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Samuel Türken (ETOX): Additive Effects of PFAS Mixtures on Acute Toxicity and Phenotypic Endpoints in Zebrafish Embryos

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Abstract: "Additive Effects of PFAS Mixtures on Acute Toxicity and Phenotypic Endpoints in Zebrafish Embryos

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Per- and polyfluoroalkyl substances (PFAS) are synthetic organic chemicals linked to adverse human health and environmental effects. While many studies have examined individual PFAS toxicity in model organisms such as zebrafish, fewer have investigated mixture effects. To assess potential mixture interactions, we applied two classical modeling approaches—concentration addition (CA) and independent action (IA)—to evaluate single and combined exposures of PFOS, PFHxS, PFOA, PFNA, PFDA, and PFUnDA. One mixture was designed for equal toxicity (LC_{25}) using CA modeling, while another reflected environmentally relevant ratios found in Scandinavian populations. Zebrafish embryos were exposed from 0-5 days post fertilization (dpf) to individual PFAS or mixtures at varying concentrations. Acute toxicity and phenotypic abnormalities were assessed.

Our findings demonstrate that PFAS mixtures produce developmental effects in zebrafish, with toxicity largely explained by additive interactions. These results underscore the importance of considering mixture effects in PFAS risk assessment.

Future Directions: To further elucidate the toxicogenomic mechanisms underlying PFAS mixture toxicity, an upcoming study will compare the transcriptomic responses of individual PFAS and their mixtures using mixture modeling approaches for gene expression data."

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