

Do Madagascar hissing cockroaches exhibit age-dependent neurogenesis?



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Background

- **Neurogenesis:** mature neurons forming from neuron stem cells⁴
 - Self renewal progression
- **Neuroblast:** an undifferentiated embryonic nerve cell, becomes a neuron
- Neurogenesis decreases as aging occurs³
 - Significant decline with neurodegeneration²
- Role in structural and functional plasticity of the brain⁴

Model Organism

- Previous neurogenesis studies mostly used mammalian models
- Neurogenesis has been shown in a few species of insect
 - Insect models allow for more research possibilities
 - Fewer experimental restrictions
 - More simplistic models



Figure 1. Madagascar hissing cockroach



Figure 2. Madagascar hissing cockroach dissected brain

- Madagascar hissing cockroaches (*Gromphadorhina portentosa*) will be the experimental model
- Benefits:
 - Large size (approx. 85 g)
 - Can be handled without additional protective equipment
 - Slow moving, flightless

Objectives & Hypothesis

Objective 1: To determine if the Madagascar hissing cockroach is an appropriate model organism for studying neurogenesis

Objective 2: To determine if age impacts neurogenesis in the Madagascar hissing cockroach brain

Hypothesis: With increasing age, there will be a correlated decrease in neurogenesis

Methods

- Two groups, young and old, with 12 cockroaches in each group:
 - Young adult cockroaches: approximately 7 month past adult emergence
 - Old adult cockroaches: approximately 2 years past adult emergence

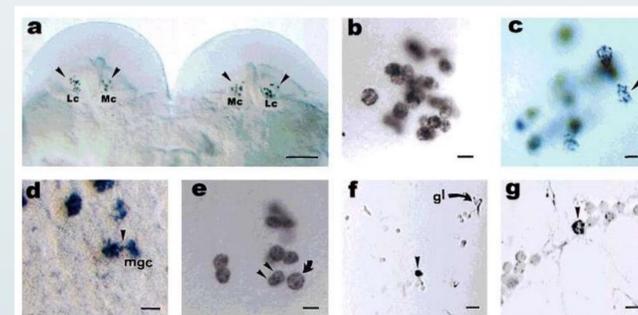


Figure 3. Stained whole mounts of brain showing BrdU labelled cells¹

- Label neuroblasts with BrdU
 - Incorporated into DNA of dividing cells during the S phase
 - Detected using a (Ig)G2a antibody
- Presence of labelled neuroblast is indicative of neurogenesis

Expected Results

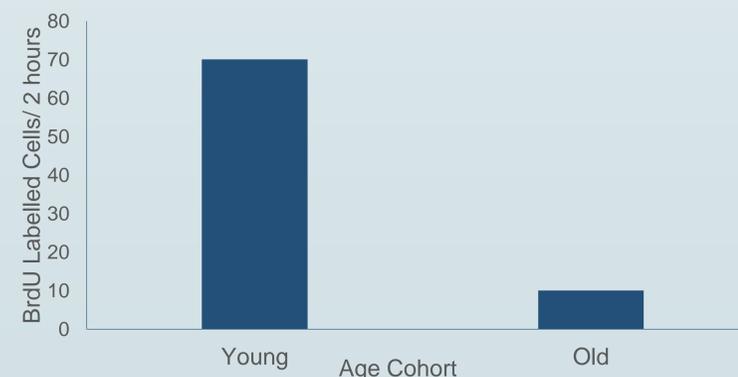


Figure 4. Number of BrdU labelled neuroblasts in brain tissue of young and old cockroaches

- Prediction: The young cohort will have significantly more neuroblasts than the old cohort
 - Indicates that young cohort exhibits higher levels of neurogenesis compared to the old cohort

Conclusion

- If successful, this would allow for more research on neurogenesis
- Lead to decrease in neurodegenerative diseases
- Future studies:
 - Look at how enriched environments affect neurogenesis
 - Medications that increase neurogenesis levels in aged cockroaches



Figure 5. Madagascar hissing cockroach average old adult length



Figure 5. Madagascar hissing cockroach marked for identification

Acknowledgements

- We thank the department of Entomology at the University of Manitoba for the cockroaches used to start our colony. We also thank Dr Jane Waterman and the class of BIOL 3100 Fall 2020 for their advice and support.

References

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