Acetylcholine and Nicotine Potentiate Currents in Cells Isolated from Sea Anemone Nematostella vectensis

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Nicotinic acetylcholine receptors (nAChRs) are important components of the peripheral and central nervous systems. Nematostella vectensis, the starlet sea anemone, is an important model system for studying the nervous system of Cnidarians. However, there are no reports of currents recorded from isolated Nematostella cells. In my study, I not only devised a method of isolating cells from Nematostella that can be used to characterize currents, but also found evidence for direct activation of these currents by nicotinic agonists. I isolated, 3 to 5 μm diameter spherical cells that were viable and could be maintained in culture for several weeks. Using whole cell patch clamp, I identified two currents: a linear current between -80 and +80 mV, and a voltage-dependent current seen at voltages above -20 mV. The voltage-dependent current increased significantly in the presence of either the endogenous neurotransmitter acetylcholine or nicotine, an agonist that selectively activates nAChRs. The effect of nicotine was dose dependent: 370 μM nicotine caused a 3.1-fold increase in current ($p=0.02$). Nicotine's effects on the voltage-dependent current correlate with its effect on the behavior of intact Nematostella. My research demonstrates a novel and powerful way to explore the nervous system of Nematostella vectensis.

Awards Won:
First Award of $5,000
American Physiological Society: First Award of $1,500
China Association for Science and Technology (CAST): Award of $1,200