New bacterium appears to be efficient air purifier in extremely acidic environment

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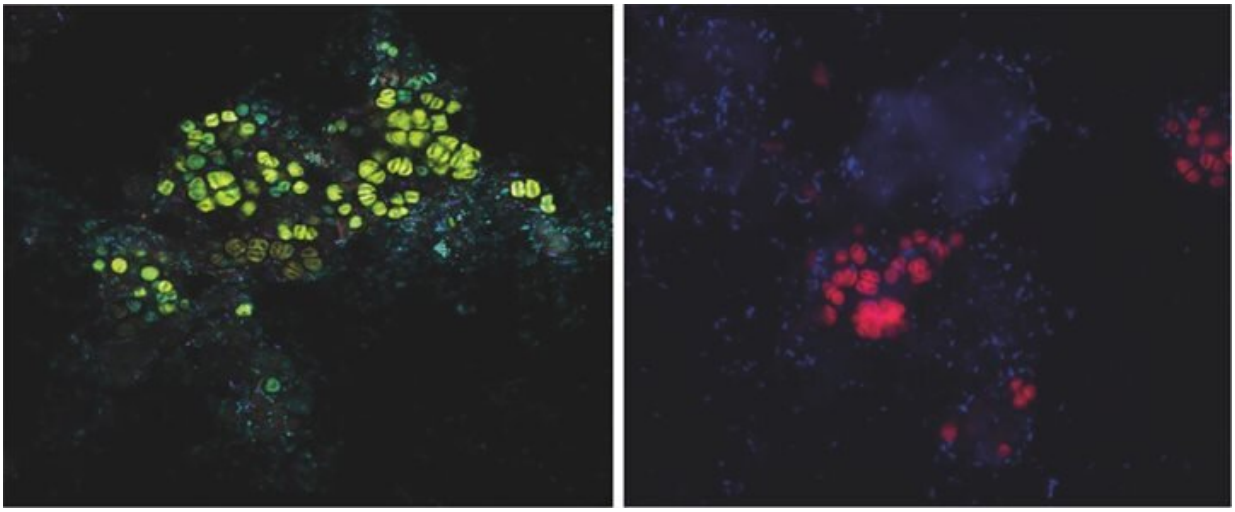

Microscopic photographs of the biomass from the bio-scrubber. In yellow and red the newly discovered Candidatus nitrosacidococcus tergens is highlighted. Credit: Nunzia Picone

Microbiologists at Radboud University have discovered a new bacterial strain that feeds on ammonia and urea in an extremely acidic environment. That bacteria would be capable of this at a very low pH level had previously been considered impossible. The organism, which was discovered in an air filter of a pig farm, appears to be an unusual and distant relative of the known ammonia oxidizers that are normally found in the oceans. The researchers will publish their findings in *The*

ISME Journal on 10 December.

Scientists have long suspected that there must be a bacterium with these characteristics. DNA traces had already been found in the soil of tea plantations and 'refuse dumps' of leaf-eating ants. But it had never been possible to grow the organism in the lab before now. The Radboud microbiologists named the bacterium "Candidatus Nitrosacidococcus tergens."

The newly discovered bacterium appears to be extremely efficient at trapping ammonia. The researchers discovered the bacterium in the bio-scrubber of a pig farm in Noord Brabant; this is a system used to purify the air from these stalls of ammonia. "The company had noticed that the filter showed excellent performance, better than other systems," said Huub Op den Camp, Professor of Microbiology of Acidic Volcanic Ecosystems at Radboud University. "So they asked us to examine what the reason could be."

The dominant bacterium present in the biofilter system could function well even at the low pH values of 2.5. This in contrast to other ammonia oxidizers, that are customarily used in wastewater and air purifying systems and that live only at neutral pH values.

"The bacteria can be used to purify water and air of ammonia, but there is a large disadvantage: a lot of nitric oxide (NO) is also released during degradation. Nitrogen oxides can also be found in car exhaust, for example, and, like ammonia, they are not good for the environment."

An important and as yet unresolved question in microbiology is how acidophilic bacteria such as Candidatus nitrosacidococcus tergens handle such large differences in acidity inside and outside of the cell. Future research will focus on this question.

More information: Nunzia Picone et al. Ammonia oxidation at pH 2.5 by a new gammaproteobacterial ammonia-oxidizing bacterium, *The ISME Journal* (2020). DOI: 10.1038/s41396-020-00840-7

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