

The role of DARPP-32+ NNs in zebra finch song production

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Experimental Design

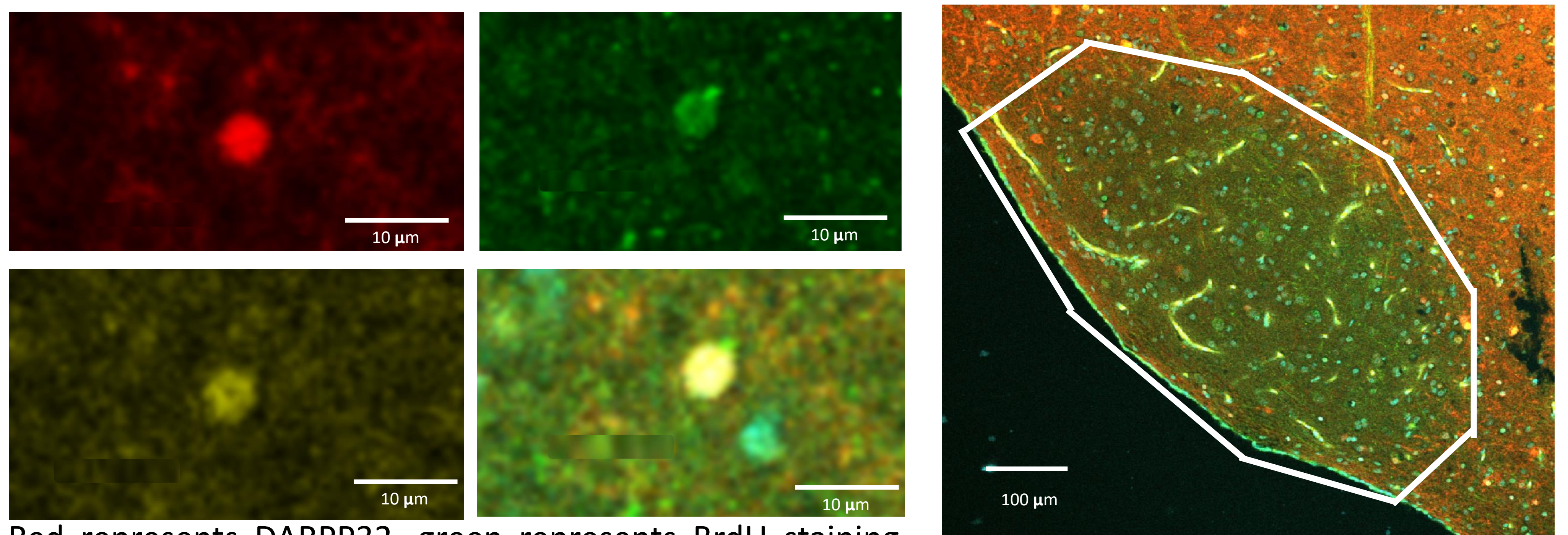
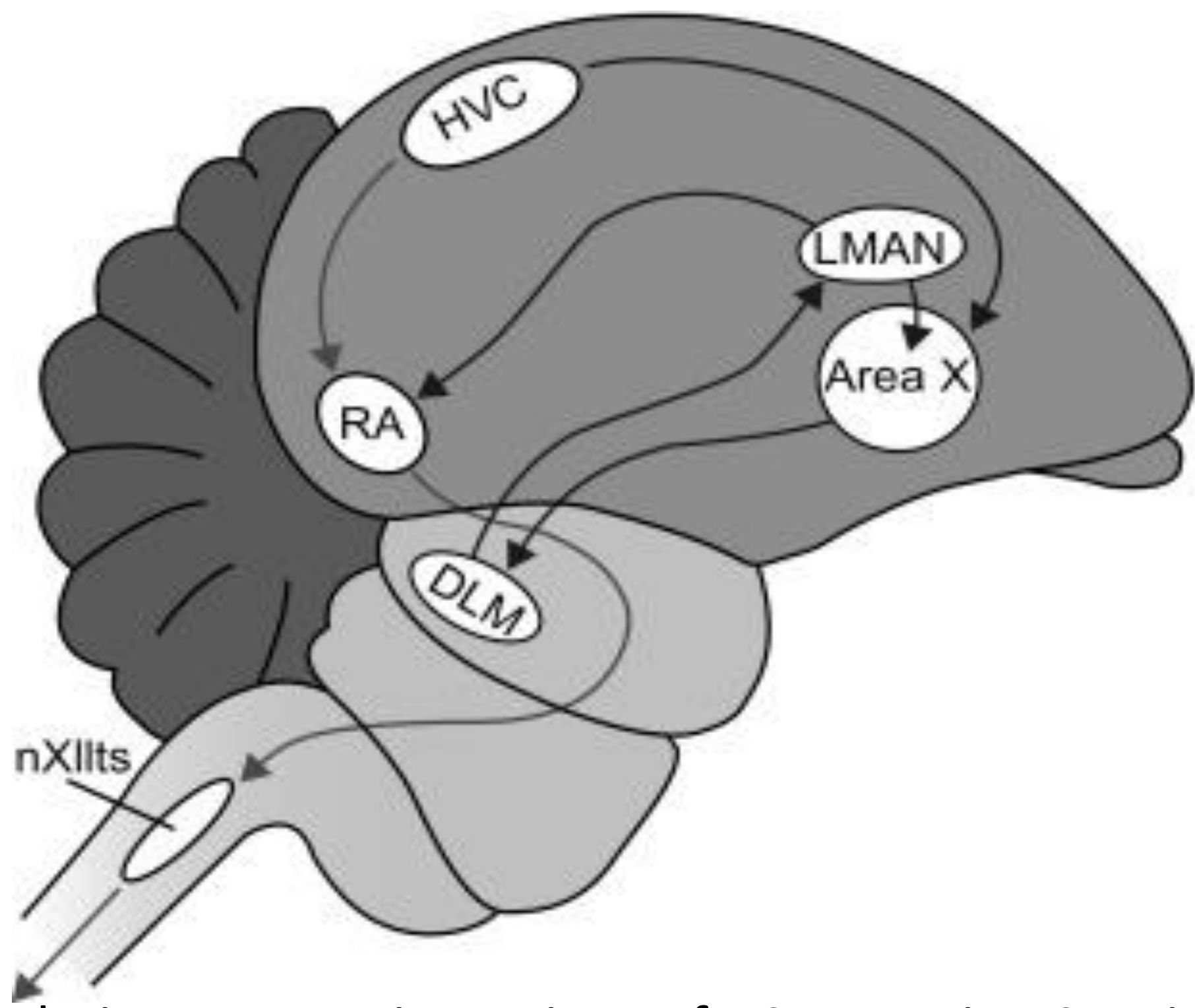
The zebra finch (*Taeniopygia guttata*) HVC song circuit is a model system for studying the effect of adult neurogenesis on a specific behavior: in this case, song learning, perception, and production.



