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Developmental and reproductive toxicity of natural mixtures of POPs in Zebrafish

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Persistent organic pollutants (POPs) occur as mixtures in the environment and there are huge gaps in knowledge on which agents occur in real-life mixtures, at which levels they exert toxicity and about the possible mechanisms of action.

Important advantages using zebrafish as a model to study developmental toxicology include small size, low cost, easy to breed, short generation interval, external fertilization, transparent embryos and well characterized early development.

In the present project, zebrafish was exposed via the fodder to 2 different natural mixtures of POPs (PCBs, DDTs, brominated flame retardants), extracted from burbot liver oil. One group was exposed to a mixture from Lake Losna (low levels), three groups were given increasing doses of a mixture from Lake Mjøsa (high levels) and the controls received fodder containing only solvent (acetone).

Preliminary results show that larvae mortality during the first 20 days post fertilisation was significantly higher in the exposed groups compared to controls. The male/female sex ratio and the male weight gain were significantly higher in the fish exposed to both mixtures. Induction of CYP 1A1 was significantly elevated in all exposure groups and histological changes were found in liver and gonads of fish exposed to the mixture from Lake Mjøsa. Gene and protein expression studies on the same material are forthcoming. The concentrations of POPs in the zebrafish were at the same level or lower than in wild fish from Lake Mjøsa suggesting that environmental relevant levels of real-life mixtures may produce developmental and reproductive effects.