Acidification affects the ability of bacteria to clean our oceans

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Credit: Tiago Fioreze / Wikipedia

Marine bacteria are heavily influenced by the ongoing ocean acidification caused by human emissions of carbon dioxide. This discovery was made by researchers at Linnaeus University, Sweden, together with researchers in Spain. The results are presented in an article in the recognised scientific journal *Nature Climate Change*.

"It is well known that the acidification of our oceans causes the degradation of coral reefs and disturbs the production of the calcareous shells of important phytoplankton", says Jarone Pinhassi, professor in marine microbiology at Linnaeus University in Kalmar, Sweden. "However, it is new that also bacteria are affected negatively by ocean acidification".

Researchers at Linnaeus University can now show that bacteria in the ocean that are exposed to acidification are forced to significantly alter their metabolism; from focusing on degradation to investing energy on dealing with the acid in the water.

Bacteria in our oceans play a crucial role in the global cycle of elements necessary to life.

They act primarily as degraders of organic material produced by microscopic algae in the ocean, or material released through wastewater. When algae or other organisms die and are degraded by bacteria, these miniscule organisms function as the wastewater treatment plants of the ocean. At the same time, bacteria help release nutrients like nitrogen and phosphorous, which are essential to the food chain.

It is estimated that the world's oceans will become three times more acid towards the end of this century if human emissions of carbon dioxide from combustion of fossil fuels continue at current rates.

"It has generally been assumed that increased concentrations of carbon dioxide in the water – and the ocean acidification this causes – will primarily affect the production of the marine ecosystem by affecting the algal photosynthesis", says Jarone Pinhassi. "Now our genetic analyses show that ocean acidification directly affect how bacteria regulate their metabolism".

In every litre of seawater there are around 1 billion bacterial cells. In a manner similar to how gut microbiota is important to the well-being of humans, bacteria in our oceans play a critical role in determining the health of marine ecosystems. For example, bacteria synthesise vitamins on which algae and other organisms in the oceans depend.

"In order to understand the consequences of future climate change on the productivity of the ocean, it is essential to carry out research on how bacteria respond to human emissions of carbon dioxide", says Jarone Pinhassi. "Perhaps we can even learn how to take advantage of the genetic adaptations of marine bacteria, in order to make better use of the resources of our planet."

More information: Carina Bunse et al. Response of marine bacterioplankton pH homeostasis gene expression to elevated CO2, *Nature Climate Change* (2016). DOI: 10.1038/nclimate2914

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