

# Scientists discover organic acid in a protoplanetary disk

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An international team of scientists from Russia, Germany, Italy, the U.S. and France has discovered a relatively high concentration of formic acid in a protoplanetary disk. This is the first organic molecule found in protoplanetary disks containing two oxygen atoms.

The finding is significant because organic acid is much more difficult to obtain than other organic molecules found in protoplanetary discs. Methanol is obtained from carbon monoxide on the surface of dust particles under stellar radiation, but formic acid requires more complex reactions, which are not possible without active processes of organic synthesis.

"We have found formic acid in the protoplanetary disk surrounding the young sun-like star TW Hydra. The finding implies that rich organic chemistry, which can lead to the formation of larger organic molecules, probably takes place at the base of the formation of planets in [protoplanetary disks](#)," say the researchers. "Formic acid, along with [methanol](#) and formaldehyde, are the most

common complex molecules found in protoplanetary disks. In the context of interstellar communication, this shows that at least some of the components of prebiotic chemistry are present in the protoplanetary disk, which is expected to be similar to the solar nebula that formed our solar system."

Thus, the discovery may indicate an active process of organic synthesis occurring long before the formation of the planets. This means that immediately after the appearance of celestial bodies, large amounts of organic compounds must already be present in their primary material. The results are extremely important for understanding the specific conditions under which the emergence of life takes place at an early stage in the development of planetary systems. It is known that [formic acid](#) is the basis for the synthesis of more complex carboxylic acids actively used by earth life.

The observation of the protoplanetary disk of the young orange dwarf TW Hydra, located 176 light years from the Earth, was conducted by the ALMA radio telescope (Atacama Desert in Chile). The age of the star is about 10 million years, so a protoplanetary disk and one massive Jupiter-like planet have formed around it, but an Earth-type planet has not yet formed. This gives a very rare opportunity to look into the era of the formation of solid Earth-like planets around a star similar to the sun.

The results of the study are published in *The Astrophysical Journal Letters*.

**More information:** Cécile Favre et al, First Detection of the Simplest Organic Acid in a Protoplanetary Disk, *The Astrophysical Journal* (2018). [DOI: 10.3847/2041-8213/aad046](https://doi.org/10.3847/2041-8213/aad046)

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