Organization of locomotor command systems in the lamprey brain
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In vertebrates, command systems in the brain activate central pattern generators (CPGs) in the spinal cord to generate the basic pattern of locomotor activity, such as swimming or walking. Reticulospinal (RS) neurons in reticular nuclei are the neural output elements of the command system that activate the spinal CPGs. In the lamprey, a lower vertebrate, several brain areas are part of the locomotor command system: rostrolateral rhombencephalon (RLR); dorsolateral mesencephalon (DLM); ventromedial diencephalon (VMD); and reticular nuclei. Neurons in the RLR project to the DLM and VMD, which then activate RS neurons (Paggett et al., 2004). Also, RS neurons receive inputs from second order sensory neurons in the lateral rhombencephalon as well as ascending inputs from spinal neurons. The purpose of the current project is to provide anatomical evidence for the above proposed pathways in the locomotor command system and potentially to identify new brain command areas that were previously unrecognized. Fluoro-gold (FG) or Texas red dextran amine (TRDA) were applied to reticular nuclei via pressure ejection, or TRDA was applied via pin application. First, neurons were labeled in the lateral rhombencephalon, and these cells probably correspond to second order trigeminal sensory neurons. Second, occasionally some neurons were labeled in the spinal cord. Third, neurons were labeled in the mesencephalon and diencephalon, and these may correspond to the DLM and VMD, respectively. However, further research is necessary to determine the functional identity of these retrogradely labeled neurons. In the future, other anatomical tracers and application techniques will be employed to determine the best methodology to conduct a thorough mapping of the pathways within the locomotor command system in the lamprey brain. A better understanding of this system in the lamprey may provide insights into the organization and operation of similar brain locomotor command systems in higher vertebrates, including humans.