

ENDOCRINE DISRUPTING CHEMICALS

Worldwide, there is growing concern over the potential effects of endocrine disrupting chemicals (EDCs). EDCs are man-made chemicals found in, for example, pesticides, fertilizers, personal care products, heavy metals, industrial chemicals and pharmaceuticals (especially birth control). These chemicals have an adverse effect on the endocrine system of living organisms, including humans.

Protecting the environment against harmful chemicals

Potential threat

The endocrine or hormonal systems of a body regulates and controls virtually all living processes such as reproduction, growth and development, metabolism and resistance to disease. EDCs mimic some of the normal hormones and may disrupt or modify the normal function of natural hormones, resulting in adverse effects of the hormone function. The male reproductive system is especially vulnerable to exposure to these chemicals. The thyroid system, nervous systems and the immune system might also be affected.

At the top of the food chain the aquatic species are particularly vulnerable, but effects have also been

observed in terrestrial species. Since the 1990s, researchers all over the world have warned that the environmental load of EDCs has reached critical levels at which wildlife is at risk.

In recent years, EDCs have been found in water bodies all over the world, including South Africa.

According to the World Health Organisation, ingesting food containing EDCs, for example fish, is a major exposure route, and may lead to bioaccumulation and biomagnification. (Fish-eating birds, for example, have been found to have concentrations of EDCs many times higher than those found in fish on which they feed, or compared with levels in the surrounding waters).

Coordinated research

Little is still known of the extent to which these chemicals occur globally as well as in South African waters. To improve local scientific understanding of EDCs, the WRC coordinated a multi-year research programme, involving all researchers and other roleplayers, such as government departments and water suppliers.

A development plan was drawn up to investigate the extent of EDCs in South African water systems. A list of priority compounds to be investigated was compiled, analytical methods for determining EDC activity and levels of individual EDC compounds were evaluated and tested. In addition, a survey of laboratory capability and capacity was conducted.

Several selected sites were then surveyed, including dam and river systems within the Rietvlei Nature Reserve, in Gauteng, and the Eerste River, in the Western Cape, Makati Flats, in KwaZulu-Natal, Vaal River Barrage and Hartebeestpoort Dam. The programme went a long way in building capacity at the research facilities for activity testing as well as chemical analysis.

Findings

The first surveillance research projects confirmed the presence of EDCs, such as hormones, industrial compounds and pesticides (including DDT), in South Africa's water systems.

Based on the outcome, the next in-depth study was then undertaken on the Rietvlei Nature Reserve. The investigations covered fish, amphibians, snails, and small and large mammals.

The study concluded that wildlife in the area is already affected. Wildlife exposure seems to manifest in feminisation of fish and amphibian species, and on conditions such as intersex (forming of eggs in the testes) and even abnormalities in limb development.

The novel finding of abnormalities in Eland testes may be the first evidence that terrestrial wildlife are also being impacted by environmental pollution of EDCs in South Africa.

No method is yet available to calculate the long-term risk of EDCs on South African ecosystems. However, the findings in Rietvlei, including high chemical residue levels in water, sediment and tissue, skewed sex ratios, reduced biodiversity, gonadal malformations in fish, snails, mice and eland fat and lesions in the testes, are a matter of concern. *It is highly unlikely, if at all possible, that such diversity of effects in a range of bio-sentinel animals, could be coincidental.*

Recommendations

Conventionally treated water remains relatively free of EDC. However, it must be recognised that a large percentage of the population still remains dependent on untreated water for streams and rivers. They are, therefore, exposed to these chemicals.

A health risk assessment for known carcinogenic and toxic effects indicated that if untreated water from the dams in the Rietvlei Nature Reserve is used for domestic purposes or irrigation, health risks could be anticipated.

Action therefore needs to be taken by authorities and water suppliers to limit the deposit or dumping of EDCs in the environment, especially near water resources.