



# Laurentian SETAC



Laurentian Chapter of the Society of  
Environmental Toxicology and Chemistry

## GTA and Southern Ontario Virtual Pub Night

**“The effects of paternal  
exposure to pharmaceuticals on offspring  
reproductive health in zebrafish.”**

**Dr. Shumaila Fraz  
McMaster University**

- When:** Wed June 17<sup>th</sup> 2020 , 7:00 p.m. – 8:30 p.m.  
**Where:** ONLINE via Zoom! Meeting ID: 443 480 4987  
**Cost:** Free!  
**RSVP:** Please RSVP to get the password!

Join us for an engaging talk from the comfort of your own living room and hey, grab a cold drink while you're at it!

Please RSVP to [Trudy Watson-Leung](mailto:Trudy.WatsonLeung@Ontario.ca)  
[[Trudy.WatsonLeung@Ontario.ca](mailto:Trudy.WatsonLeung@Ontario.ca)]

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# Abstract

Chronic, low concentration chemical exposures may have both direct health outcomes on adults and indirect effects on their offspring. Using zebrafish, we have examined the impacts of carbamazepine (a common pharmaceutical contaminant), on reproductive output and a suite of male reproductive endpoints (aggression, courtship behaviour, 11-ketotestosterone levels, sperm morphology, sperm motility). Fish were exposed for 6 weeks to 10 µg/L of carbamazepine prior to assessment of reproductive endpoints. Our studies have examined the direct effects of carbamazepine on the parental fish and found decreased reproductive output, lower 11-ketotestosterone levels, altered behaviour, and sperm morphology. The reproductive effects of carbamazepine on the parental generation have been consistent and repeatable across several experimental exposures. Offspring were generated in four different lines from crosses with both parents unexposed, both parents exposed, or with only one parent exposed to distinguish between maternal and paternal effects on offspring reproductive endpoints. The impacts were the result of parental exposure because the offspring were reared to the F4 generation in clean water; F1 embryos could only have been exposed via maternal deposition into the yolk. We found that paternal exposure was most important for offspring reproductive health; offspring from crossing exposed mothers and unexposed fathers did not show significant effects. This rules out maternal deposition as an important exposure scenario for the F1 embryos. Yet, reproductive output was lower in crosses with an exposed father, supporting the notion that paternal exposure was impacting offspring health. The effects of paternal carbamazepine were evident into the F4 generation, suggesting transgenerational effects. Considering that carbamazepine is a histone deacetylase inhibitor in mammals, the effects of carbamazepine are likely via an epigenetic mechanism. Recent studies in zebrafish support the role of the sperm epigenome in early development stages and major reprogramming events. Collectively, our data suggest that paternal exposures are strongly relevant to offspring reproduction and male reproductive health in fish.