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## Investigation of toxic effects of water disinfection by-products on zebrafish by toxicological tests and gene expression analysis

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Water disinfection is used to reduce pathogens in drinking water, however, disinfectants react with compounds naturally present in water (organic material) and produce disinfection by-products. The aim of this study was to investigate the toxic effects of a water disinfection byproduct, 3-amino-9 ethylcarbazole (3A9EC). First, acute and sub-chronic toxic effects of 3A9EC were tested by a modified OECD 236 protocol. At the end of exposure lethality values ( $LC_{50}$  and  $LC_{10}$ ) were determined for embryos. Subsequently, early-life stage test (OECD 210) was conducted to study the lethal and sub-lethal effects of 3A9EC on the early development of zebrafish. Embryos were exposed to five test concentrations (2 mg/l, 1 mg/l, 0.5 mg/l, 0.25 mg/l, 0.125 mg/l) below the 72h  $LC_{10}$  ( $2.154 \pm 0.254$  mg/l) of the acute test. Fish could only survive in the two lowest test concentrations, showing developmental malfunctions, size and weight differences and depigmentation compared to the control group. To observe toxic effects on the vascular and nervous system as well as on the liver, 3A9EC was tested on three transgenic zebrafish lines (nestin:RFP, neu:GFP; fli1:GFP, gata1:RFP; wt1b:GFP). Organ malfunctions and failures were observed in all examined transgenic lines. Samples were taken three times in the early life stage test for gene expression analyses to study the genes that could have a role in the development of adverse effect exerted on the examined organs. In the case of the nervous system, all examined genes ( $\alpha 1T$ , *gap43*, *ngn1*, *gfap*, *elavl3*, *syn2a*, *mbp*) showed downregulation in the qRT-PCR analysis. In the vascular system, three observed genes showed downregulation (*Fli-1*, *HIF1a*, *notch1a*) and three genes were upregulated (*A2a.1*, *A2a.2*, *A2b*). In liver two genes were down- (*gpx4b*, *got2a*) and two were upregulated (*mknk2b*, *scd*). Results show that 3A9EC may be potentially harmful to living organisms including humans, however further experiments are needed.

### Biography

Erna Balogh is a third-year PhD student at the Department of Aquaculture of Szent István University in Hungary. She deals with molecular genetics and toxicology. She is part of the Zebrafish Ecotoxicological group. She has an expert in gene expression analysis. The title of her thesis is "Investigation of effects caused by water disinfection by-product on zebrafish using toxicological tests and molecular biological methods". She is a member of the Hungarian toxicologist company.

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