A behavioural analysis and differential proteomics approach to study effects of pharmaceuticals in the zebrafish

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Pharmaceuticals are widely used by humans, for food production or for veterinary purposes, but they may also enter the environment. However, many pharmaceuticals (if not all) have unknown mode of actions in the different environmental niches. Especially neuro-active drugs are of particular concern when acting on non-target species as the neural system is essential for the regulation of various physiological processes and behaviours. Studying altered zebrafish behaviour as a consequence of exposure to defined pharmaceuticals and subsequent monitoring of molecular changes, allows obtaining mechanistic and functional insights underlying aversive physiological and behavioural effects of pharmaceuticals. In this respect, the zebrafish is also one of the most valid models in ecotoxicological research to study effects of chemical pollutants in aquatic environments, on different levels of complexity or organization.

Upon exposure to selected pharmaceuticals, like the psychoactive drug mianserin, we are assessing the spatiotemporal dynamics of free swimming behaviour using 3D video tracking. Next, by adopting differential proteomics, we aim to reveal mechanistic information of toxicity at the molecular level, or at least aim to provide a picture of (biochemical) pathways that are affected. Doing so, a tandem mass tag (TMT) labelling method was combined with liquid chromatography and tandem mass spectrometry to analyse effects of mianserin. We ultimately aim to integrate affected behavioural parameters with altered biochemical pathways as to provide improved mechanistic insights on the mode of action of defined pharmaceutical compounds.

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