

Toxicity of metals from River Deba sediments

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A sampling point located in the middle zone of the Deba catchment, downriver from the town of Bergara (Gipuzkoa, Basque Country, Spain). Credit: Jessica Unda / UPV/EHU

Researchers are studying the contamination of sediments and particulate matter across the River Deba catchment, one of the most affected by discharged waste water in the province of Gipuzkoa. The research is led by Estilita Ruiz-Romera.

A recent study by the group has concluded that "not all the metal contained in the sediments directly affects [human health](#), but that only a fraction of these metals can be incorporated into the human body," explained Jessica Unda, a researcher in the Department of Chemical Engineering and the Environment. In the study, the researchers analysed the bioaccessibility of the metals present in the sediments—in other words, the percentage of metal that can end up diluted in human gastrointestinal fluids.

The researchers simulated in vitro the release of these metals in the gastrointestinal tract: they subjected [sediment samples](#), which had been gathered at locations from the River Deba catchment area in 2011 and 2012, to specific conditions characteristic of the stomach phase and the intestinal phase (conditions in terms of temperatures, enzymes, stomach acids, etc.). According to the conclusions produced by the research, "It is the discharging of urban and industrial [waste water](#) that contributes towards or discharges the more bioaccessible metals," explained Unda. "With respect to temporal variation, we have seen that in some locations, the risk of human toxicity due to bioaccessibility has been reduced" due to the commissioning of the Epele (Arrasate-Mondragon) treatment plant in 2012.

Change in environmental directives

In the study, they compared the results with others obtained through chemical methods and concluded that the physiological method "offers higher results than the chemical methods," which leads them to think that "a more realistic simulation of the conditions of the [gastrointestinal](#)

[tract](#) is more suitable in the bioaccessibility analysis," said Unda. The researchers stress that "European directives should introduce [sediment](#) and the analysis matrix to go a step further. This work set out to emphasise the importance of sediment, because it is a vector that transports these metals. Yet it is a matrix that has been little studied."

The Water Framework Directive stipulates that the ecological quality of a catchment must be determined using the total concentration of the metals in the sediments, "but it is not sufficient to stipulate the level of toxicity of the catchment only through the total concentration of metal in it. It is necessary to analyse a more direct line between the [metal](#) content and human health, which would be by means of bioaccessibility," Unda said.

More information: Jessica Unda-Calvo et al, Chemical and physiological metal bioaccessibility assessment in surface bottom sediments from the Deba River urban catchment: Harmonization of PBET, TCLP and BCR sequential extraction methods, *Ecotoxicology and Environmental Safety* (2017). [DOI: 10.1016/j.ecoenv.2016.12.029](https://doi.org/10.1016/j.ecoenv.2016.12.029)

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