

Pollution wreaks havoc on corals' immune systems

10 September 2020, by Angela Nicoletti



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Fighting infections is hard. It's even harder for corals also grappling with pollution.

Katherine Dougan, a Ph.D. student in the FIU Institute of Environment, found high levels of nutrients including nitrogen and phosphorous—caused by fertilizer, sewage and other human sources—are actually making it harder for corals to defend themselves against infections. And this is something they have to do a lot to stay healthy and survive.

A normal day on the reef usually results in corals getting roughed up. Fish slam into them while hunting. Sometimes, corals will become prey and get bitten. This is bad, because fish have pretty dirty mouths. Bacteria that's left behind can get into the wound, causing an infection. Corals are usually capable of recovering, though. Special immune proteins immediately get to work, helping close the wound and heal the tissue. Dougan wanted to see whether [pollution](#) was altering this normal, everyday process.

Previous studies have shown common pollutants wreak havoc on coastal ecosystems, causing everything from dead zones that cannot support [marine life](#) to harmful algae blooms. A connection was also made between pollution and high rates of [coral](#) bleaching, bacterial infections and disease spread on reefs. There wasn't specific evidence on why this was happening.

Dougan worked with a collaborative team at UC Santa Barbara to assess the immunity of different coral fragments in the Florida Keys by monitoring immune protein levels before and after they were damaged. Overall, corals in polluted water had lower levels of important immune proteins. The most significant finding, though, was that corals facing pollution had low levels of proteins even before they experienced any sort of damage. This means they can't carry out a process they've been doing for as long as they've lived in the ocean.

"This type of damage from fish is a normal event for coral that has been happening long before us," Dougan said. "Now, the problem is we have created this environment of nutrient pollution that is undermining their ability to carry out their normal immune system function. We're making their job more difficult."

These findings are a cause for concern, especially for coral reefs along the coastlines of developed areas, where [agricultural runoff](#) and [septic tanks](#) are causing major pollution problems.

Marine sciences associate professor Mauricio Rodriguez-Lanetty, who oversees the lab where the research was conducted, says this study is critical in informing important change.

"In order to help corals to improve their tolerance and resistance to pathogens, it is imperative for us to understand how poor-water quality affects the immune capacity of corals to fight disease-causing agents," Rodriguez-Lanetty said. "This should be

part of management top priority to guide control and intervention strategies for coral disease outbreak."

The findings were recently published in *Frontiers in Marine Science*.

More information: Katherine E. Dougan et al. Nutrient Pollution and Predation Differentially Affect Innate Immune Pathways in the Coral *Porites porites*, *Frontiers in Marine Science* (2020). DOI: [10.3389/fmars.2020.563865](https://doi.org/10.3389/fmars.2020.563865)

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