**Toxicity in Aquatic Environments – The Cocktail Effect**

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Anthropogenically sourced chemicals are commonly released into aquatic habitats where they can have a multitude of detrimental impacts on organisms and ecosystems. Aquatic toxicants typically exert impacts through perturbation of physiological function; however, these effects can vary greatly depending on the life stage and environment of the organism. Using a case study approach, this chapter will explore the interactions that development and environment may have on observed toxicity, with a particular emphasis on the physiological underpinnings that result in toxicity. This will include examining how toxicity can vary across developmental stages and environments, and also how sub-lethal toxicity can impact the ability of organisms to perform and cope with typical environmental stressors, such as hypoxia. We will first examine how aquatic toxicants can have very different effects and sensitivities depending on the life stage of the affected organism. To highlight these differential responses across development we will use examples of neuroendocrine disruption in fish and amphibians, which can have a suite of impacts including altered developmental progression, sexual differentiation and reproduction, as well as disrupting the basic function of the endocrine stress axis. Through the lens of the biotic ligand model, we will then explore how different environments can impact metal toxicity and how these factors can dramatically alter the fitness consequences to a wide array of aquatic organisms. Finally, we will use polycyclic aromatic hydrocarbon toxicity to demonstrate that even transient exposure to toxicants at various life stages can have persistent physiological consequences that can hamper an organism’s performance and ability to cope with environmental challenges. Specifically, we will use embryonic fish models to demonstrate how transient exposure to polycyclic aromatic hydrocarbons can result in cardiorespiratory perturbations that can have long lasting physiological consequences for individuals that range from mortality to reduced physiological performance.