

Microbes, How Low Can They Go?



Lead author Tullis Onstott (Princeton) collects samples from deep in a South African mine.

Acetic Acid H C O H Image Credit: NASA Astrobiology Onstott et al. (2014) Geobiology

Study sheds new light on how deep in the subsurface microorganisms can survive and reproduce.

- A new study used samples from a South African mine to evaluate how much energy cells require to repair damage caused by extreme high-temperature environments to estimate the maximum depth for their growth.
- Researchers studied acetic acid, an amino acid that exists in two 'mirror image' forms. Life prefers one type, but both types exist in nature. When acetic acid switches from one form to the other, which happens more rapidly in high temperature environments, it can damage or even kill the cells; in this study, the scientists measured how quickly cells can repair this damage.
- The results indicate that more energy is required for maintenance than previously thought, refining the limits on the maximum depth for growth, and indicating that there are fewer microbes surviving in the deep subsurface. This suggests that life did not originate in the deep subsurface (if it required the same molecules as today), but does not preclude that life might have originated around deep sea vents.
- Previous estimates of the maximum depth for growth were based on the availability of resources like carbon, but the method used in this study is more accurate and requires fewer assumptions about the environment.
- This study will help determine the potential for life in the subsurface of other rocky planets, by allowing scientists to more accurately calculate the energy requirements of these different environments.