Sensing bacterial communication

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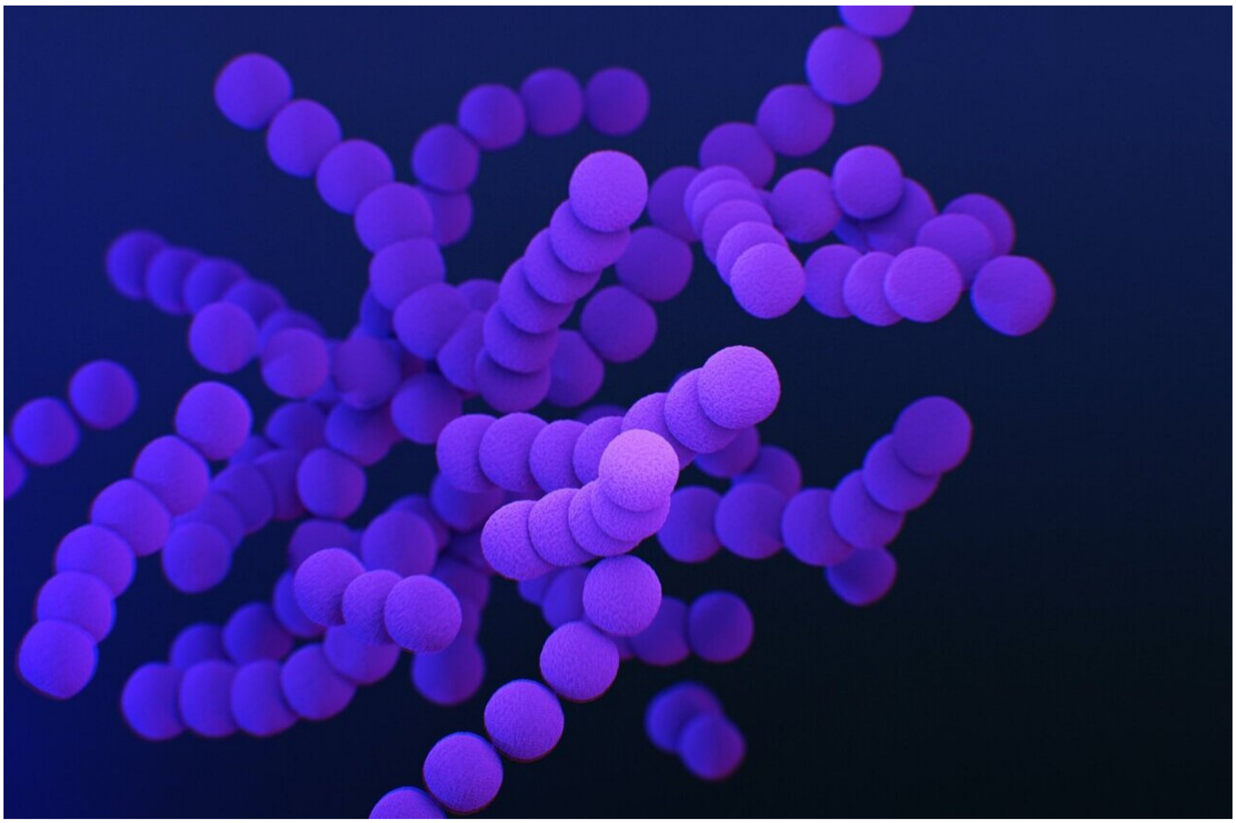

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They may not have mouths or even vocal chords, but tiny organisms do communicate with one another. A Florida Tech study may give researchers and students further insight into that process.

Previous research on quorum sensing, a cell-to-cell communication process that allows bacteria to share information about cell density and accordingly adjust gene expression, has been done on bacteria and yeast, this is the first time the communications process has been discovered in algae. The study is the focus of the research paper, "Quorum Sensing Behavior in the Model Unicellular Eukaryote Chlamydomonas reinhardtii," which was published in *iScience* in November.

The study was conducted by a team comprised of Florida Tech doctoral student Kirstin Cutshaw, university research assistant Brianna Richardson, alumni Alexandra Folcik, Timothy Haire and Joseph Goode, former university student researchers Pooja Shah and Faizan Zaidi and ocean engineering and marine sciences associate professor Andrew Palmer.

Investigating how microbial communities change behavior in response to external stimuli, cell density and other factors is important to our fundamental understanding of how these populations interact with the surrounding world. The findings and future research may further illuminate why organisms react the way they do and the science behind their reactions.

By examining a species of unicellular algae known as Chlamydomonas reinhardtii, the team determined that the swimming speed of the algae was positively correlated with cell density. In other words, the more algae that were present, the faster they swam. This acceleration is dependent on the production of a chemical signal which can be isolated and applied under laboratory conditions to study this process further. The team also confirmed that the same signal appears to have a similar response in closely related species as well- suggesting a conserved phenomenon, not unlike bacterial quorum sensing.

This potential expansion of quorum sensing to a new group of microorganisms provides important insight into how microbial populations evolve and regulate "social" behaviors.

With quorum sensing, bacteria communicate with one another using small signal molecules and sometimes change their behavior as a result. However, in algae, more is to be understood as to how this is happening. Cutshaw's research included working on finding the molecule, genes and receptors that are responsible for the acceleration. While quorum sensing among bacteria can be compared to conversations at a party and trying to pick out different voices, the team is trying to figure out a new communicative gathering among the algae.

"The analogy here is that we've stumbled on a party, but everyone speaks a language we don't know," Palmer said. "We can see they're doing something in response to the conversation, they're talking and swimming faster, but we don't know what part of the conversation made them do that, and that's what we're trying to figure out."

During this process, Cutshaw has learned patience and to adapt to discoveries not originally expected, such as the communicative one found with the algae.

"I've learned that science isn't necessarily about what works right; sometimes it's about what goes wrong and what we can learn from that," she said.

More information: Alexandra M. Folcik et al. Quorum Sensing Behavior in the Model Unicellular Eukaryote Chlamydomonas reinhardtii, *iScience* (2020). DOI: 10.1016/j.isci.2020.101714

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