

# For arid, Mars-like desert, rain brings death

November 14 2018, by Blaine Friedlander

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A small, ephemeral lagoon in the hyperarid core of the Atacama Desert. Credit: Carlos González-Silva

When rains fell on the arid Atacama Desert, it was reasonable to expect floral blooms to follow. Instead, the water brought death.

An international team of planetary astrobiologists has found that after encountering never-before-seen rainfall three years ago at the arid core of Chile's Atacama Desert, the heavy precipitation wiped out most of the

microbes that had lived there.

"When the rains came to the Atacama, we were hoping for majestic blooms and deserts springing to life. Instead, we learned the contrary, as we found that rain in the hyperarid core of the Atacama Desert caused a massive extinction of most of the indigenous microbial species there," said co-author Alberto Fairen, Cornell visiting astrobiologist, on new research published in Nature's *Scientific Reports*.

"The hyperdry soils before the rains were inhabited by up to 16 different, ancient microbe species. After it rained, there were only two to four microbe species found in the lagoons," said Fairen, who is also a researcher with the Centro de Astrobiología, Madrid. "The extinction event was massive."

The core of Atacama rarely, if ever, sees rain. But thanks to changing climate over the Pacific Ocean, according to the new paper, that part of the desert experienced rain events on March 25 and Aug. 9, 2015. It rained again on June 7, 2017. Climate models suggest that similar rain events may take place about once every century, but there has been no evidence of rain for the past 500 years.



A historically rare rainbow in the Atacama Desert. Credit: Carlos González-Silva

The surprise precipitation has two implications for the biology of Mars.

Large deposits of nitrates at the Atacama Desert offer evidence of long periods of extreme dryness. These nitrate deposits are food for microbes, Fairen said.

The nitrates concentrated at valley bottoms and former lakes about 13 million years ago. "Nitrate deposits are the evidence," said Fairen. "This may represent an analog to the nitrate deposits recently discovered on Mars by the rover Curiosity."

Another implication may go back four decades. With this new

knowledge, the researchers believe that science may want to revisit the Viking experiments on Mars from the 1970s, which involved incubating Martian soil samples in aqueous solutions.

"Our results show for the first time that providing suddenly large amounts of water to microorganisms – exquisitely adapted to extract meager and elusive moisture from the most hyperdry environments – will kill them from osmotic shock," said Fairen.

In addition to Fairen, on the paper, "Unprecedented Rains Decimate Surface Microbial Communities in the Hyperarid Core of the Atacama Desert," Armando Azua-Bustos of Centro de Astrobiología and Carlos González-Silva of Universidad de Tarapacá, Arica, Chile, were lead authors. Fairen was funded by the European Research Council.

**More information:** A. Azua-Bustos et al, Unprecedented rains decimate surface microbial communities in the hyperarid core of the Atacama Desert, *Scientific Reports* (2018). [DOI: 10.1038/s41598-018-35051-w](https://doi.org/10.1038/s41598-018-35051-w)

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