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Assessment of wastewater treatment plant effluent on fish reproduction

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Wastewater treatment plant (WWTP) effluents are known contributors of chemical mixtures into the environment. Of particular concern are endocrine-disrupting compounds that can affect hypothalamic-pituitary-gonadal axis function in exposed organisms. The present study examined the reproductive effects of exposure to a historically estrogenic WWTP effluent. A 21-d reproduction study using fathead minnows was conducted on-site at a WWTP using a continuous flow-through system, delivering final effluent in real-time. Fathead minnow breeding pairs were exposed to control water and three effluent dilutions (5%, 20%, and 100%). Molecular and biochemical endpoints representing key events along adverse outcome pathways linking estrogen receptor activation, and other molecular initiating events, to reproductive impairment were examined. Seven-day composite effluent samples were collected for analytical chemistry and in vitro bioassays. Chemistry results were used to construct a chemical-gene interaction network to aid in targeted gene expression analyses examining additional potentially impacted pathways. Results indicate that cumulative fecundity was significantly reduced in fish exposed to 100% effluent and increased in 20% effluent, the approximate dilution factor in surrounding waters. Male vitellogenin concentrations increased in a dose-dependent manner with effluent dilution. The results provide insights into the significance of pathway-based effects with regard to predicting adverse reproductive outcomes. *The contents of this presentation do not constitute official EPA policy.*

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