Effects of Serotonin on Crayfish Nerve cord

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Introduction

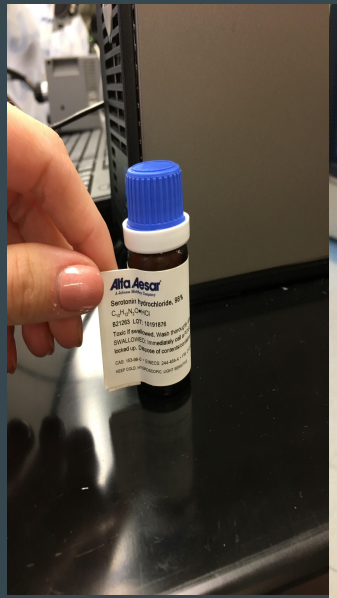
- Serotonin is a neurotransmitter.
- Serotonin has been shown to increase aggressive behaviors in crustaceans.
- In crayfish, serotonin acts as an excitatory neurotransmitter on the excitatory flexor motor neurons.
- How does serotonin affect projection neurons?
- Are the effects of serotonin permanent or temporary?

Hypothesis

Serotonin will increase the neuronal spike frequency in *Procambarus clarkii*.

Methods

- Materials:
  - Crayfish, Procambarus Clarkii, from Carolina Bio Supply
  - Saline
  - 25 µM Serotonin
    - concentration based on Momohara, Y., 2015.
  - Draining System



Methods cont.

- Steps:
  - Dissection
  - Electrophysiology setup in draining system:
    - Pin electrode placement not recorded. Most likely between ab 3 and ab 4.
  - Base recording 1, Experimental Serotonin recording, Base Recording 2
  - Data Analysis

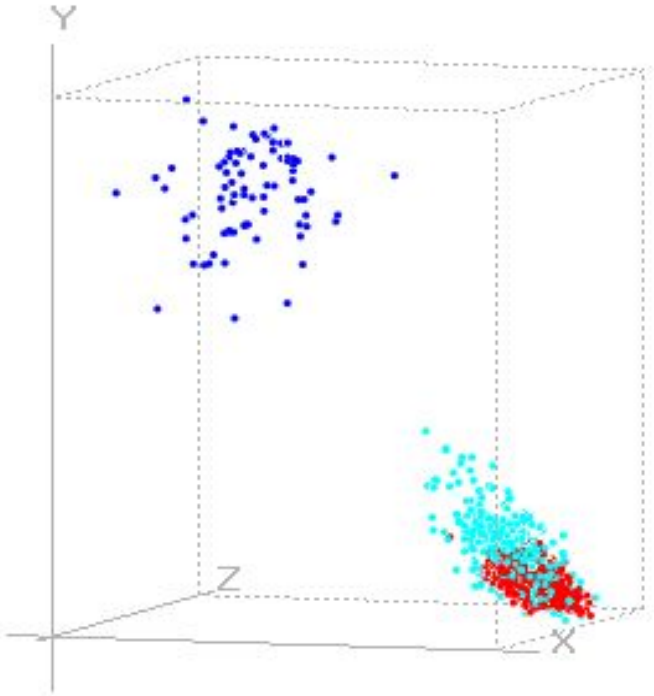
Delivery of Serotonin Results

- Shows a separation

of groups

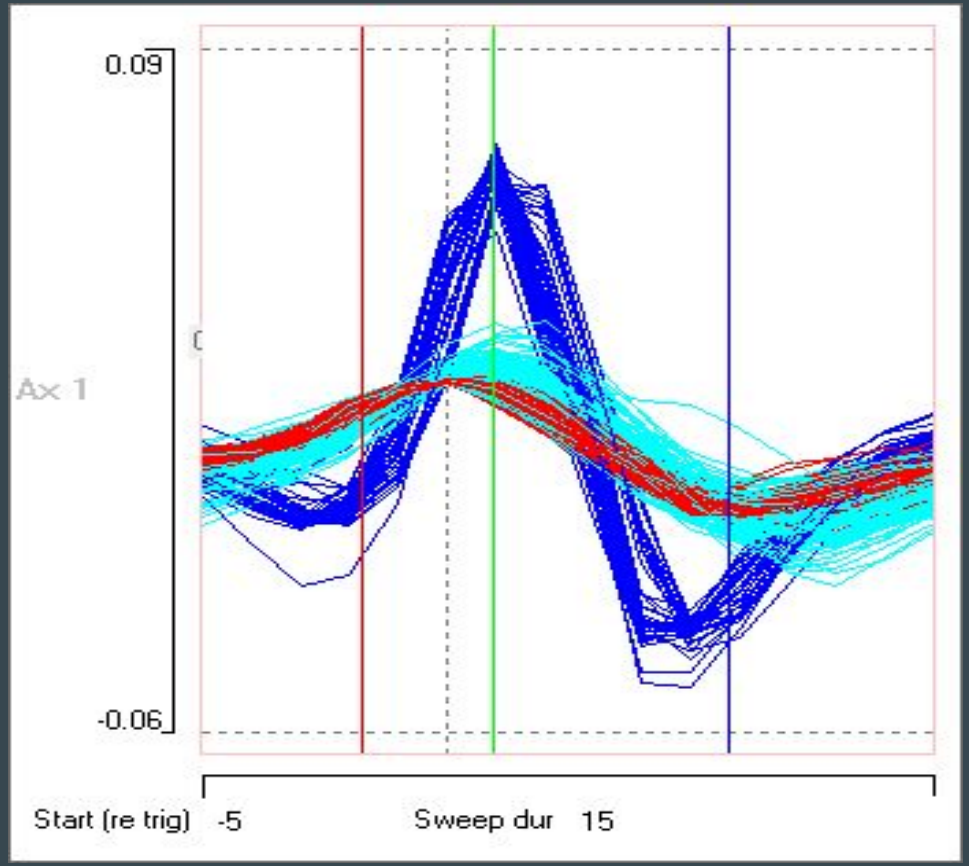
- Three groupings
- Possible action potentials.
- Serotonin delivery caused excitation in

one “neuron”.



