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Urban biocide pollution rivals that of agricultural pesticides

Pesticides and biocides can cause serious harm to aquatic ecosystems. A study by Swiss researchers has found that the levels of some common biocides and pesticides entering wastewater and rivers from urban environments are similar to those of pesticides from agricultural land. Although smaller quantities are used in urban areas, similar total amounts escaped into surface waters.

Biocides and pesticides are both used to control unwanted or harmful organisms. Biocides can be used to kill algae and mould in domestic and industrial uses and are often found in products such as cosmetics and paints. Pesticides are largely used in agricultural settings to protect plants, i.e. to control harmful organisms including weeds but are also used in urban areas. The results of this study suggest that efforts to control pesticide and biocide pollution must give greater consideration to urban areas as a potential source of biocidal and pesticidal pollutants. However, the different patterns of pollution from urban and agricultural environments mean that no single control strategy would be effective.

To quantify the contribution of urban and agricultural areas to biocide and pesticide pollution, the researchers examined a complete river catchment area on the Swiss plateau, an area of 25 km^2, with 12,000 inhabitants and 470 hectares of crops. They asked local farmers for information on pesticide use, to establish how much pesticide was applied to 95 per cent of the agricultural land in the catchment area. Collecting data for urban areas was more difficult, so the researchers estimated pesticide and biocide usage based on surveys of local people and national consumption figures. They also sampled water from rivers leaving four clearly defined sub-catchment areas, from the catchment as a whole, and from the urban drainage system.

The information revealed that pesticide use in agricultural areas tended to exceed biocide and pesticide use in urban areas. Agricultural pesticide use varied from 1.6 to 106 kilograms per chemical, while urban biocide use was in the range of 4.6 to 73 kilograms per chemical for the period of study in the whole catchment area. However, when they looked at the amounts of the various pesticides and biocides that were in water leaving the catchment, they found that quantities of some of the chemicals from urban areas were as high as some from agricultural land, despite lower use.

By calculating the rate of loss of each chemical the researchers could demonstrate that a higher proportion of biocides and pesticides from urban areas entered the waterways. Urban loss rates varied from 0.6 to 15 per cent, while agricultural losses were an order of magnitude smaller; just 0.4 to 0.9 per cent.

The researchers also looked at the effect of rainfall on pollution rates. Levels of agricultural pesticides in surface water increased when it rained, but only for up to one or two months after crops had been treated. In contrast, chemicals used in urban areas followed two distinct patterns. Several were found to increase in concentration in surface water following rainfall throughout the year, e.g. diuron, as used in paints, which was most likely washed away from building facades. For other chemicals, such as the fungicide carbendazim, rain had little impact on loss rates, suggesting that they are used indoors.

The results highlight the need for a range of strategies to tackle biocide and pesticide loss from both urban and agricultural land. Not only are urban environments a significant source of water pollution, but the patterns of pollution are different. The researchers suggest that strategies to tackle this would include additional treatment steps at wastewater treatment works, reduction measures at source or even banning some pesticides and biocides.

Source: Wittmer, I.K., Scheidegger, R., Bader, H.-P., Singer, H., Stamm, C. (2011) Loss rates of urban biocides can exceed those of agricultural pesticides. *Science of the Total Environment*. 409: 920-932.

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