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Popular Article

Virovore: Creature that eats virus

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Introduction

A virovore is a creature that consumes viruses. The name virivore (equivalently, virovore) derives from the Latin word '*vorare*', which means to eat or devour, and the English prefix viro-, which means virus and it is a translation of the Latin word for poison. Virivory, in which organisms, predominantly heterotrophic protists but also some metazoans, consume viruses, is a well-described process (González and Suttle, 1993).

Viruses may lyse bacteria and liberate nutrients (i.e., the viral shunt), they are regarded as a top predator in marine ecosystems. Additionally, viruses are crucial for structuring microbial trophic interactions and controlling carbon transport (Welsh *et al*., 2020).

Discovery

A microscopic marine flagellate that was proven to eat and digest viral particles was the first virovore to be described. Numerous studies afterward proved the intake of virions both directly and indirectly. The assumption that nutrients were transported from the viruses to consumers was supported in 2022 by DeLong and his coworker. They show that the ciliates *Halteria* and *Paramecium* decreased *Chlorovirus* plaque-forming units by up to two orders of magnitude during the course of two days. (DeLong *et al*., 2023).

Researchers discovered that a species of *Halteria*, tiny ciliates that live worldwide in freshwater, may consume large quantities of contagious *Chloroviruses*. According to a study, both have an aquatic habitat in common.

To test the hypothesis, DeLong and his team collected samples of pond water, cultured

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several bacteria, and then injected a significant amount of *Chlorovirus*, a freshwater resident that infects green algae. The team monitored the population sizes of the viruses and the other microbes over the following few days to determine whether the latter were consuming the former (Deng *et al*., 2014).

And sure enough, one specific microbe—a ciliate called *Halteria*—seemed to be nibbling on the viruses. In water samples where the ciliates had no other food source, *Halteria* populations increased by around 15 times in just two days, whereas *Chlorovirus* levels decreased by 100 times. Without the virus, *Halteria* did not develop at all in control samples. In further studies, the team found that after tagging *Chlorovirus* DNA with fluorescent dye, *Halteria* cells instantly began to shine. This made it simpler to confirm that the virus was being consumed by *Halteria* (Olive *et al*., 2022).

Biogeochemical importance

The most prevalent biological species in the waters of the world are viruses. The life cycle of a lytic virus, or viral shunt, is a crucial step in the cycling of particulate and dissolved organic matter in the world's seas. Given that they are composed of lipids, amino acids, and nucleic acids as well as perhaps carbon ingested from host cells, viral particles themselves also make up a significant component of the nitrogen and phosphorus rich particles within the dissolved organic matter pool. If consumed and the microorganism is healthy, it is believed that viruses can supplement a grazer's diet (Mayers *et al.,* 2023).

It has been proposed that viruses may potentially affect host nutrition more severely in smaller grazers. For instance, the estimated contributions to nano-flagellates are 9% carbon, 14% nitrogen, and 28% phosphorus. Smaller bacteria are the best food source for grazers due to their size and carbon content, viruses represent a different dietary option because they are small, non-motile, and abundant for grazers.

For typical grazers, consuming 1000 times more viruse would be necessary to derive the same amount of carbon from viruses as they do from bacteria. Viruses are not, therefore, the best carbon source for grazers. Consuming viruses, however, has advantages beyond growth. According to studies, when viral particles are digested, amino acids are released that the grazer can use to synthesise their own polypeptides (Deng *et al*., 2014).

Process of Viral sweep and their importance

Trophic interactions among grazers, bacteria, and viruses play a crucial role in controlling the cycling of nutrients and organic matter. By consuming viral particles, grazers use a technique

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known as the viral sweep to recycle carbon back into the traditional food chain. Viral offspring are released when host cells are infected and are then devoured by grazers.

Numerous variables, including the size and quantity of the viral particles, may have an impact on the viral sweep. The elemental makeup of the viral particles depends on the virus's size. A virus with a larger capsid, for instance, will donate more carbon, while viruses with larger genomes, because of the extra nucleic acids, will contribute more nitrogen and phosphorus. The viral sweep's effects might possibly be more profound if grazers that feed on virus-infected bacteria are taken into account. Overall, grazers contribute significantly to the carbon cycle by eating germs and viruses (Jover *et al*., 20014).

Ecological importance

According to studies, grazers may consume viruses and digest them, or they may consume viruses and release them back into the environment. The discovery that grazers might, after ingesting viruses, discharge them back into the ecosystem could have profound ecological effects (Frada *et al*., 2014).

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