

Seaweed, slime and socks: The science behind the suds

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The novel phosphodiesterase enzyme, discovered by a team from Newcastle University, UK, is used by bacteria to unstick themselves from seaweed. The bacteria release an enzyme which breaks down the sticky molecules, naturally present on the seaweed surface. This enzyme is a powerful, new type of natural cleaner, which researchers have found

can be used to help cleaning in other places.

Isolating the enzyme and testing it under a variety of conditions in the lab, the Newcastle team led by Professor Grant Burgess in collaboration with Dr. Michael Hall, found it was not only extremely heat stable—but it also worked at its optimum at low temperatures, as it would in the sea.

The university team worked with leading cleaning products manufacturer Procter & Gamble (P&G) to harness this power of nature and to demonstrate that it could be used to develop more sustainable laundry detergents that work efficiently and effectively at low temperatures.

Dr. Michael Hall, senior lecturer in organic and biological chemistry at Newcastle University and project co-investigator, explained:

"Phosphodiesterases are found everywhere—they are even naturally present on your skin. But what was so exciting about this phosphodiesterase was its resilience. Most enzymes are quite fragile and are damaged by high temperatures, but this one was able to work in both hot and [cold temperatures](#) and still be highly effective."

"Improving cleaning in cold water with more environmentally friendly products requires new breakthrough technology," adds Dr. Neil Lant, lead scientist in global enzyme technology at P&G and visiting lecturer at Newcastle University.

"We have been able to develop this exciting seaweed based discovery into a new ingredient called Purezyme in partnership with biotech supplier Novozymes. We're delighted that the unique new enzyme is now helping our Ariel products achieve even deeper cleaning."

From ships hulls to your washing machine

The enzyme—isolated from a [marine bacterium](#) called *Bacillus licheniformis*—was originally discovered by the Newcastle team in 2010, when they were researching how to clean the hulls of ships.

Grant Burgess, professor of marine biotechnology at Newcastle University, said: "Ships accumulate high levels of slime and other organisms on their hulls, a process called fouling, and this leads to more resistance, higher fuel consumption and can cause corrosion. To combat this, we were keen to understand how marine organisms such as fish, dolphins and seaweed, for example, appear to have solved this fouling problem, as they are good at keeping themselves clean in the sea. Since seaweed was easier to catch, we decided to explore how seaweed can keep itself clean. The key was discovering that some seaweeds are actually covered in bacteria that can release cleaning compounds. While bacteria have the capacity to produce powerful adhesives to stick themselves to surfaces, they also produce an 'anti-glue'—a phosphodiesterase—that can break up sticky molecules. The big surprise was that similar glues are present on dirty clothing where they bind difficult to remove body soils and odors to the fabric. This bacterial [enzyme](#) can break down these glues, and can therefore be used to keep our clothes clean as well, when introduced to laundry detergents. This is a wonderful example of borrowing a cleaning idea from Mother Nature. By studying how a [seaweed](#) keeps itself clean, we can now keep our own socks clean and fresh, while at the same time protecting our environment."

Provided by Newcastle University

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