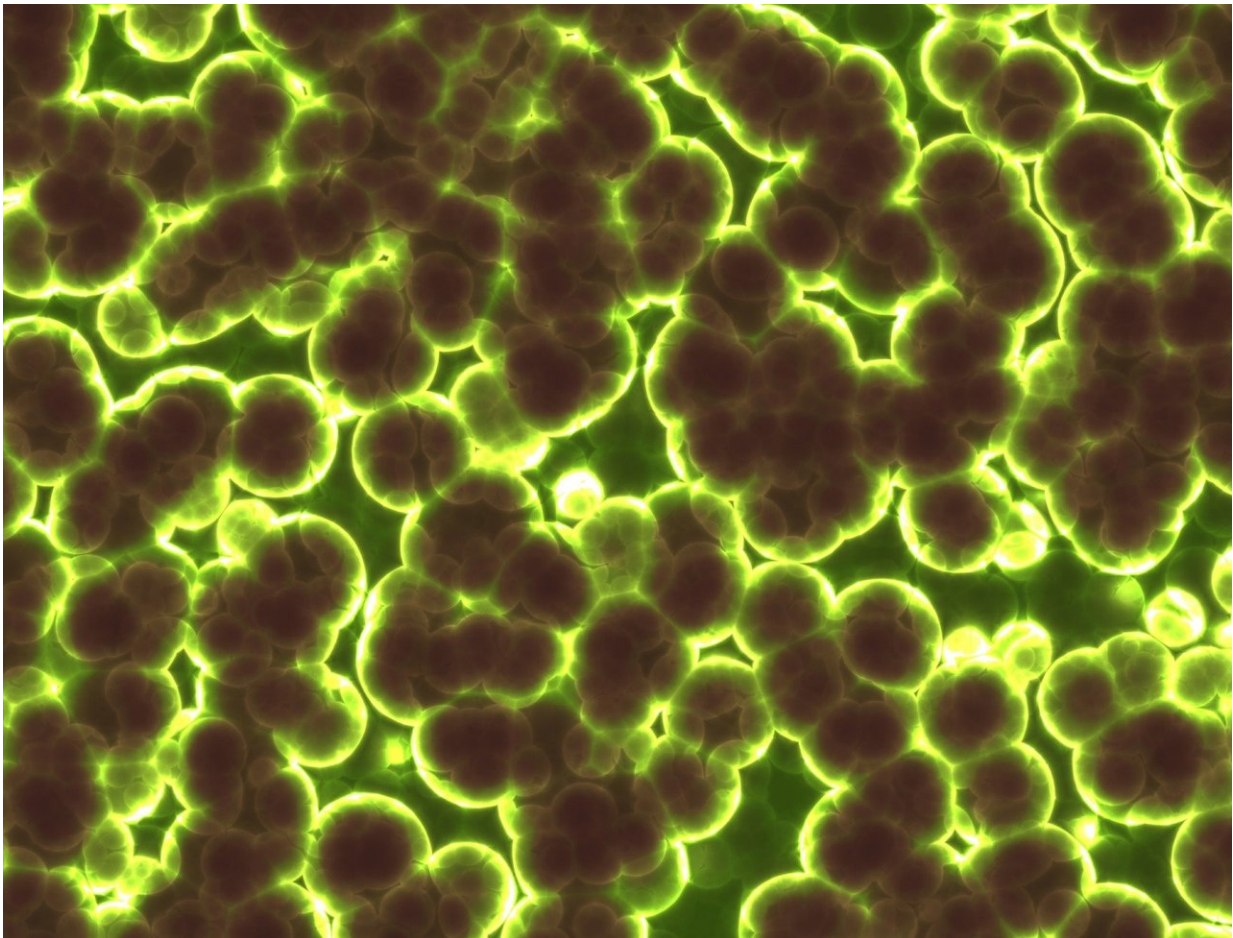


Divide and conquer? New insights from the ancients of the microscopic world

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Australian scientists have unlocked another mystery of the class of

microorganisms believed to be among Earth's oldest of life forms, throwing new light on the study of cell division and the evolution of life.

In a newly published paper in *Nature Microbiology* a research team from the iThree Institute at the University of Technology Sydney describes the cell division process used by the microorganism *Haloferax volcanii* from the [archaea](#) realm of single-celled life, which is distinct from bacteria.

Archaea make up the third major grouping, or domain, of life on the planet, alongside eukaryotes (including all plants and animals) and bacteria, but were only recognized as being distinct from bacteria in the late 1970s.

They can survive in [extreme conditions](#) of cold, heat and salinity, exist in the soil, sewage, oceans, and oil wells, and even make up an estimated 10 per cent of the microbial population found within the human gut.

"Our results show that bacteria and archaea divide differently," said Associate Professor Iain Duggin who leads the Microbial Molecular and Cellular Biology research group at the iThree Institute.

"This is a new system to study cell division, and provides a means to compare and contrast with the well-studied bacterial cell division mechanism, based on the protein FtsZ, and related to the microtubules found in human and all other higher organism [cells](#).

"It will help us understand the most important and fundamental aspects of how microbes multiply and the things they all appear to do in common."

A principal author on the study, Dr. Yan Liao, said the findings about archaea had unveiled the mystery of a novel "two FtsZs" strategy for cell division, different from bacterial cell division.

"This work opens a door to identifying fundamental activities across the full spectrum of cellular life. We still have so much to discover about the world of archaea, and in doing so gain a better understanding how complex life on Earth evolved.

"Cell division is a central aspect of the biology of all living organisms. For example, abnormal [cell division](#) can cause a tumor/cancer to develop. A better understanding of archaea can not only answer basic biological questions but also lead to the development of new biotechnological tools, such as methods for delivering vaccines or drugs that potentially could get around antimicrobial resistance."

Associate Professor Duggin said the study of archaea might also hold solutions to problems beyond human health.

Organisms in the archaea domain are responsible for all biological methane, a major greenhouse gas, as occurs in cattle and other ruminants.

"We've found that the methanogenic archaea responsible for this appear to divide differently from other archaea," Associate Professor Duggin said. "Besides being very interesting in regard to the evolution of the cell wall and its relationship to the division mechanism, it also offers the possibility of vaccinating livestock so they don't produce methane."

More information: Liao, Y., Ithurbide, S., Evenhuis, C. et al. Cell division in the archaeon *Haloferax volcanii* relies on two FtsZ proteins with distinct functions in division ring assembly and constriction. *Nat Microbiol* (2021). doi.org/10.1038/s41564-021-00894-z

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