

Organochlorine pesticides: Agrochemicals with potent endocrine-disrupting properties in fish

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ABSTRACT

Organochlorine pesticides (OCPs) are persistent environmental contaminants that act as endocrine disruptors and organ system toxicants. These pesticides (e.g. dichlorodiphenyltrichloroethane (DDT), dieldrin, toxaphene, among others) are ranked as some of the most concerning chemicals for human health. These pesticides (1) act as teratogens, (2) are neuroendocrine disruptors, (3) suppress the immune and reproductive systems, and (4) dysregulate lipids and metabolism. Using a computational approach, we revealed enriched endocrine-related pathways in the Comparative Toxicogenomics Database sensitive to this chemical class, and these included reproduction (gonadotropins, estradiol, androgen, steroid biosynthesis, oxytocin), thyroid hormone, and insulin. Insight from the Tox21 and ToxCast programs confirm that these agrochemicals activate estrogen receptors, androgen receptors, and retinoic acid receptors with relatively high affinity, although differences exist in their potency. We propose an adverse outcome pathway for OCPs toxicity in the fish testis as a novel contribution to further understanding of OCP-induced toxicity. Organochlorine pesticides, due to their persistence and high toxicity to aquatic and terrestrial wildlife as well as humans, remain significant agrochemicals of concern.

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