Birds were injected with BrdU 2 times a day for 3 days.

21-22 days post injection, birds sang for an hour prior to perfusion. n=2

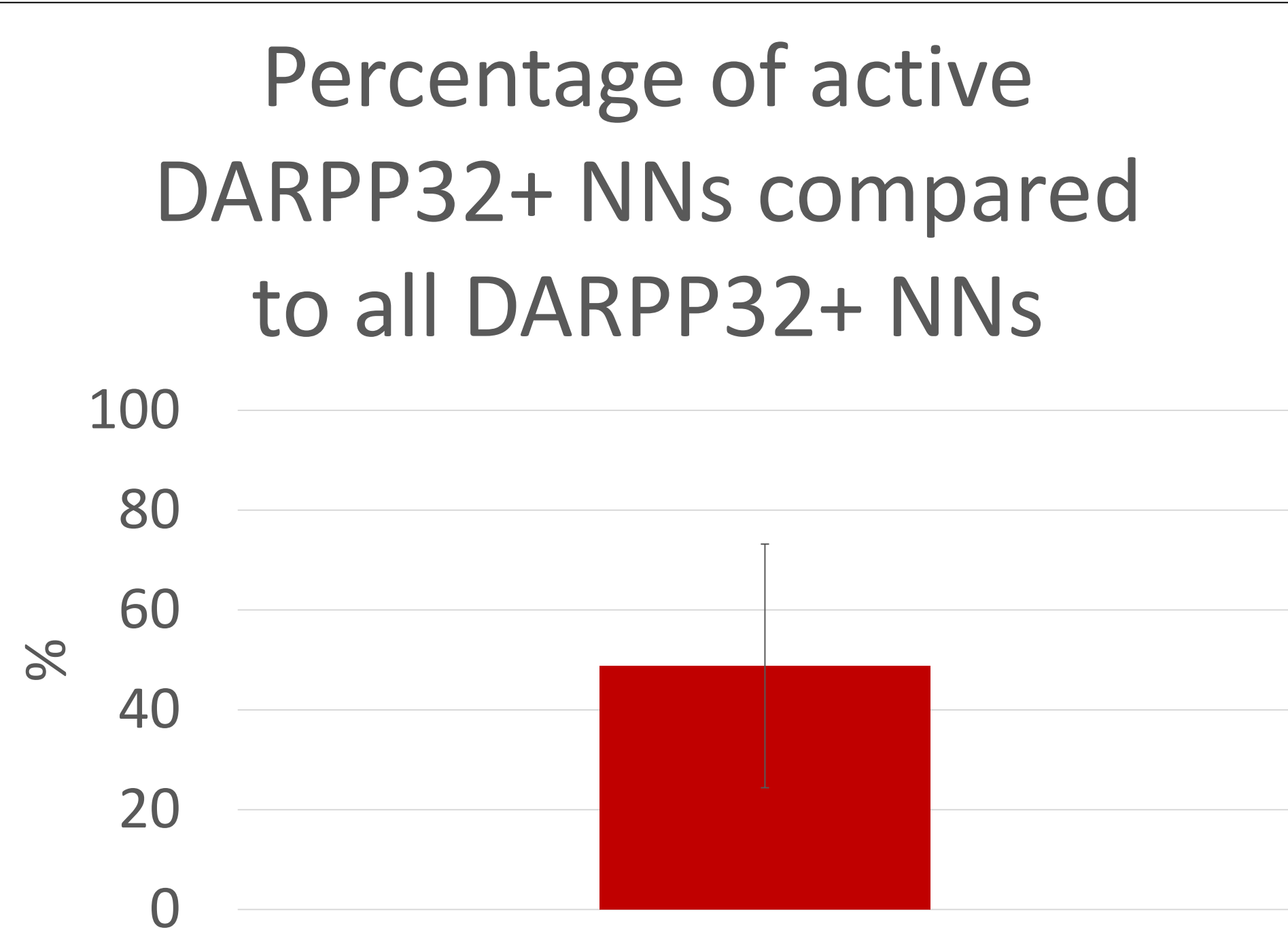
Results



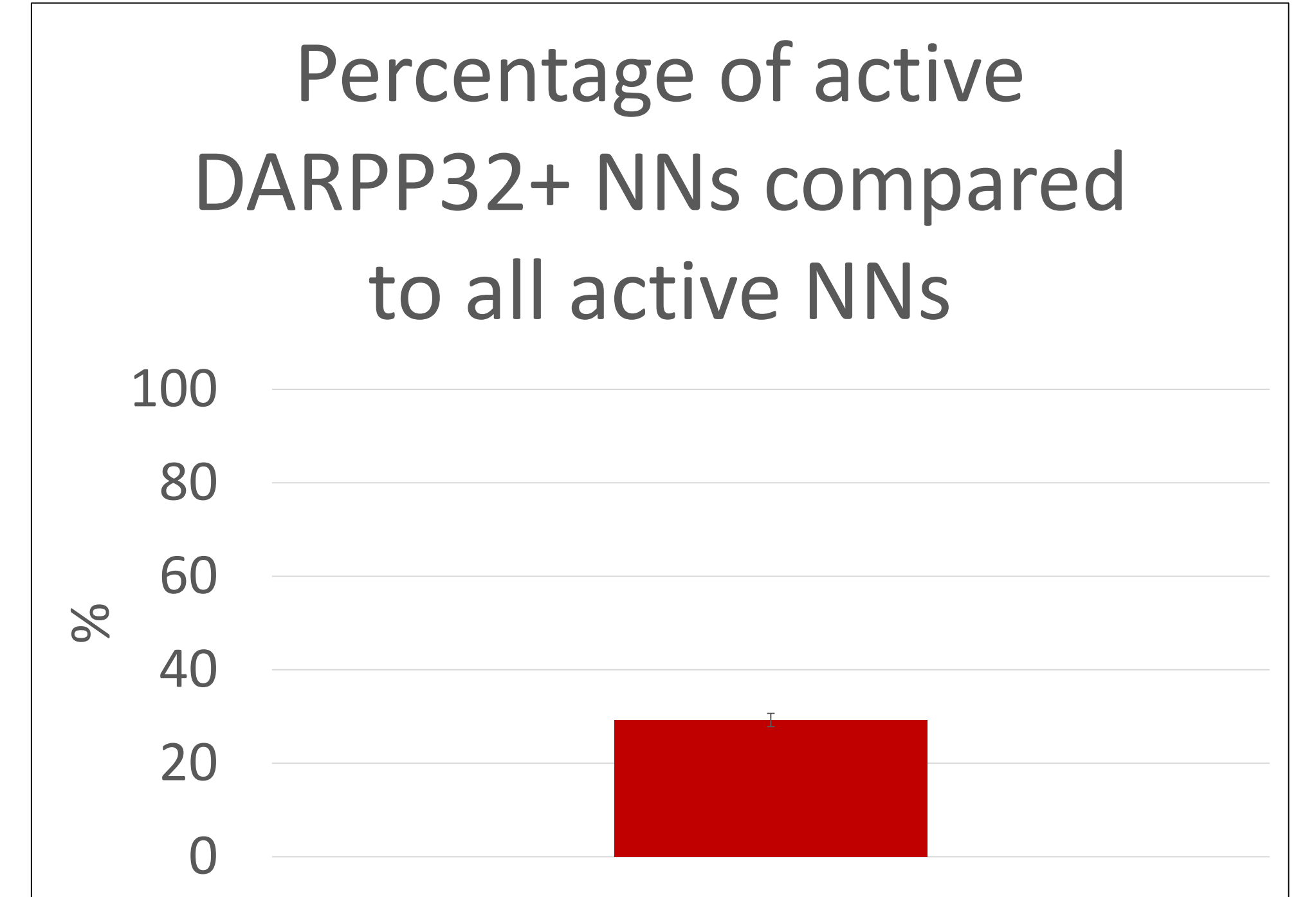
Red represents DARPP32, green represents BrdU staining for NNs, and yellow represents ZENK staining which is indicative of IEG expression. The last image is a merge of all 3 channels.

Above is an image of HVC, demarcated by the white lines, at z = 8.69 μ m.

Cabej, N.R. Epigenetics of Sympatric Speciation. *Epigenetic Principles of Evolution*, 2019, 2, 600. Zebra finches learn and master one song throughout their lives. Once song is mastered in a song crystallization event, song is robust.¹ Even after crystallization, zebra finches continue to refine their song and two types of adult born neurons (NNs) are added to HVC, the center of the song circuit. One type of NN sends axons to the robust nucleus of the arcopallium (RA).² Little is known about the other type of neuron. It neither projects to Area X nor is an inhibitory interneuron.³ As shown recently in our lab, these neurons transiently express DARPP-32, a protein that is indicative of dopaminergic neurons.⁴



This graph represents the amount of DARPP32+ ZENK+ BrdU+ neurons compared to neurons that stained for DARPP+ and BrdU+. On average, 48.8% of DARPP32+ BrdU+ neurons are active during singing.



This graph represents the amount of DARPP32+ ZENK+ BrdU+ neurons compared to the neurons that stained for BrdU+ and ZENK+. On average, 29.3% of active cells at 3 weeks express DARPP32.

Conclusions & Future Work

At 3 weeks, 48% of DARPP-32+ NNs are active during song production. In addition, 29% of IEG-expressing neurons express DARPP-32. This suggests evidence to believe that DARPP-32+ NNs have a role in the HVC song circuit. In further work, a 5-week and 8-week cohort will be examined. In addition, we noticed DARPP32+ZENK+BrdU+ neurons were found on the peripherals of HVC. We also qualitatively noted a significant number of DARPP32+ZENK+BrdU+ neurons. In further projects we will quantify these qualities.

Objective

We seek to determine the identity and function of these DARPP-32+ NNs. Specifically, we examine whether DARPP-32+ NNs are active during song production.

References

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Acknowledgements

- ❖ Jake Aronowitz and the Kirn Lab
 - ❖ Professor Gloster Aaron
 - ❖ TRIO and the Wesleyan McNair Program
 - ❖ Ronnie Hendrix and Erika Taylor
- It is with sincere respect that I acknowledge Wesleyan University is built upon the traditional indigenous land of the Wangunk tribe.