NEWS

Artificial sweetener persists in the environment

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Artificial sweetener persists in the environment

Sucralose, the sugar substitute better known to Canadians and Americans as Splenda, hit Norwegian food markets in 2005. A year later, scientists from the Norwegian Institute for Air Research (NILU) found the chemical to be omnipresent in the environment—in Oslo Fjord and in raw and treated wastewater. Now, scientists in Sweden report finding it completely unchanged in wastewater effluent in Stockholm and elsewhere in Sweden.

The Swedish environmental protection agency (EPA), Naturvårdsverket, commissioned researchers at the Swedish Environmental Research Institute (IVL) to examine surface waters and wastewater effluent for sucralose. The researchers reported in January that samples from both large and small wastewater treatment plants in Sweden had sucralose concentrations of 8 micrograms per liter (μg/L) or more before treatment. Larger plants could decrease sucralose concentrations by 10% at most.

The remaining sludges contained negligible amounts of sucralose, as expected, but that was not the case for effluent. At least one smaller municipal sewage treatment plant released treated effluent containing about 11 μg/L. Downstream, nearby surface waters had sucralose concentrations about 10-fold less, but in some cases, surface waters contained up to 3.5 μg/L.

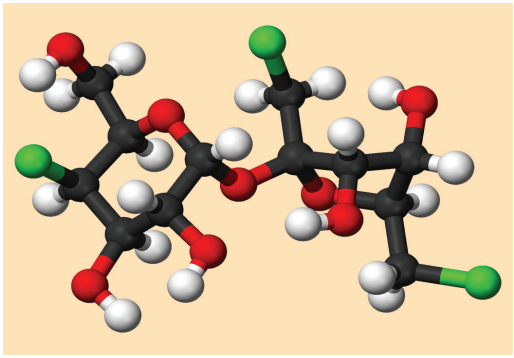
Although sucralose is seemingly harmless to people—humans excrete 98% of it unchanged—it is extremely persistent, with a half-life in water of up to several years, depending on pH and temperature. That persistence makes Henrik Kylin of NILU, one of the scientists who found the compound in Norway, very wary.

In Oslo Fjord, the levels hit 2–7 μg/L in sewage influent and effluent, Kylin reported last May at the Society of Environmental Toxicology and Chemistry Europe meeting in Porto, Portugal. A back-of-the-envelope calculation shows that sales in Norway of one low-calorie soft drink brand alone could account for about half of the measured concentrations.

Because the EU Scientific Committee on Food approved sucralose as safe for human consumption, the sweetener did not have to undergo an environmental review, notes Per Ola Darnerud of the Swedish National Food Administration. Several EU countries, including Sweden, have allowed its use in food products. Canada and the U.S. approved sucralose as a food additive in the 1990s, also without environmental impact assessments. Kylin points out that sucralose would have passed such a review because it does not appear to have toxic effects, nor does it bioaccumulate. "We don't even have test methods for the type of ecosystem effects that would be relevant" to sucralose, Kylin says.

The presence of a sugarlike substance in the environment could change organisms' feeding behaviors, says Kylin. Even more alarming, he says, is the possibility that sucralose could interfere with plant photosynthesis, and that could cause problems for algae—and have the unexpected consequence of shutting down CO_2 uptake.

No one has systematically examined the environmental effects of sucralose, says Kylin. As a follow-up to the monitoring report, the Swedish EPA has started using biological assays with fish and mussels to determine whether any toxicological endpoints can be observed, says Swedish EPA researcher Axel Hullberg. The researchers expect to report their results later this year.



BEN MILLS

Sucralose, an artificial sweetener with 600 times the sweetness of sugar, looks like sucrose. Its two $-CH_2Cl$ groups seemingly should make the chain very reactive, and its breakdown components are chlorinated monosaccharides, 1,6-dichloro-1,6-dideoxy-D-fructose and 4-chloro-4-deoxy-D-galactose, which also have unknown environmental effects.

Tate & Lyle, the inventor of sucralose, sent a statement to *ES&T* noting that the original petitions submitted 20 years ago to European regulatory authorities included environmental impact data. The new report from IVL shows that sucralose passes through sewage treatment plants, the company says, but it provides no indication of environmental impacts. Because the artificial sweetener is not "biologically active," Tate & Lyle notes, "regulatory authorities have already determined that sucralose poses no risk to the environment."

Meanwhile, Darnerud says, Sweden is bringing the issue of persistent food additives of any kind to the table with the EU, which has taken environmental testing under consideration for future products. As for those additives already on the market, there may be "other compounds that could have equal or similar effects, that are not broken down so easily, but that have not been looked at," he comments. The U.S. and Canada have used sucralose for a long time, without any evidence so far of adverse effects to the environment or human health. But perhaps, Darnerud says, that's because no one has looked for those impacts or because they will take decades to appear.

—NAOMI LUBICK