WHY DID THE SALMON CROSS THE ROAD?

THE NEUROCRINE CONTROL

OF LOCOMOTOR BEHAVIOUR

IN JUVENILE SALMONIDS

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EXTENDED ABSTRACT ONLY – DO NOT CITE

Activation of the stress response generally alters locomotory behaviours in ways that may function to increase survivability. A large body of evidence exists showing that among mammals a number of neuroactive chemicals are involved in controlling stress induced locomotor activity. However, the neurocrine/endocrine factors controlling locomotory movements in fish are less understood. We have investigated the role of the peptide corticotropin releasing hormone (CRH) and the neurotransmitters serotonin, dopamine, and (-amino-n-butyric acid (GABA) on locomotor activity in juvenile chinook salmon (*Oncorhynchus tshawytscha*). These four systems were manipulated by injecting both agonists and antagonists into the third ventricle to allow for diffusion to various brain sites. Locomotor activity following recovery was monitored by remotely activated video cameras placed above the tanks. Activity was later quantified by superimposing a grid onto the image and counting the number of line crossings within a specific period.

CRH and serotonin acted synergistically to increase spontaneous locomotor activity during the test. The combined action of CRH and serotonin was inhibited by GABA. In contrast, GABA alone stimulated activity, an effect that appears to be mediated through the dopaminergic system. The results of these experiments suggest that the interactions amongst the CRH, serotonergic, dopaminergic and GABAergic systems are important for determining the final behavioural output. CRH is believed to be the primary activator of the hypothalamic-pituitary-interrenal axis in fish, and as such is likely to play a central role during the stress response. The secretion of serotonin, dopamine, and GABA is also significantly altered during the stress response. Therefore, we hypothesise that CRH may co-ordinate both the behavioural and physiological changes observed during the stress response in fish by interaction with a number of neurocrine systems.

To investigate whether the activating effects of CRH noted above might have adaptive value during the stress response we tested experimentally the preference of fish for light or dark and their ability to find cover following ICV injections of CRH or saline. The behaviour of fish during the light/dark preference experiments was complex although fish injected with CRH did spend less time in the dark. However, we think that this may be due primarily to increased activity alone. Recently, we found that the ability of fish to find cover following a stressor was significantly reduced in fish that had received an injection of the CRH antagonist, ∀-helical CRH. This suggests that during the stress response endogenous CRH may be important for reducing the likelihood of predation by facilitating cover seeking.