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Is toxic rain killing organic molecules on Mars?

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Dust grains made of a harsh chemical used as a disinfectant on Earth may rain down on the surface of Mars, new research suggests. This could solve a decades-old puzzle about why the surface of Mars is so lacking in the chemical building blocks of life as we know it.

NASA's twin Viking spacecraft failed to find any signs of organic material on the surface of Mars when they landed there in 1976. This was puzzling because, even if there is no native life on Mars, organic molecules from comet dust should gradually accumulate on its surface. Subsequent missions have also failed to find organic material on the Red Planet.

In the wake of the Viking measurements, scientists suggested that organic molecules on Mars are destroyed by hydrogen peroxide, which is used as a bleach and disinfectant on Earth. But there was no direct evidence that hydrogen peroxide was present on Mars, and it was not clear how it would even be produced in sufficient quantities to wipe out organic material.

Now, calculations have shown that large amounts of hydrogen peroxide could be produced on Mars as a result of wind-blown dust grains rubbing together. The analysis for the different stages of the process was carried out by two teams led by Gregory Delory at the University of California, Berkeley, and Sushil Atreya at the University of Michigan in Ann Arbor, both in the US.

Raining grains

When wind causes dust grains to rub against one another, an electric charge builds up that breaks down water vapour and carbon dioxide. The resulting molecules react with each other to make hydrogen peroxide vapour, greatly increasing its concentration in the atmosphere.

That concentration "gets so large that the atmosphere cannot hold it anymore", Atreya told **New Scientist**. As a result, it begins to condense into solid particles, which rain down onto the surface. This process is similar to the way snow forms from water vapour in Earth's atmosphere. However, the hydrogen peroxide falling on Mars would be in the form of microscopic grains, Atreya says.

The accumulating hydrogen peroxide would react with and destroy the carbon-based molecules that life as we know it is based on.

This mechanism was suggested in the 1970s as a way hydrogen peroxide might be produced on Mars, but it was not clear how it would work in detail and how much hydrogen peroxide it would yield. According to the new research, hydrogen peroxide would be present at a level of 4 parts per million in the atmosphere in areas where it is being produced by dust.

Methane mystery

Dust is agitated most dramatically on Mars in dust storms and dust devils, but Atreya says the process is "a lot more universal". The constant, small-scale disturbances of sand and dust from ordinary winds probably account for most of the hydrogen peroxide production, he says.

If hydrogen peroxide is present in quantities as large as those

Enlarge image

Toxic hydrogen peroxide may be produced in electrically charged dust storms on Mars (Artist's impression: NASA)

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suggested by these studies, it will deepen the puzzle over *Mars's mysterious methane source*. Hydrogen peroxide would help remove methane from the atmosphere, so a larger source of methane would be needed to explain the levels seen there.

Small amounts of hydrogen peroxide were detected in the atmosphere of Mars in 2003. The instruments onboard NASA's Mars Science Laboratory, to launch in 2009, should be able to able to determine for certain if hydrogen peroxide is present in the soil itself.

If it is there in large quantities, it could cause problems for future human explorers. "It is possible there could be long-term corrosive effects that would impact crews and equipment," Delory says.

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