

Some artificial sweeteners are forever chemicals that could be harming aquatic life

July 15 2024, by Matthew Derry and Alan Goddard



Credit: Pixabay/CC0 Public Domain

With so much [health advice](#) to avoid excessive sugar in our diets to reduce risks obesity and tooth decay, some people choose to use artificial sweeteners as an alternative in hot drinks and recipes.

Artificial sweeteners that mimic the composition of sugar can be [made in the lab](#) from carbon, hydrogen and oxygen. Some [reports](#) suggest that [artificial sweeteners](#) directly affect human gut health, but there is currently little [evidence for this](#).

The fate of such sweeteners once they enter our environment is [rarely considered](#). But a [recent study](#) from researchers at the University of Florida shows a commonly used artificial [sweetener](#), [sucralose](#), may have negative effects on our freshwater ecosystems.

This study measured the effect of sucralose (also known as E955), one of the sweeteners approved for use in the UK, on microbes in our [water systems](#). Researchers found the presence of sucralose hindered the growth of blue-green algae (or cyanobacteria) which photosynthesize to produce oxygen, help regulate oxygen levels in the [marine environment](#), and provide a food source for many organisms including fish.

Ingesting sucralose in place of these nutrients means the microbes do not grow, as sucralose cannot be broken down by the enzymes that degrade natural sugars to fuel their metabolism.

In turn, this may have adverse effects up the [food chain](#) and disrupt carefully balanced ecosystems once sucralose is released into our water system and the wider environment. A 2019 study found that the presence of sucralose can cause DNA damage and genetic mutations in [freshwater fish](#) such as carp.

Sweet yet persistent

Artificial sweeteners such as sucralose are not metabolized by the human body so they are excreted—this is what makes them low-calorie sugar alternatives. And that's where the environmental problem begins. Current wastewater treatment plants are unable to remove these sugar

mimics, meaning they end up in our environment—in our water, rivers and soil.

To compound this, sucralose is very hard to break down—it is a persistent pollutant, or "forever chemical." This is because it does not easily undergo bacterial decomposition.

Forever chemicals are increasingly present in our streams, rivers and oceans—most notably per- and polyfluoroalkyl substances ([PFAS](#)) that don't degrade. PFAS are [synthetic chemicals](#) found in many consumer products, including [skincare products](#), [cosmetics](#) and [waterproof clothing](#). PFAS can remain in the human body for many years, and some present significant risks to our health—potentially causing liver damage, thyroid disease, obesity, infertility [and cancer](#).

Artificial sweeteners that persist in our environment act like PFAS because they cannot be broken down. If they cannot be completely avoided, then methods of adequately removing and recovering them from wastewater are urgently required.

These include the use of biomimetic membranes—filtration devices containing naturally occurring proteins that remove contaminants from water. Together with researchers around the world, [we are developing](#) new [bioinspired membranes](#) that mimic biological gateways found in nature. These will be able to selectively extract compounds from water at low pressure with low energy input.

As an example, cells need to take up phosphate to make DNA, but this cannot just cross the fatty membranes that surround all cells. Therefore, special transport proteins exist in the cell membranes, acting as specific "gates" to let phosphate into cells. Bioinspired membranes extract and embed these transport proteins in plastic membranes that can be used to commercially remove phosphate from water in a specific way.

Above all, this research should serve as a reminder that policymakers and water companies need to strive harder to minimize the many sources of chemical pollution that can affect water quality in the environment.

This article is republished from [The Conversation](#) under a Creative Commons license. Read the [original article](#).

Provided by The Conversation

Citation: Some artificial sweeteners are forever chemicals that could be harming aquatic life (2024, July 15) retrieved 16 July 2024 from <https://phys.org/news/2024-07-artificial-sweeteners-chemicals-aquatic-life.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.