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Agricultural Organochlorine Pesticides Residues In Surface And Groundwaters of the Negro River Basin (North Patagonia)

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Abstract

In the present research, we studied the occurrence of a total of 16 organochloride pesticides (OCs) forbidden by the Convention, including α -HCH, β -HCH, γ -HCH, δ -HCH, heptachlor, aldrin, heptachlor epoxide, dieldrin, endrin, endrin aldehyde, pp'-DDT, pp'-DDE, and pp'-DDD, as well as endosulfan and its metabolites (α -endosulfan, β -endosulfan, endosulfan sulfate) in the surface and ground waters of the Negro River basin in seven sites with different land uses. Our results concluded that the physicochemical parameters determined that groundwater was unsuitable for human consumption due to high pH and low DO. The mean value of the sum of the concentrations of the OCs analyzed for dissolved pesticides in groundwater samples was 2.35 ng L⁻¹, and only aldrin was detected at the outlet of the river area in the order of 5.44 ng L⁻¹. In contrast, no pesticides were detected in waters characterized by mixing processes with seawater. As a result, chlorinated cyclodiene insecticides, like heptachlor, β -endosulfan, and aldrin, were detected in groundwater samples. Only aldrin was detected in the surface waters of one site (the river outlet). However, most of these samples' OCs were <DL. Some OCPs (aldrin, heptachlor, and β -endosulfan) could have entered the groundwater through the filtration of layers of sand, clay, and adjacent strata. These OCPs might come from local agriculture and horticultural practices in the most productive area of Patagonia. Aldrin and β -endosulfan were the most frequent OCPs in all the sites, except for the estuarine waters, where all OCPs were <DL, probably because of a dilution factor. The PCA analysis showed endosulfans and heptachlors better-explained groundwater samples and cyclodienes surface waters. The correlations between the physicochemical parameters of groundwaters and β -endosulfan might imply that this chemical comes from recent applications in the area. Health risk assessments demonstrated that groundwaters might not pose carcinogenic risks, but aldrin values were above the recommendations for drinking waters, and these values should be further monitored. Nonetheless, chronic exposure to these contaminants might still be risky for human health. Thus, the anthropogenic contaminants are associated with the geographical locations of wells and economic activities. Therefore, future review policy options or management could be necessary to protect the aquifer and the river used as a water source for local communities.