Comet Impacts Could Have Helped Create Life on Earth

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Comet impacts early in Earth's history could've help create compounds necessary for life. Here is comet Hale-Bopp above the Earth's surface.marcel / Fotolia

Comets may have helped to give rise to life on Earth. New research mimicking the conditions of a comet impact on our planet 4 billion years ago has shown that such an event could give rise to multi-chained peptides. That's intriguing since peptides make up proteins, one of the fundamental building blocks of life as we know it.

The study, presented August 18 at the Goldschmidt Conference in Prague, is the first to provide evidence that an impact could make tri-peptides, consisting of three linearly linked molecules, says study author Haruna Sugahara, a biogeochemist at the Japan Agency for Marine-Earth Science and Technology.

The simulation was carried out with a mixture of amino acids, which have been found on comets, as well super-cold ice and rock (of which they are made). The force of the impact was re-created with a propellant gun. Researchers analyzed the chemical products afterward and found that the force of the "impact" caused a significant proportion of the amino acids to form the beginning of chains that make up proteins, Sugahara says.

But more than peptides are necessary for protein-synthesis, which is the essence of life (the main role of DNA is, after all, to make proteins). Sugahara says that RNA, the cousin of DNA, is also necessary, but is unlikely to be formed by comet impacts. Many scientists suspect hydrothermal vents could've helped create these nucleic acids.

It's possible that life then came about from substances brought to the Earth by comets, asteroids and meteorites, and then combined with substances created by hydrothermal vents, she says. Lightning storms may have also played a role in creating necessary organic compounds, she adds; when electrical currents like lightning course through a mixture of water, methane, ammonia and hydrogen, which were all thought to be present on early Earth, amino acids can be created.

George Cooper, a scientist at NASA's Ames Research Center, said the find was promising but that he'd have to learn more about the details of the study (which isn't yet published) before making a final judgment.

"If there's a way to make [tri-peptides] back then, 4 billion years ago…that'd be extremely important" for the development of life, he says. His concern is that the simulation would need to take into account all the other substances found in comets, such as salts and a jumble of other organic compounds, to be considered an accurate representation. But it nevertheless is an interesting finding suggesting that these impacts played a role in the development of life, he adds.