

REPRODUCTIVE DISRUPTION OF FISHES BY AN ENDOCRINE-ACTIVE WASTEWATER EFFLUENT

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ABSTRACT: The city of Boulder discharges its wastewater treatment plant (WWTP) effluent into Boulder Creek. This effluent contains detectable levels of biogenic steroidal estrogens, synthetic steroidal estrogens, and synthetic non-steroidal estrogens. White suckers (*Catostomus commersoni*) were collected from the WWTP outfall and from upstream reference sites. Gonadal intersex was identified in downstream white suckers but not in reference white suckers. The sex ratio was skewed in favor of females at downstream sites, with males half as abundant than at reference sites. Downstream male white suckers had decreased testicular sperm abundance and significantly elevated plasma vitellogenin; downstream females had a smaller GSI and an asynchronous pattern of ovarian follicular development. To determine whether this reproductive disruption was attributable to endocrine-active wastewater contaminants, we exposed adult male fathead minnows (*Pimephales promelas*) to either Boulder Creek water (Reference), 100% Effluent, or a 50/50 mixture of Reference and 100% Effluent (50% Effluent). Fish were maintained under stimulatory environmental conditions for up to 28 days on-site within a mobile flow-through exposure laboratory. Primary and secondary sex characters were rapidly demasculinized upon exposure to 50%- and 100%-effluent. Within 14-days of exposure, males exposed to 50%- and 100%-effluent had significantly fewer and less prominent nuptial tubercles, significantly less prominent dorsal fat pads, and decreased abundance of sperm within the testes. Vitellogenin was maximally elevated in both 50%- and 100%-effluent treatments within 7 days, consistent with the hypothesis that the reproductive disruption observed is likely due to endocrine-active wastewater contaminants.

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