

How corals fight back

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Australian researchers are a step closer to understanding the rapid decline of our coral reefs, thanks to a breakthrough study linking coral immunity with its susceptibility to bleaching and disease.

The discovery was made by Caroline Palmer, Bette Willis and John Bythell, scientists from the Australian Research Council Centre of Excellence for Coral Reef Studies, James Cook University (Queensland) and Newcastle University (UK).

"Understanding the immune system of reef-building corals will help to reduce the impact of coral diseases and environmental stresses," says Caroline Palmer, lead author of the publication. "Potentially, this will enable us to more accurately predict the vulnerability of [coral reefs](#) to disease and bleaching, before there are obvious signs of stress."

"This unique study broadens the limited knowledge we have about the defence systems of corals, which is one of the main challenges facing scientists aiming to protect corals" says Professor Bette Willis, a chief investigator in the ARC CoE for Coral Reef Studies. "Identifying and measuring the immune functions of several different corals allows us to predict which ones are particularly susceptible to stress."

"Variation in levels of immune function among different species is likely dependent on the energy they assign to it. As energy is vital for an effective immune response, corals that utilise energy to grow and reproduce rapidly have less to spare for their immune response," says Caroline Palmer. "These corals, like the staghorns, Acropora, are the

colonies most vulnerable when challenged by temperature stress or disease."

A key element of the coral immune system is melanin production. Melanin, a classic part of immune responses found in invertebrates, also provides a defence against disease-causing organisms in corals. It may also be used to stop harmful UV light from reaching the [symbiotic algae](#) and causing bleaching.

The study of coral immunity will enable scientists to better pre-empt the effects of different stresses on corals. This is important, as by the time physical symptoms become apparent, strategies to mitigate stress effects will be far less valuable.

"Our increased understanding of coral immune systems may therefore be used to address the causes rather than the symptoms of coral declines", says Caroline Palmer. Bette Willis adds: "This approach is necessary particularly given that coral bleaching is similar to having a fever - it's a common sign for many different stresses so it's often difficult to point to any one cause in particular".

Two of the main factors that cause corals to bleach are attacks by disease-causing microbes and temperature stress. It is currently estimated that between three and six per cent of corals in the Great Barrier Reef (GBR) are affected by coral diseases, and up to a third of corals at a given location can be affected by temperature stress in a warm year. Temperature stress is a growing concern due to global warming.

Researchers and reef managers are currently working on strategies to protect vulnerable coral sites. The preventive measures envisioned involve minimising human impacts which might further injure the coral, such as dredging, building construction, pollution, land runoff or damaging corals by boat activity or fishing.

More information: Their paper published in the June issue of the *FASEB Journal*: Palmer CV, Bythell JC, Willis BL (2010) Levels of immunity parameters underpin bleaching and disease susceptibility of reef corals. *FASEB J* 24:1935-1946

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