Abstract Submitted
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Sensory Neuron Terminals in Paddlefish Electroreceptors: Where Do Spikes Start?[1] DESMON ROGERS, LILIA NEIMAN, DAVID F. RUSSELL, Ohio University — We studied the branching terminals of sensory neuron axons at electroreceptors in the skin of paddlefish. They respond to weak electric fields in nearby water, from prey. FOCUS PROBLEM: Where are spikes initiated? Since a sensory neuron branches repeatedly to receive input from 3-30 "sensors," is there a separate spike initiation zone for each sensor? Or do all the sensors sum to drive spiking at a single zone? APPROACH: (i) 3-Color fluorescent antibody labeling and light microscopy revealed the locations of specific cell components known to be involved in action potential generation, including voltage-gated sodium channels, and neurofilament-H inside sensory axons, and myelin around axons. (ii)Fluorescent lipophilic tracers DiI and DiO revealed the membrane of sensory axon branches. RESULTS: (i) Antibody labeling showed that as a sensory axon branched repeatedly, each sub-branch remained myelinated until 100 microns from the sensors, where each sub-branch had a classic "hemi-node" organization, with a final cluster of sodium channels (the last node), beyond which unmyelinated neurites, not showing voltage-gated sodium channels, branched profusely to innervate a pair of adjacent sensors. (ii) Lipophilic tracers confirmed this organization. We used 2-color tracing to ask if the 3-6 sensory axons in an electroreceptor co-innervate all of its sensors. CONCLUSION: A sensory axon can have multiple spike initiation zones, e.g. up to 15 (one for each pair of sensors) in paddlefish electroreceptors.

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