Responses of central pattern generators in the American lobster STNS to a family of neuropeptides

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This summer, I worked in the Dickinson lab examining central pattern generators in the American lobster stomatogastric nervous system (STNS). The STNS is a network of neurons that control digestion, commonly found in arthropods such as insects and crustaceans. The stomatogastric ganglion (STG) in this system is comprised of 30 primary neurons that form two central pattern generators (CPGs)—neural networks capable of producing rhythmic muscular sequences without cues from outside the central nervous system.[1] CPGs can dictate rhythmic motions in invertebrates and vertebrates alike, and can be flexibly modulated by neuropeptide hormones, which are short amino acid chains that act as neurotransmitters. Neuromodulation is a form of nervous system communication distinct from typical synaptic transmission, in that chemicals such as peptide hormones flood a system to act on multiple neurons at once, rather than communicating at just one synapse.

Neuropeptides are common neuromodulators that can flexibly affect the STNS, and are therefore often studied in this system. My work focuses on the GSEFLamide neuropeptide family, which was identified in a collaborative 2017 study.[2] Each of the two & 3 * V , ¶ P V W X G \ L Q J controls a distinct part of the O R E V W H U ¶ V V W R P D F K W K H J D V W U L F P L O O S D W W H U Q controls three teeth used to break down food, and the pyloric pattern controls an active I L O W H U W K D W O H D G V midgut.[3] The peptides that modulate these CPGs originate either I U R P G H V F H Q G L Q J S U R M H F W L R Q Q H X U R Q V W K D W V H F U H W, or from the neuroendocrine system releasing peptides into the bloodstream.

References:

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3. Marder E, Bucher D. 2007. Understanding Circuit Dynamics Using the Stomatogastric Nervous System of Lobsters and Crabs. *Annual Review of Physiology*. 69:291±