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INDIVIDUAL AND COMBINED EFFECTS OF TRICLOSAN AND METOLACHLOR ON LEMNA GIBBA

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ABSTRACT: Emerging contaminants such as pharmaceuticals and personal care products (PPCPs) have received increasing attention in the scientific literature due in part to their potential toxicity to aquatic biota. Historically, the impacts of pesticides, another group of compounds designed with biological activities, on aquatic ecosystems have received more intensive study than PPCPs. Widespread and persistent use of pesticides and PPCPs validates the presumption that they may co-occur in aquatic systems, thus leading to potential combined effects. The present study investigated the individual and combined toxicity of triclosan, a chlorinated biphenyl ether used as an antimicrobial disinfectant agent in a variety of consumer products, and a heavily used chloroacetamide herbicide, metolachlor, to Lemna gibba, a floating nonrooted macrophyte that is commonly used as a model to assess aquatic hazards to higher plants. Each compound targets fatty acid biosynthesis; specifically, triclosan inhibits enoyl-acyl carrier protein reductase and metolachlor targets acyl-CoA elongase enzymes. Following a 7 d static renewal exposure to triclosan, the L. gibba median effective concentrations (EC50) for wet mass, frond number, and chlorophyll a were 66.8, 77.6, and 129.4 ìg/L, respectively. A similar 7 d study was performed with metolachlor; EC50s for wet mass, frond number, and chlorophyll a were 36.6, 72.0, and 36.3 ìg/L, respectively. Ongoing studies are exploring the combined toxicity of triclosan and metolachlor. Because co-occurrence is expected to exist across a range of environmental conditions, future studies will explore the interactive effects of nutrient gradients to the toxicity of this particular mixture to L. gibba. In particular, mixture toxicity will be assessed under a stoichiometric range of nitrogen and phosphorous ratios, representative of environmental concentrations at which these compounds are expected to co-occur.

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