Contamination of the aquatic environment by pharmaceutical drugs used in human and veterinary medicine is an emerging issue, as it can cause toxic effects in biological systems. This study explored how the marine organism *Hediste diversicolor*, a polychaete worm, responded to exposure to salicylic acid, a key component of aspirin. They found the species to adapt and respond in a way that minimised the effects of metabolising the contaminating compound, suggesting that the acid does not currently pose a threat to marine polychaetes.

The arrival of pharmaceutical drugs into our waters is almost inevitable, via means such as the release of raw and treated sewage, animal excretion and manure use, and improper disposal of expired medication. Many human activities cause pharmaceutical drugs to enter aquatic ecosystems, where they may exert toxic effects on the organisms present. This is problematic, as drugs are designed to have a specific action within an organism, have properties that allow them to cross biological barriers, and are especially persistent, leading to a build-up within an organism.

One compound of particular concern is salicylic acid (SA), the active metabolite of acetylsalicylic acid (ASA), which is the active substance commonly known as aspirin. Aspirin is widely used, with an estimated 40 000 tons — or 120 billion tablets — consumed per year, and is thus often found in aquatic areas across the world. SA may disturb biological systems and interact with specifics enzymes in a way that causes toxic effects, such as oxidative stress, which can lead to tissue and liver damage. Such damage has been seen in freshwater organisms, including crustaceans and fish, and it is thought that many living organisms could potentially be affected by environmental exposure to these compounds.

This study explored the potential toxic effects of SA towards the ragworm (*Polychaeta Hediste diversicolor*), a sediment-dwelling marine organism frequently found along European and North American coasts and in lagoons from Europe to Africa. This species is tolerant of environmental extremes (such as salinity and temperature), and can grow and reproduce under stress, making it a good bio-indicator of the quality of estuarine environments. The species is important economically (as fishing bait) and ecologically (it is a key component of soft-bottom communities, where the seabed consists of fine grain sediments, mud and sand), and its feeding behaviours condition the cycle of nutrients and contaminants in its ecosystem).

As there were previously no studies into the potential effects of SA on Polychaeta species, this study aimed to measure several defensive features ('biomarkers') that frequently are activated in response to chemical insult. The specimens were collected in spring 2016 at the Local Nature Reserve of the Douro Estuary, Portugal, and placed in laboratory quarantine for 10 days. Subsequently, 96 specimens were chosen randomly, and exposed for 96 hours to different concentrations of SA (0.00 (control), 50.0, 75.0, 112.5, 168.75, 253.125 micrograms per litre) — two concentrations were similar to those found in the wild, and three higher. Specimens were then frozen and processed.

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In terms of biomarkers, the researchers explored the activity of a few key enzymes, and determined the amount of damage caused to cell membranes. While they did see signs of low to moderate oxidative stress, they found that SA was not able to generate a full state of oxidative stress in *H. diversicolor*, and caused no damage to cell membranes — overall, the adaptive protective response of the exposed individuals was sufficient to minimise and inhibit the damage caused by the metabolism of SA. As some of the chosen exposure levels were similar to those found in realistic environments, the lack of an acute response suggests that SA does not pose much of a risk towards marine polychaetes at present.

However, the researchers caution that as the specimens were especially responsive and adaptive in their behaviour — with some enzymes becoming notably more active after exposure — polychaetes may be particularly vulnerable to chemical contamination from various anthropogenic substances. Longer-term studies are needed that further explore the effects of SA on aquatic ecosystems, say the researchers, using organisms at lower and higher trophic levels to gain a fuller picture of the compound’s effect on aquatic habitats.


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