When one pollutant splits on the other: Plastic pellet pollutants used to measure organic pollutants in coastal waters

In an ironic twist and another innovation in the monitoring of pollutants in coastal waters, scientists are using one form of pollution to measure another. Small, plastic resin pellets that unintentionally end up in the environment as a result of plastic manufacturing are proving to be a useful medium for monitoring persistent organic pollutants - and a valuable supplement to the traditional measurements undertaken in water, sediment and biomonitors such as mussels.

Picking up pellets

CSIR researchers, Tim McClurg and Steven Weerts, who collected and sent pellets from beaches in Durban and Maputo to the leader of the project, Hideshige Takada of the Tokyo University of Agriculture and Technology, explain how these plastic pellets serve as a monitoring medium. "Plastic resin pellets are small spherical granules (mostly less than 5 mm in diameter) that are used as a feedstock in the manufacture of plastic goods. They may be unintentionally released to the environment during transport and are commonly present in the vicinities of plastics manufacturing plants. Pellets are inevitably washed into the oceans where they may persist for many years. They are found on beaches all over the world. The plastic material promotes the accumulation of hydrophobic contaminants (contaminants that tend to repel and not absorb water) from the surrounding seawater. The pellets are, in effect, 'passive samplers' and over time tend to accumulate burdens of contaminants that bear a relationship with ambient concentrations."

The International Pellet Watch Project started in 2006, and appealed to people around the world to collect plastic resin pellets from beaches and send them to the Tokyo-based laboratory via airmail. Unlike the use of mussels, shipment proved to be simple, with no cooling or freezing required. With the results correlating positively with data from mussel watch programmes, researchers are encouraged that plastic pellets can play a useful role in the monitoring of persistent organic pollutants in coastal waters.

A research paper presenting the results of the initial study has been published in *Marine Pollution Bulletin*. The findings are based on samples of polyethylene pellets from 30 beaches in 17 countries, with approximately 100 pellets collected from every beach. The results show that polychlorinated biphenyls (PCB) concentrations in the pellets were highest on US coasts, followed by western Europe and Japan. As might be expected, lower values were recorded in tropical Asia, southern Africa and Australia. High concentrations of Dichlorodiphenyltrichloroethane or DDT, one of the most well-known synthetic pesticides, were found on the US west coast and in Vietnam. The principal source of the latter may be the current usage of the pesticide for malaria control. Of particular interest from the southern African perspective were the relatively high concentrations of gamma-hexachlorocyclohexane (HCH) that were detected in pellets collected near Maputo and Durban.

McClurg says the higher concentrations of HCH (also known as Lindane) were remarkable, but not

altogether unexpected, as Lindane has been commonly used as an agricultural insecticide, and in pest control, throughout southern Africa over many years. He added that this trend is likely to reverse following recent moves to impose a global ban on the manufacture and use of Lindane.

Public can help

Weerts says that the project was continuing and emphasised that interested individuals could contribute by submitting samples of pellets. These can often be found among the debris stranded by a high tide. About 100 pellets are required from each site. These can be posted in an ordinary envelope to the CSIR's Durban office and will be sent to Japan for analysis. It is important that the location and date of collection be clearly indicated. Samples from the country's south and west coasts would be particularly welcome.

He remarks that it was "in a sense, ironic that we are using something that should not be in our waters, to monitor other unwanted pollutants. With plastic production increasing by 8% per year, plastic pellets can be expected to become more ubiquitous in our oceans. There is some consolation in the fact that they may be able to play a positive role." Weerts and McClurg are quick to point out that they are not involved in the analysis of the samples. "We are simply acting as agents, but also have a strong vested interest in the project. Marine pollution is a global problem. A broader understanding of the 'big picture' will enhance our ability to monitor local marine pollution more effectively."

- Alida Britz