In simple bacteria, scientists find new evidence of complex immunity

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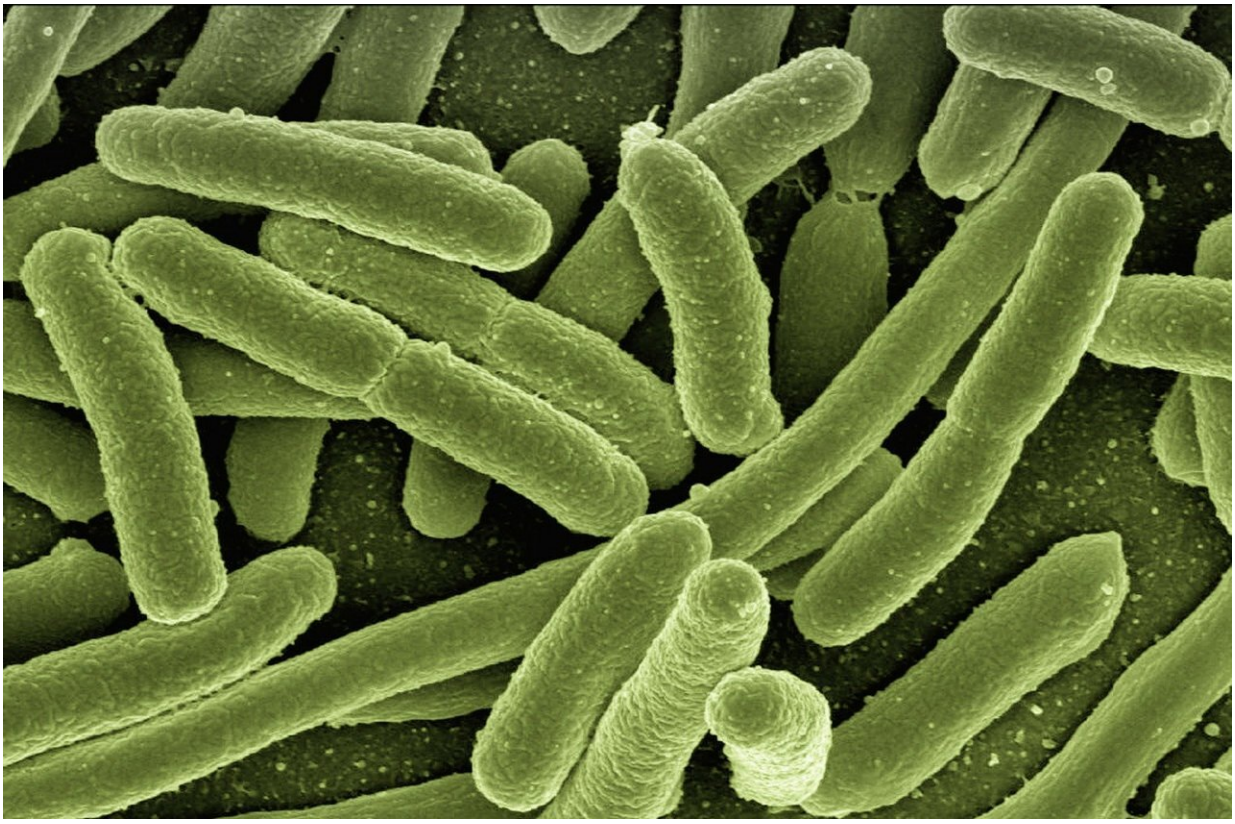

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Bacteria have lots of enemies. Among them are rivaling bacteria, viruses, and even DNA—namely, a special type of DNA called a plasmid, which can infect a microbe and hijack its inner resources to replicate. Luckily

for them, bacteria have evolved remarkably flexible tactics for fighting off infections.

A recent study from Rockefeller's Luciano Marraffini and graduate student Jakob T. Rostøl, published in *Nature Microbiology*, shows that when other immune tactics fail, bacteria will eliminate persistent plasmids by employing the enzyme Csm6. This response represents just one strategy in a large repertoire of defense mechanisms, collectively called CRISPR systems, which bacteria use to find and destroy foreign genetic material.

Type III CRISPR systems, for example, use the protein Cas10 to track down viruses and plasmids. The activity of Cas10 depends on the presence of a specific foreign RNA sequence, so this approach only works when plasmids make a lot of RNA. When they don't, Marraffini and Rostøl found, Csm6 springs into action. The researchers showed that, unlike Cas10 and several other CRISPR-related proteins, Csm6 is not choosy. Rather than search for a unique sequence, the enzyme degrades any transcript that crosses its path.

The study, says Marraffini, demonstrates the robustness of bacterial immune systems. "Bacteria have many different CRISPR systems, and each of those systems have many different components," he says. "This study highlights that versatility, and shows that all these components all have their own ways of protecting the organism."

More information: Jakob T. Rostøl et al. Non-specific degradation of transcripts promotes plasmid clearance during type III-A CRISPR–Cas immunity, *Nature Microbiology* (2019). DOI: 10.1038/s41564-018-0353-x

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