

Difference Between Obligate Intracellular Parasite and Bacteriophage

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Key Difference - Obligate Intracellular Parasite vs Bacteriophage

A [parasite](#) is an organism which lives in and on another organism, deriving nutrients from them. Some parasites totally depend on the host organism while some are partially dependent. They are known as total parasites and partial parasites, respectively. Obligate intracellular parasites are one group of parasites which are not capable of reproducing outside the host cell. There are different types of obligate intracellular parasites. A bacteriophage is one type among them. Bacteriophage is a [virus](#) which attacks a bacterium and replicates using bacterial replication mechanisms. They are the most abundant viruses in the biosphere. They attach to the bacterial cell wall and inject their [nucleic acid](#) to the bacterium. Inside the bacterium, viral [genome](#) replicates and makes necessary components and enzymes to make many new bacteriophages. The key difference between obligate intracellular parasite and bacteriophage is that obligate intracellular parasite is **any type of organism including a virus, bacterium, protozoan, fungus which cannot reproduce without a host cell** while bacteriophage is an obligate intracellular parasitic virus which infects and replicates only in [bacteria](#).

What is an Obligate Intracellular Parasite?

The term 'obligate' means 'strict' or 'must.' Intracellular means inside the cell. Parasite is an organism which lives in or on another organism and obtains nutrients from it. Thus, the obligate intracellular parasite can be defined as an organism which depends entirely on other organisms' intracellular resources for the survival and reproduction. These organisms reproduce inside the host cells by causing a disease. They are not able to reproduce outside the host cells. There are different types of obligate intracellular parasites. All viruses including bacteriophages are intracellular obligate parasites. Certain bacteria including [Chlamydia](#), [Rickettsia](#), [Coxiella](#), certain species of [Mycobacterium](#) belong to this group of organisms. There are also obligate intracellular fungal and protozoan species such as [Pneumocystis](#), [Plasmodium](#), [Cryptosporidium](#), [Leishmania](#), and [Trypanosoma](#).

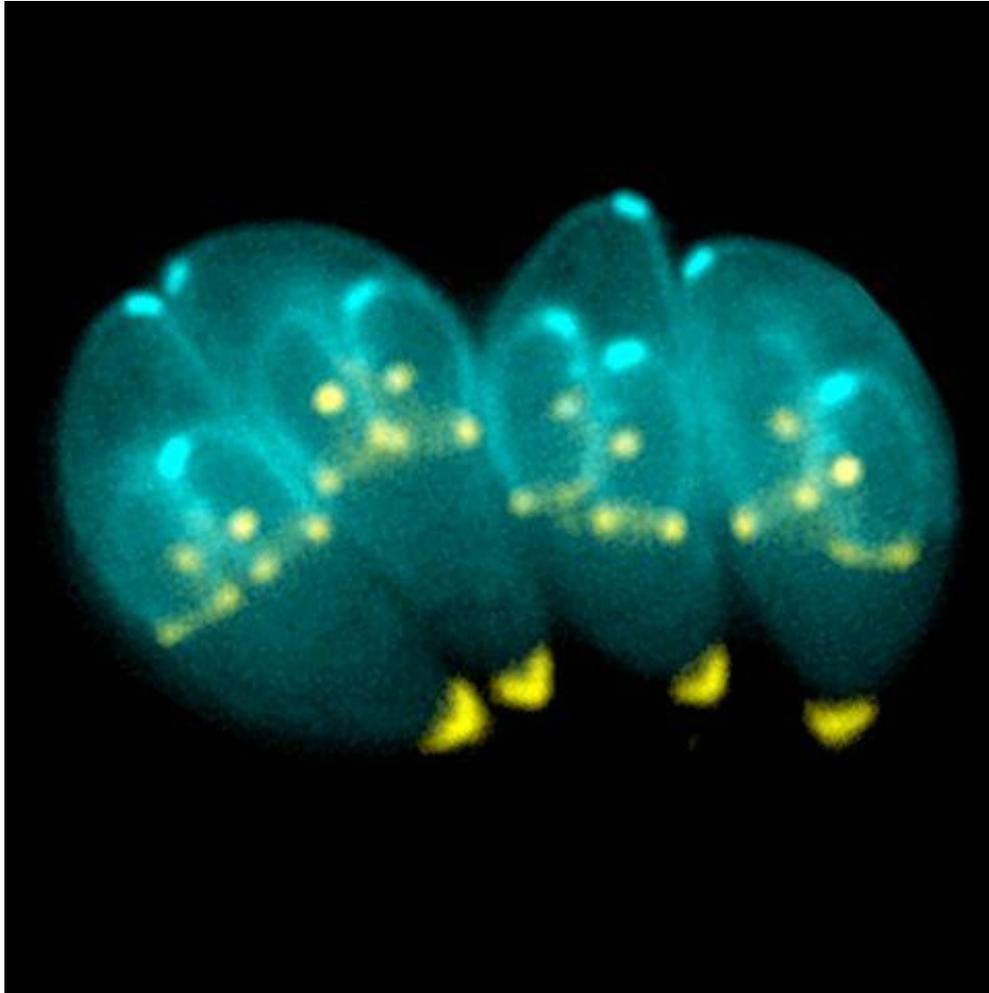


Figure 01: Obligate intracellular parasite *Toxoplasma gondii*

Obligate intracellular organisms cannot reproduce outside the host cell. Hence, it is difficult to grow them and study in laboratories. However, some scientists have been able to study about Q – fever parasite *Coxiella burnetti* using a technique which facilitated the growth of an axenic culture of it. They have suggested that the same technique can be used to study about other intracellular obligate parasites as well.

