

Difference Between Prophage and Provirus

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Key Difference - Prophage vs Provirus

A virus is an infectious agent that is an obligate endoparasite which needs a living host cell for its replication. It has either a DNA genome or an RNA genome. Most of the viruses possess RNA genome. Provirus and prophage are viral genomes that are inserted into the host cell and integrated into to the host genome. **A prophage is a viral genome that infects bacterial cells and integrates with bacterial genome whilst a provirus is a viral genome which integrates into a eukaryotic genome.** This is the **key difference** between prophage and provirus.

What is a Prophage?

Prophage is termed as the bacteriophage DNA that is inserted by the virus into the bacterial cell and integrated into the bacterial DNA. The Prophage also can exist in the bacterial cell as an extrachromosomal plasmid. Simply, prophage could be expressed as the stage of the virus that is inserted and present inside the host as its genome which does not express its true form while inside the host. Therefore, the virus is present in a latent form where the viral genome existing within the bacterial cell doesn't cause any cellular disruption.

The host cell damage could be accessed through different aspects of chemicals or UV radiation. Once detected that the cellular disruption has taken place, the Prophage could be removed from the bacterial DNA through a process termed as Prophage induction. Once induction is completed, viral replication is initiated through a lytic cycle. When this has been initiated, the virus takes control of the reproductive mechanism of the host cell. This causes cell lysis and disruption. The new viruses formed during viral replication are released through exocytosis process. Therefore, the latent phase could be termed as the period from infection up to the lysis of the cell.

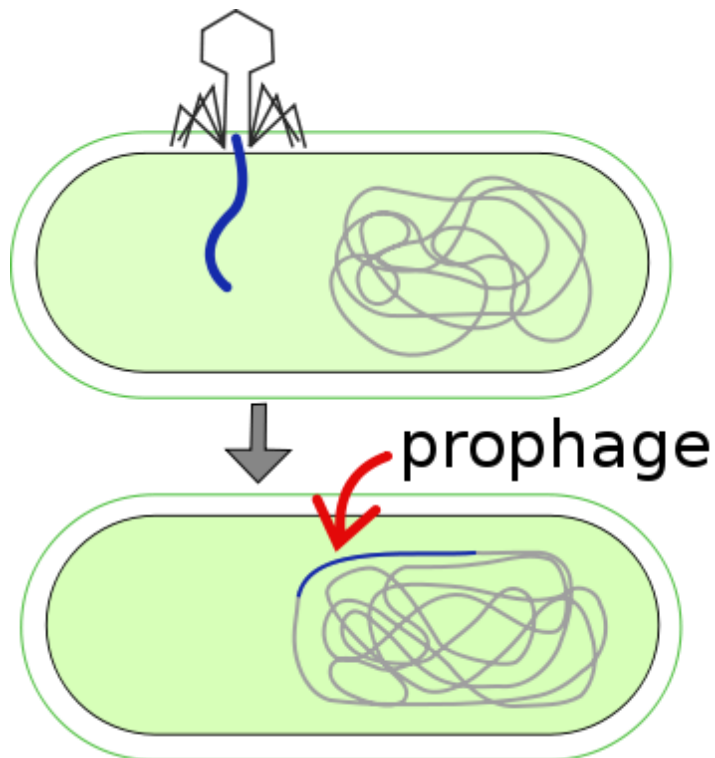


Figure 01: Prophage

In the context of horizontal gene transfer, prophages are important components. They are also considered as the parts of the total mobile genetic elements present in a genome such as the mobilome. Upon infection by bacteriophage, if the target cell doesn't contain the same prophage, the virus will immediately activate its lytic pathway for replication. This process is referred to as zygotic induction.

What is Provirus?

Similar to prophage, provirus is a viral genome that is inserted by the virus into a eukaryotic host cell and integrated into the host DNA. Proviruses differ from prophages due to the fact that proviruses integrate the viral genome into eukaryotic genome while the prophage selects bacterial genome as their host. A provirus could reside in a state that it doesn't replicate on its own but replicates with the host genome. Therefore, effects of the provirus are not developed within the eukaryotic host. The provirus could act as an endogenous viral element for longer periods of time that has the potential of causing infection. The common example is endogenous retroviruses which are always present in a stage of the provirus.

Provirus undergo lysogenic viral replication. In this phenomenon, provirus once integrated into the host genome, it does not replicate by itself while making new DNA copies but replicate with the eukaryotic host genome. Through this process, the provirus will be passed to the original cell and through cell division, the provirus will be present in all descendant cells from the initially infected cell.

