

Protein synthesis, ATP unnecessary for bacterial spore germination

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Spores of *Bacillus* bacteria can survive for years in a dormant state, and then germinate in minutes. But it has long been unclear whether germination required protein synthesis, or cellular energy packets, which are known as ATP. Now, a team from UConn Health, Farmington, CT, has shown that neither is necessary. The research is published online September 19 in the *Journal of Bacteriology*, published by the American Society for Microbiology.

In the study, the investigators incubated spores of several species of *Bacillus* at 75-80° C for 20 hours. They then removed spores that had been killed in the process. They measured levels of ATP, and assayed RNA from the spores. In treated spores, there was no ribosomal RNA, and virtually no ATP. This was telling, because ribosomes are the machinery that make proteins. The treated spores germinated, despite an absence of both ribosomal RNA and ATP, demonstrating that they were unnecessary for germination.

Bacterial spores are major causes of [food spoilage](#), and food-borne disease, and spores of several species, including *Bacillus anthracis* (responsible for anthrax), and *Clostridium difficile*, cause several severe human diseases, said corresponding author Peter Setlow, PhD, Professor of Molecular Biology and Biophysics, UConn Health, Farmington, CT. But to cause trouble, the spores, which are dormant, must germinate.

"However, when spores germinate their resistant properties are lost and they become quite easy to kill," said Setlow. "Basic knowledge about the

process and mechanism of spore germination may lead to better ways to either prevent or stimulate this process, thus enabling spore eradication."

As someone who has been working on spores, and their resistance and germination, for nearly 50 years, Setlow said that he was very familiar with long ago studies that indicated that spores germinated without the synthesis of either ATP or protein. He said that recent work had challenged the older studies. That, he said, motivated him and his collaborators to re-examine spore germination, in an effort to resolve the controversy, so that the science could move on to addressing the spoilage and illness caused by the relevant bacterial species.

More information: George Korza et al. Changes in Spore Small Molecules, rRNA, Germination and Outgrowth After Extended Sub-Lethal Exposure to Various Temperatures: Evidence That Protein Synthesis is not Essential for Spore Germination, *Journal of Bacteriology* (2016). [DOI: 10.1128/JB.00583-16](https://doi.org/10.1128/JB.00583-16)

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