Intracellular obligate parasites keep the host alive since they need nutrients from the host to grow and reproduce. Some parasites promote host organisms' protein self-degradation. They use degraded proteins in the form of [amino acids](#) as their energy sources.

What is a Bacteriophage?

A bacteriophage (phage) is a virus which infects and propagates within a specific bacterium. All bacteriophages are obligate intracellular parasites. They need a host bacterium to reproduce. They are also known as bacteria eaters due to their bactericidal activity. Bacteriophages were discovered by Frederick W. Twort in 1915, and they were named as bacteriophages by Felix d'Herelle in 1917. They are the most abundant viruses on earth. A bacteriophage is composed of two major components: a genome and a protein capsid. The genome can be either DNA or RNA. But the majority of bacteriophages have a double-stranded DNA genome.

Bacteriophages are specific to one bacterium or a specific group of bacteria. They are named by the bacterial species they infect. For example, bacteriophage which infects *E. coli* is called coliphage. Bacteriophages are in different shapes. Among them, head and tail structure is the most common shape.

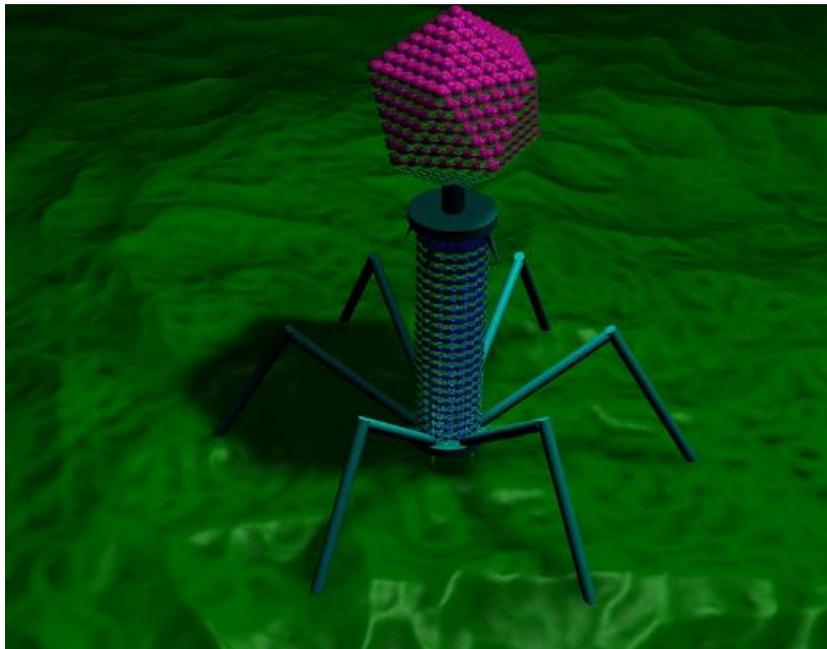


Figure 02: Bacteriophage

Bacteriophages should infect the host cell in order to reproduce. They attach tightly to the bacterial cell wall using their surface receptors and inject their genetic material into the host cell. Bacteriophages can undergo two types of infection named lytic and lysogenic cycle, depending on the type of phage. In lytic cycle, bacteriophages infect bacteria and rapidly kill the host bacterial cell by lysis. In lysogenic cycle, viral genetic material integrates with bacterial genome or plasmids

and exists within the host cell for several to thousand generations without killing the host bacterium.

Phages have various applications in molecular biology. They are used to treat pathogenic bacterial strains which are resistant to antibiotics. They can also be used to identify specific bacteria in disease diagnosis.

What are the similarities between Obligate Intracellular Parasite and Bacteriophage?

- Obligate intracellular parasites and bacteriophages need a living organism to reproduce.
- Both types cannot reproduce outside the cells.

What is the difference between Obligate Intracellular Parasite and Bacteriophage?

Obligate Intracellular Parasite vs Bacteriophage	
Obligate intracellular parasite is a microparasite which is capable of growing and reproducing inside the cells of a host.	Bacteriophage is another type of obligate intracellular parasite which infects bacteria.
Types	
Obligate intracellular parasite includes viruses, bacteria, protozoans, fungi, etc.	Bacteriophage includes only viruses

Summary - Obligate Intracellular Parasite vs Bacteriophage

Obligate intracellular parasite is an organism which cannot reproduce outside the host cell. Different types of obligate intracellular parasites can be found. Among them, viruses, bacteria, fungi, and protozoans are well known. Bacteriophages are a type of obligate intracellular parasites. Using bacterial replication mechanisms, bacteriophages replicate their genomes and make many copies of new phages

inside the host cell. This is the difference between obligate intracellular parasite and bacteriophage.

References:

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2. Revolvly, LLC. "Obligate intracellular parasite." Revolvly. N.p., n.d. Web. [Available here](#). 01 July 2017.

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