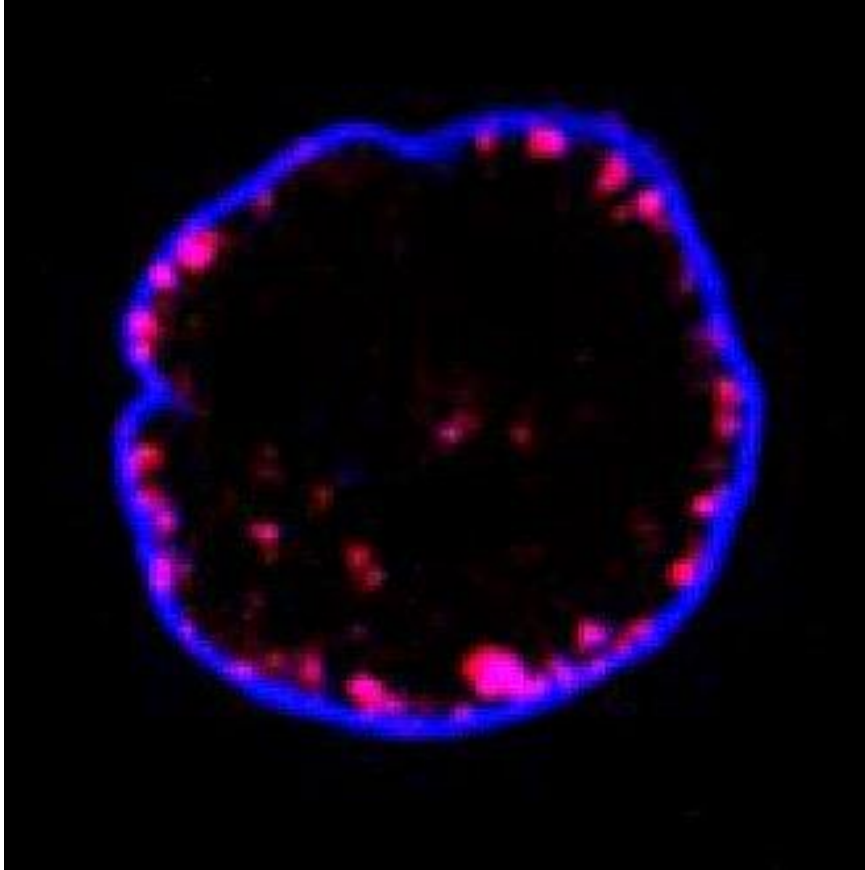


Figure 02: HIV Provirus

Provirus integration to the eukaryotic genome could result in two types of infection such as latent infection and productive infection. Latent infection occurs when the provirus gets transcriptionally silent. During productive infection, the integrated provirus becomes transcriptionally active which is transcribed into mRNA (messenger RNA) which results in the direct production of a new virus. This produced virus, through its lytic cycle, infects the cells and causes cellular disruption. A latent infection has the potential to become a productive infection, when organisms become immune compromised or when they have certain other health issues.

What is the Similarity Between Prophage and Provirus?

- They are viral genomes that are integrated into living host cells.

What is the Difference Between Prophage and Provirus?

Prophage vs Provirus	
Prophage is a bacteriophage DNA that is inserted into the bacterial cell by the virus and is integrated into the bacterial DNA.	Provirus is a viral genome that is inserted into a eukaryotic host cell by the virus and is integrated into the host DNA.
Targeted Organisms	
Prophage infects bacteria.	Provirus infects a eukaryotic organism.

Summary - Prophage vs Provirus

Prophage is referred to as the bacteriophage DNA that is inserted by the virus into the bacterial cell and integrated into the bacterial DNA. A provirus is a viral genome that is inserted by the virus into a eukaryotic host cell and integrated into its DNA. The Prophage also can exist in the bacterial cell as an extrachromosomal plasmid. Proviruses differ from prophages due to the fact that proviruses integrate into eukaryotic genome while the prophage selects bacterial genome as their host. Provirus integration to the eukaryotic genome could result in two types of infection such as latent infection and productive infection. Proviruses undergo lysogenic viral replication. This is the difference between prophage and provirus.

Reference:

- 1.Saussereau, Emilie, and Laurent Debarbieux. "Bacteriophages in the Experimental Treatment of Pseudomonas aeruginosa Infections in Mice." *Advances in Virus Research Bacteriophages, Part B*, 2012, pp. 123–141., doi:10.1016/b978-0-12-394438-2.00004-9.
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- 1.'Prophage SVG'By Prophage.JPG: Suly12derivative work: Asielia ([CC BY-SA 3.0](#)) via [Commons Wikimedia](#)
- 2.'HIV proviruses at the periphery of the nucleus' by AJC1 ([CC BY-SA 2.0](#)) via [Flickr](#)

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APA:Difference Between Prophage and Provirus.(2017 November 22). Retrieved (date), from <http://differencebetween.com/difference-between-prophage-and-vs-provirus/>

MLA: "Difference Between Prophage and Provirus" *Difference Between.Com*. 22 November 2017. Web.

Chicago: "Difference Between Prophage and Provirus". *Difference Between.Com*. <http://differencebetween.com/difference-between-prophage-and-vs-provirus/>accessed (accessed [date]).



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