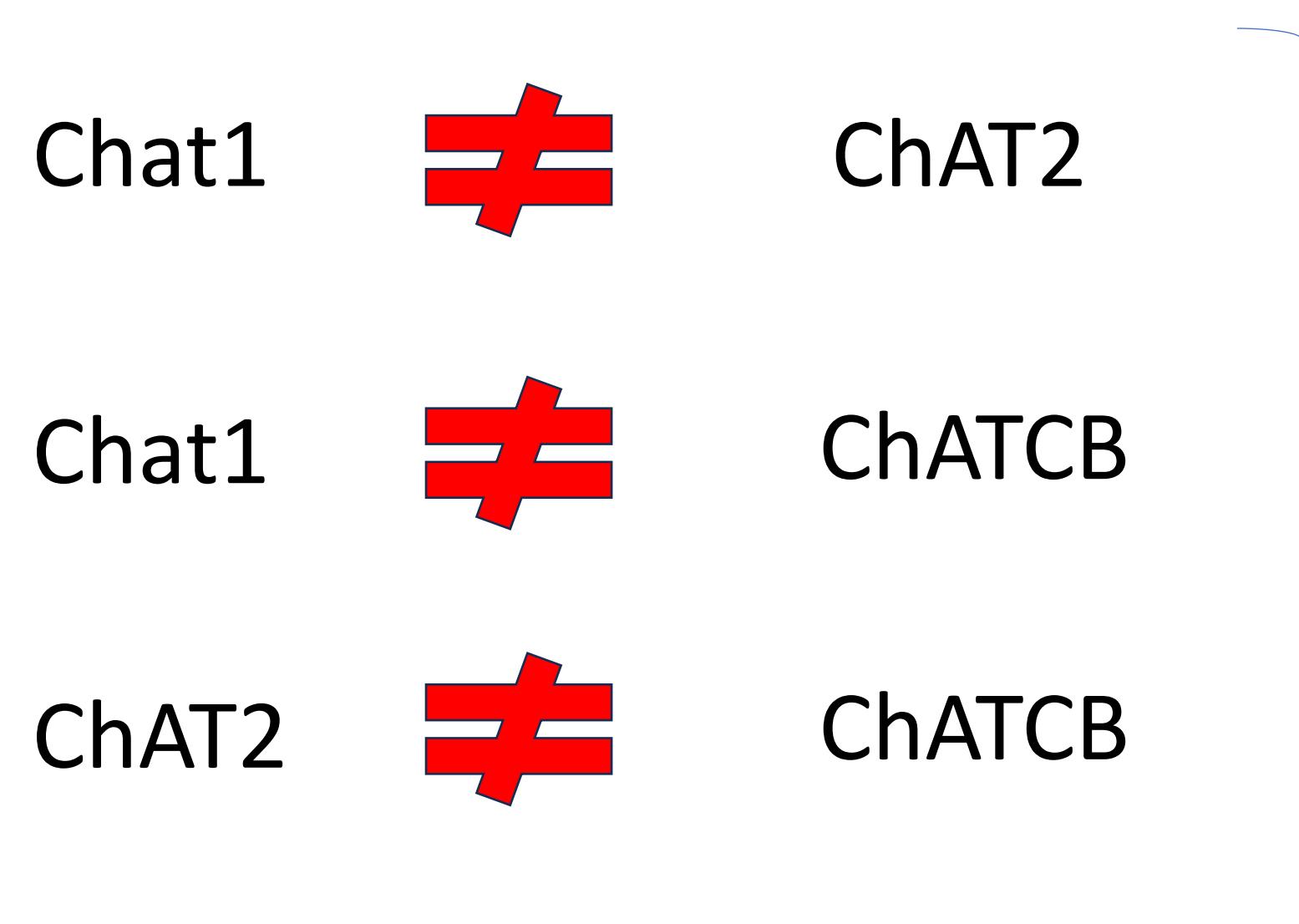
ChAT1 → Circular, large, medial

ChAT2 → Oblong, small, lateral

ChATCB → Oblong, small, posterior/medial

HCR → Circular, large, distributed

Overall IHC vs HCR Label Comparison



Similarities:

- ChAT 1 and HCR center clusters
- ChAT1 and ChATCB small posterior/medial clusters

Probable explanation: Labelling of different versions

Possible explanations:

- One or more not labelling ChAT
- Labelling different versions of ChAT
 - Splice variants
 - Post translational modifications
 - Isoforms

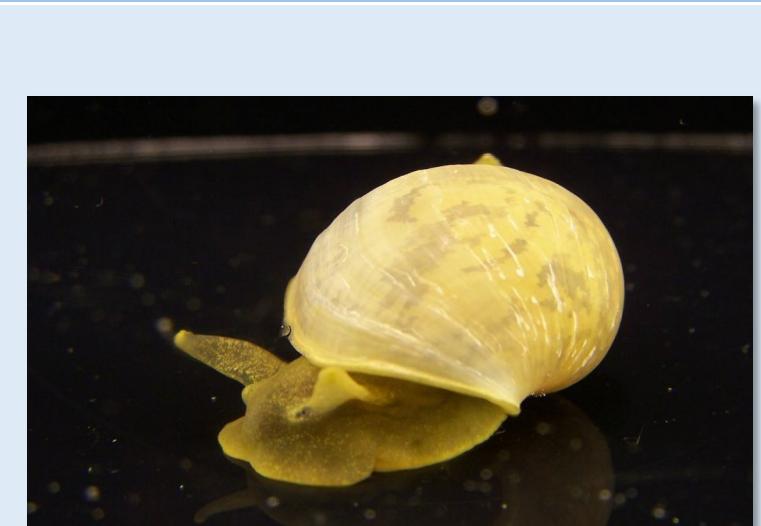
Conclusion: Hypothesis was not supported

Acknowledgements

Lymnaea stagnalis

Future Directions

I would like to thank Yulia Reunova and Victoria Tweedie-Pitre for taking me under their neuroanatomy wings this past summer. I would also like to thank Russell Wyeth for granting me this amazing opportunity. Finally, I would like to thank everyone who listened to me stress over how many snails I needed to dissect every week.



- Determine specific labeling of antibodies
- Explore ChAT in the *Lymnaea* genome