Title: Adrenergic modulation of temporal pattern processing within and across generations

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Animals must recognize and adaptively respond to temporal patterns of stimuli they encounter to optimize survival both within and across generations. Through designing a novel trial-by-trial associative learning paradigm for the nematode Caenorhabditis elegans, I have discovered that C. elegans is capable of "trace-conditioning," a form of associative learning that in humans has been linked to awareness. Worms learn to associate a neutral odor stimulus with a noxious light stimulus when these stimuli are paired in an ordered temporal pattern in which the odor is predictive of subsequent light exposure. Worms can learn this association even when there is a delay between the presentation of the conditioned odor stimulus and the presentation of the unconditioned light stimulus, demonstrating trace conditioning. Strikingly, I further discovered that parental worms that are trained produce progeny with enhanced recognition of the temporal patterns of trace-conditioning. Transmission of the experiential signal is dependent on the timed ordering of stimuli, as worms exposed to equal levels but randomly ordered patterns of learning stimuli do not exhibit such intergenerational effects. I found that adrenergic signaling mediates both the parental cognitive traceconditioning response as well as the transmission of intergenerational behavior and that parental gonadal adrenergic signaling is required for the progeny to inherit learned signals. I am currently leveraging the experimental accessibility of C. elegans to analyze the molecular and cellular underpinnings of how organisms flexibly respond to temporal patterns coordinately, across a brain-to-gonad axis, to ensure adaptability to environmental stimuli across generations.