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Contamination of organochlorine pesticides in the soils of the Campania Plain, Italy

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For the last several decades, organochlorine pesticides (OCPs) have been introduced into the environment through anthropogenic activity. Due to their volatility and persistence, OCPs may undergo long-range atmospheric transport and, as a result, can be redistributed globally. Exposure to OCPs can pose serious health risks, including certain cancers, birth defects, respiratory illness, dysfunctional reproductive and immune systems, greater susceptibility to disease and damages to the central and peripheral nervous systems. To date, only a handful of studies, have reported the OCPs contamination level in water, sediment and organisms in the Campania Region, however a regional study of the soil contamination is still lacking.

In our study, the distribution, inventory and potential risk of OCPs, including Hexachlorocyclohexanes (HCHs) and Dichlorodiphenyltrichloroethanes (DDTs), and their correlation with environmental and anthropological factors were investigated in soils of the Campania Plain. The specific objectives of this study were to (I) investigate the residual levels, distribution and possible sources of legacy OCPs, and further estimate their mass inventories in soils of the Campania Plain, (II) analyze the impact of soil properties on contaminant distribution, and (III) evaluate the potential ecological and health risks of OCPs.

The total concentrations of HCHs and DDTs has a geometric mean (GM) of 0.05 ng/g, and 14.4 ng/g, respectively. The significant difference in spatial variations of OCPs (Kruskal-Wallis test, $P<0.05$) was observed in the Campania Plain. Two specific areas exhibited higher concentrations of OCP residues: one situated in the Acerra-Marigliano conurbation with elevated HCHs and DDTs; and the other in the Sarno River basin which contains elevated levels of DDTs. The recent application of technical HCHs and DDTs in large quantities appears unlikely in light of the ratio of α-HCH/β-HCH and p,p'-DDT/p,p'-DDE, and the prohibition of the use of HCHs and DDTs in Italy nearly forty years ago. A significant positive correlation was observed between DDT residues and organic carbon suggesting a typical "secondary distribution" pattern. Based on Monte Carlo simulations, the mass inventories of legacy OCPs in soils of the Campania Plain were estimated to have a geometric mean of 17.3 metric tons.