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An Overview on Various Hypothesis in Origin of Virus

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Commentary

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ABOUT THE STUDY

A virus is an infectious submicroscopic creature that only reproduces inside of live cells. Viruses can infect every type of life, including bacteria, *archaea*, and both animals and plants. Viruses are the most common sort of living organism and can be found in practically all ecosystems on Earth. Virology is the study of viruses; it is a branch of microbiology.

It is uncertain where viruses first appeared in the evolutionary history of life. Some viruses may have descended from bacteria, while others may have originated from plasmids, which are DNA fragments that can migrate between cells.

In the process of evolution, viruses play a key role in horizontal gene transfer, which boosts genetic variety similarly to sexual reproduction. Some biologists believe that viruses are living forms because they carry genetic material, reproduce, and change through natural selection, despite the fact that they lack essential traits, including cell structure, that are typically thought to be crucial requirements for defining life. The term "organisms at the edge of life" and "replicators" have been used to characterise viruses since they have some but not all of these characteristics.

Origins

Viruses occur everywhere there is life, and they have probably been around ever since the origin of living cells. Because viruses do not leave fossils, it is unclear where they came from; hence their origin is being studied using molecular approaches. Additionally, rarely, viral genetic material fuses with the host species' germlines, allowing for long-term vertical transmission to the host's progeny. Paleovirologists can use this as a priceless resource of knowledge to track down historic viruses that date back millions of years. To explain the origins of viruses, there are three main hypotheses:

Regressive hypothesis: It's possible that viruses were once tiny cells that preyed on larger cells. Genes that were not necessary for their parasitism were gradually lost. Living cells, like viruses, rickettsia and chlamydia can only

multiply inside host cells. They provide evidence in favour of this theory since the genes necessary for their ability to exist outside of cells are believed to have been lost due to their reliance on parasitism. The "degeneracy hypothesis" or "reduction hypothesis" is another name for this.

Cellular origin hypothesis: Bits of DNA or RNA that "escaped" from the genes of a larger organism may have given rise to some viruses. The naked DNA fragments that may migrate across cells, known as plasmids or transposons, may have been the source of the escaping DNA (molecules of DNA that replicate and move around to different positions within the genes of the cell). Transposons, which were formerly referred to as "jumping genes," are an example of a mobile genetic element and may have originated some viruses. This is also known as the "escape theory" or the "vagrancy hypothesis".

Co-evolution hypothesis: The "virus-first hypothesis" puts out the idea that viruses may have developed from intricate protein and nucleic acid molecules at the same time as cells first arose on Earth. As a result, viruses may have been reliant on cellular life for billions of years. Because they don't have a protein coat, RNA molecules known as viroids are not considered viruses. They are frequently referred to as subviral agents since they share traits with multiple viruses. Important plant pathogens include viroids. Although they connect with the host cell and utilise the host machinery for replication, they do not code for proteins. Although the human hepatitis delta virus's RNA genome is similar to that of viroids, it lacks the ability to make its own protein coat and instead uses one from the hepatitis B virus. Therefore, it is a flawed virus. Once within a host cell, the hepatitis delta virus genome can replicate autonomously; however, in order to spread to additional cells, it needs the assistance of the hepatitis B virus, which contributes a protein coat. Similar to how the mimivirus, which infects the protozoan Acanthamoeba castellanii, is necessary for the sputnik virophage to function. These viruses, known as "satellites," may be evolutionary intermediaries between viroids and viruses since they depend on the existence of other viral species in the host cell.