**The genetic basis for chemical tolerance in a wild population of the estuarine fish, *Fundulus heteroclitus*.**

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Wild populations of the killifish *Fundulus heteroclitus* residing in heavily contaminated North American Atlantic coast estuaries have recently and independently evolved dramatic, heritable, and adaptive polychlorinated biphenyl (PCB) tolerance. However, currently available genomic tools limit our ability to characterize the genetic and biochemical mechanisms associated with PCB tolerance in this species. We are using a Quantitative Trait Loci (QTL) approach to reveal the genetic basis for PCB tolerance in one of these populations residing in a highly PCB-contaminated estuary, New Bedford (NB), MA, US. We employed a classic breeding design to partition genes associated with PCB tolerance among progeny crossed between NB and a PCB sensitive fish population from Block Island (BI), RI, US, whose embryos are >1800 times more sensitive to PCBs than those from NB. Recombinant F2 embryos were exposed to an intermediate concentration of PCB126 and phenotyped for sensitivity. Approximately 200, fully informative, co-dominant molecular markers have been identified and embryonic fish representing discordant phenotypes are currently being genotyped. We have also developed SNP (single nucleotide polymorphism) markers in 40 genes associated with the aryl hydrocarbon receptor (AHR) putative target pathway which are being screened for mapping utility. A one-dimensional single marker analysis with an early data set (50 markers) suggests the presence of at least one highly significant QTL ($P < 0.000$). Three additional markers (including AHR2) with marginal support co-segregate with PCB sensitivity. In addition to revealing mechanisms of PCB toxicity and tolerance, this study demonstrates how genomic approaches can facilitate the exploration of stress response and evolved adaptive differences among wild populations.

Purpose Statement:

The purpose of this research is to gain a better understanding of the genetic and biochemical mechanisms underlying PCB tolerance in the Atlantic killifish, *Fundulus heteroclitus*. In addition, it demonstrates the value of genomic tools to explore molecular mechanisms of stress response and evolved adaptive differences among wild populations.

Keywords:
PCB tolerance; *Fundulus heteroclitus*; QTL analysis