

Neuronal Tract Tracing in the Rat Trigeminal Sensory System

Erica Rodriguez

Mentor: Dr. Dayna Averitt

Texas Woman's University

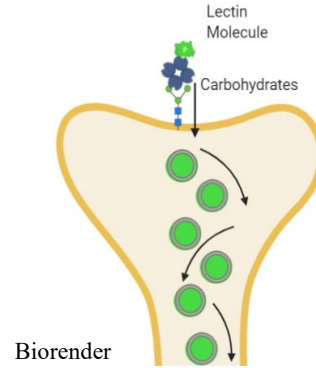
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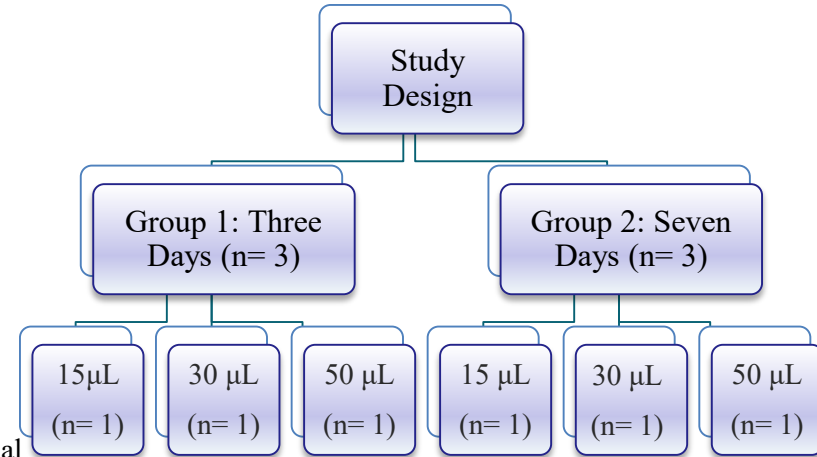
Introduction

- Neuronal tract tracers are neuroanatomical approaches that allow labeling of neuronal pathways
 - Retrograde (from the nerve ending to cell body)
 - Anterograde (cell body to nerve ending)
 - Trans-synaptic tracer (labels multiple neuronal connections)
- Wheat Germ Agglutinin (WGA) is a common trans-synaptic tracer. The most current form of WGA is the WGA-Alexa-488 trans-synaptic fluorescent dye. Literature has demonstrated successful labeling of some neural pathways using WGA-488; yet, the use of WGA-488 to investigate many other areas remains to be explored (Reeber, Gebre et al. 2011, Buttry and Goshgarian 2014, Buttry and Goshgarian 2015, Levy, White et al. 2017).
- Major challenges: 1) poor visibility and 2) ineffective labeling between the synapses of neurons.



Purpose: 1) To determine the ideal timing and volume of WGA-488 required to label brain regions in the trigeminal system, and **2)** to visualize the trigeminal sensory neuron projections from the orofacial region to the Trigeminal Ganglia and Trigeminal Nucleus Caudalis of the Brainstem.

Methodology



Injection sites:

Left Vibrissal Cheek Pad (VP)
Right Temporomandibular Joint (TMJ)

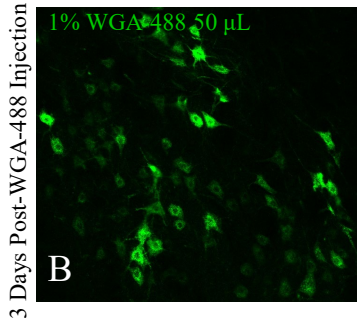
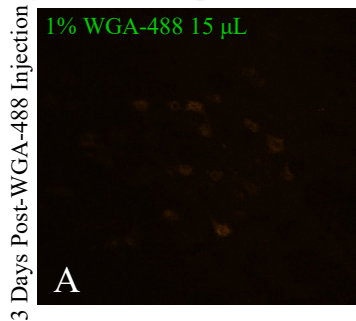


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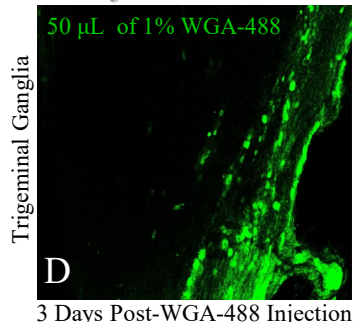
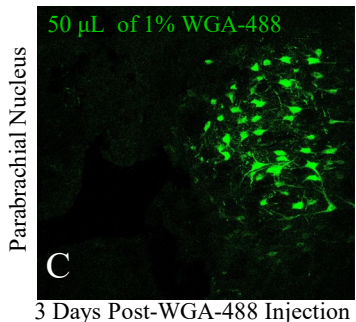
Results

Numerous Brain Regions Receive WGA-488+ Neuronal Projections

50 μ L is the Optimal Working Volume for 1% WGA-488



WGA-488+ Neuronal Projections



Three Day Tracer	Retrograde Labelling
Spinal trigeminal tract	+++
Periaqueductal Gray	++
Parabrachial nucleus	+++
Medial Lemiscus	+++
Trigeminal Ganglia	+++
Sensory Root of Trigeminal Nerve	+++
Reticular Nucleus	+++

Key

Low Labeling: +

Moderate Labeling: ++

Dense Labeling: +++

Conclusion

We report that the optimal WGA-488 volume is 50 μ L and the time course is 3 days. This study paved the path for deeper analysis of the trigeminal system. Ultimately, we aimed to obtain knowledge on the orofacial pain neuroanatomy and sensory system in male and female rats.

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