

Our Current State of Knowledge

Regarding Chronic Chemical Exposure and Genetic Selection in Teleosts.

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Historically biomarkers for specific endpoints related to a specific chemical of concern (COC) have been used to determine if these endpoints are significantly altered from reference locations. Often there was no significant difference due in part to the organisms inhabiting these impacted areas over time developing compensatory mechanisms to the stressor. Those organisms unable to compensate are generally lost from these communities or are severely reduced in numbers. A series of recent papers have begun to elucidate how chronic chemical selection pressures can result in permanent genetic changes at a far faster rate than traditional evolutionary processes (Reid et al. 2016 doi.10.1126/science.aah 4993, Whitehead et al. 2017. doi 10.1111/eva12470, Wirgin et al., 2011 doi10.1126/science 1197296). These papers build upon a large literature base that has reported the development of resistance to populations of teleosts (*F. heteroclitus*/Tomcod) to PAHs, PCBs and 2,3,7,8-substituted Dioxins along the eastern seaboard. With the advancement of genomics and meta data analysis has allowed for a more in-depth examination than has previously been possible. The results from these papers demonstrate that even in a mixture environment that a genetic “fingerprint” can be teased out from these populations and used as genetic biomarkers to proportionate COCs impacts. The characteristics of populations that might be conducive to this type of genetic and biomarker assessment will be discussed.