

Symbiotic relationships in ecology



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In ecology, symbiosis is described as a relationship between two different species in which one organism lives off on another and the other organism lives inside the other. Symbiotic relationships are characterized based on the kind of relationship they share with another organism. Although symbiosis usually occurs between virus-virus and virus-host, virus-host relationships are among the most studied and familiar relationships. (Kimball) Viruses are known to be good at the process of symbiosis as there are retroviruses, including HIV1 and Influenza that epitomizes the symbiotic relationship between the virus and the host. Symbiotic relationship between two organisms sometimes harms one species and benefits the other and in other cases neither of the species is benefited from the relationship. (Abott)

The three well known symbiotic relationships that occur are known as mutualism, commensalism and parasitism. Mutualism interaction occurs between two organisms when each organism is being benefits, whereas commensalism is a relationship between two organisms where only one of them benefits but the other is unaffected. Viruses that are living inside a host have a symbiotic relationship known as parasitism. Parasites live in the body of the host from whom they feed off and also harm in some ways. (Abott)

Viruses have the ability to live and replicate within a host cell by reverse transcriptase and integrase. HIV-1 and HIV-2 are retroviruses that cause AIDS. The genome of retroviruses consists of RNA which is reverse transcribed into DNA (Kaiser). For a virus to achieve a symbiotic relationship with its host, it first has to attach itself to CD4 cells which enable the virus to

invade its host. Once the retrovirus infects a cell, the reverse transcribed DNA enters the nucleus where it is inserted into the host's DNA. (Kimball)

Another disease that is a good example of symbiotic relationship of a virus and the human body is influenza. Respiratory passages in the body are invaded by the influenza virus cells by receptor mediated endocytosis. After the mRNA molecules are translated into proteins, the virus buds off from the plasma membrane and further spreading it onto other new cells. Viruses are found in every in the nature (Kimball). Bacteriophages are viruses that infect the bacteria causing a symbiotic relationship. Lysogeny is the steady relationship that occurs between a bacteriophage and its host. During the lyogenic cycle, the bacteriophage is called a prophage. When the prophage DNA is inserted into the chromosome of its host cell, the virions released contain some host genes and some of their own. Once the virions infect another host, they genetically transfer these bacterial genes via transduction. (Gregory)

Prophage can express many of its genes while it is present in its host genome. The genes that encode for diphtheria toxin and cholera toxin are actually a phage gene, therefore phages are known to have genes that make the bacteria more stable. Viral symbioses are known to be more parasitic to their hosts than bacterial symbiotic relationships. All animals including human bodies have a symbiotic relationship with bacteria that are present in different organ systems. Although bacteria in the intestine and skin enhance our digestion and immune system, bacteria are susceptible to antibiotics causing increase in the public health problems. Antibiotics destroy all bacteria, removing the advantages acquired by the host organism, making it

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harder to have a symbiotic relationship. Fungi are poor organisms for symbiotic relationships with human as compared to viruses. The relationship between fungi and its host is most likely to be mutualistic in most cases. Lastly, for symbiosis to occur in protists, primary and intermediate hosts are required. (Kimball)

Although protists, fungi, and bacteria can all form symbiotic relationships within a host, viruses stand out from the other groups in forming symbiotic relationships. Retroviruses and influenza are clear examples that demonstrate how the viruses share a symbiotic relationship with the human body. Viruses have the ability to reverse transcriptase and integrate their DNA into the host's cell by attaching itself to CD4 cells and inserting their DNA in the nucleus. Viruses are one of a kind organism that can create a superior symbiotic relationship with their host as well as teach the immune system to protect the human body.

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