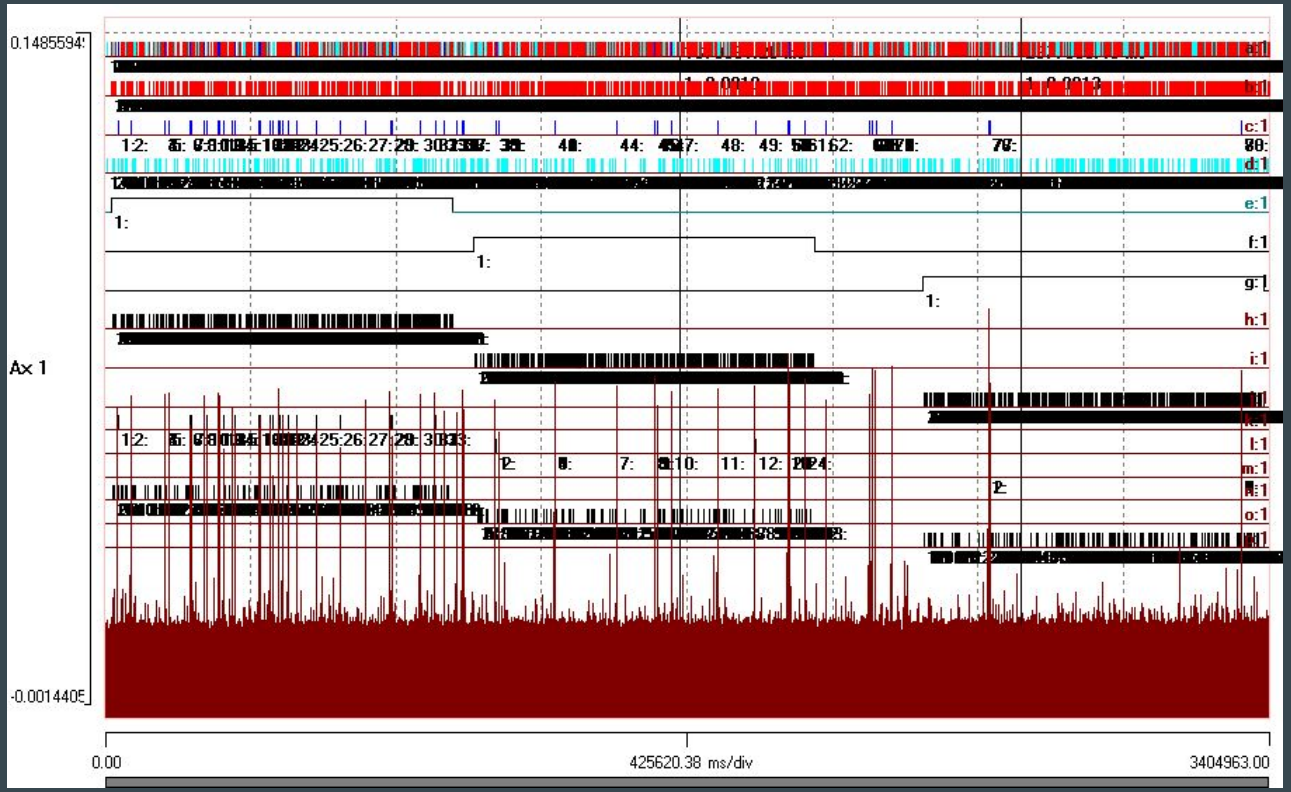
The Action Potential

- Each color represents a [possible] “neuron.”
- 3 possible neurons
- Sorting based on shape



Results

- Baseline, Experimental, Baseline.
- Number of spikes divided by 998 ms/div.
- Gives Frequency



Results Table

Channel	Experimental condition	# of spikes	frequency
Channel B	Baseline 1	290	0.29 Hz
	5HT	371	0.37 Hz
	Baseline 2	450	0.45 Hz
Channel C	Baseline 1	33	0.033 Hz
	5HT	24	0.024 Hz
	Baseline 2	5	0.005 Hz
Channel D	Baseline 1	112	0.11 Hz
	5HT	103	0.10 Hz
	Baseline 2	171	0.17 Hz

Discussion

- Reject the hypothesis
- Permanent effect of serotonin
- Neuronal death
- Noise
- Future? Perform the experiment in different order [baseline, 5-HT, baseline, octopamine, baseline] to see if it reverses the effects of serotonin.

References

- Momohara, Y., Yoshida, M., and Nagayama, T. (2015). Serotonergic modulation of social status-dependent behavioural plasticity of the crayfish avoidance reaction. *Journal of Comparative Physiology A*, 201(11),1063–1074. doi: 10.1007/s00359-015-1038-z