Researchers ID microbe responsible for methane from landfills

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Researchers have long known that landfills produce methane, but had a hard time figuring out why – since landfills do not start out as a friendly environment for the organisms that produce methane. New research from North Carolina State University shows that one species of microbe is paving the way for other methane producers.

Specifically, the researchers found that an anaerobic bacterium called *Methanosarcina barkeri* appears to be the key microbe.

"Landfills receive a wide variety of solid waste, and that waste generally starts out with a fairly low pH level," says Dr. Francis de los Reyes, an associate professor of civil engineering at NC State and co-author of a paper describing the research. "The low pH level makes it difficult for most methanogens – methane-producing organisms – to survive. We started this project in hopes of better understanding the mechanism that raises the pH level in landfills, fostering the growth of methanogens."

What the researchers found was *M. barkeri* – a hearty methanogen that can survive at low pH levels. *M. barkeri* consumes the acids in its environment, producing methane and increasing the pH levels in its immediate area. This, in turn, makes that area more amenable for other methanogens.

As moisture leaches through the landfill, it disseminates those high pH levels – making other parts of the landfill habitable for *M. barkeri* and other methane-producing microbes. *M. barkeri* then moves in and

repeats the process, leaving neutral pH levels – and healthy populations of other methanogens – in its wake.

Since *M. barkeri* and its methanogen cousins produce large quantities of methane, and methane is a powerful greenhouse gas, this could be bad news for the environment. But not necessarily. Methane can be, and often is, collected at landfill sites and used for power generation. Furthermore, methanogens break down solid waste as they go, compacting it so that it takes up less space.

"The research community can use our findings to explore ways of accelerating the methane-generation process," de los Reyes says, "creating methane more quickly for power generation, and making additional room in the landfill for waste disposal."

More information: The paper, "Effect of Spatial Differences in Microbial Activity, pH, and Substrate Levels on Methanogenesis Initiation in Refuse," will be published in the April issue of *Applied and Environmental Microbiology*.

Provided by North Carolina State University