

## First approach to a patient with suspected hepatitis

# EXPLORING VIRUSES AND THEIR DIAGNOSIS

### Virion

When not replicating, viruses occur in particles called virions. A virion consists of:

#### Genetic material

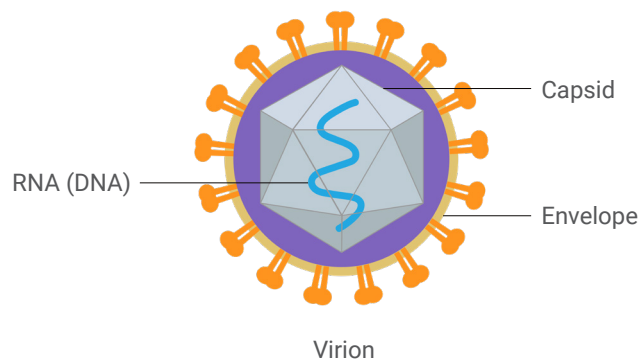
- either DNA or RNA

#### A capsid

- a protein coat which protects the genome
- encoded by the viral genome

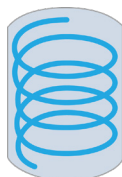
#### A lipid envelope

- present in some but not all cases
- it surrounds a shell of membrane-associated viral proteins
- usually derived from the membranes of host cells, but typically also includes proteins encoded

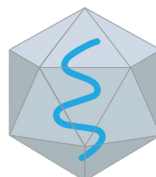


### Shapes

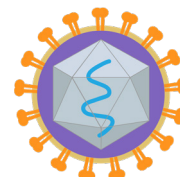
Viruses come in many different shapes, such as a helix or an icosahedral shape. Sometimes they also have an envelope.



Helical



Icosahedral



Icosahedral + envelope

## Viral classification

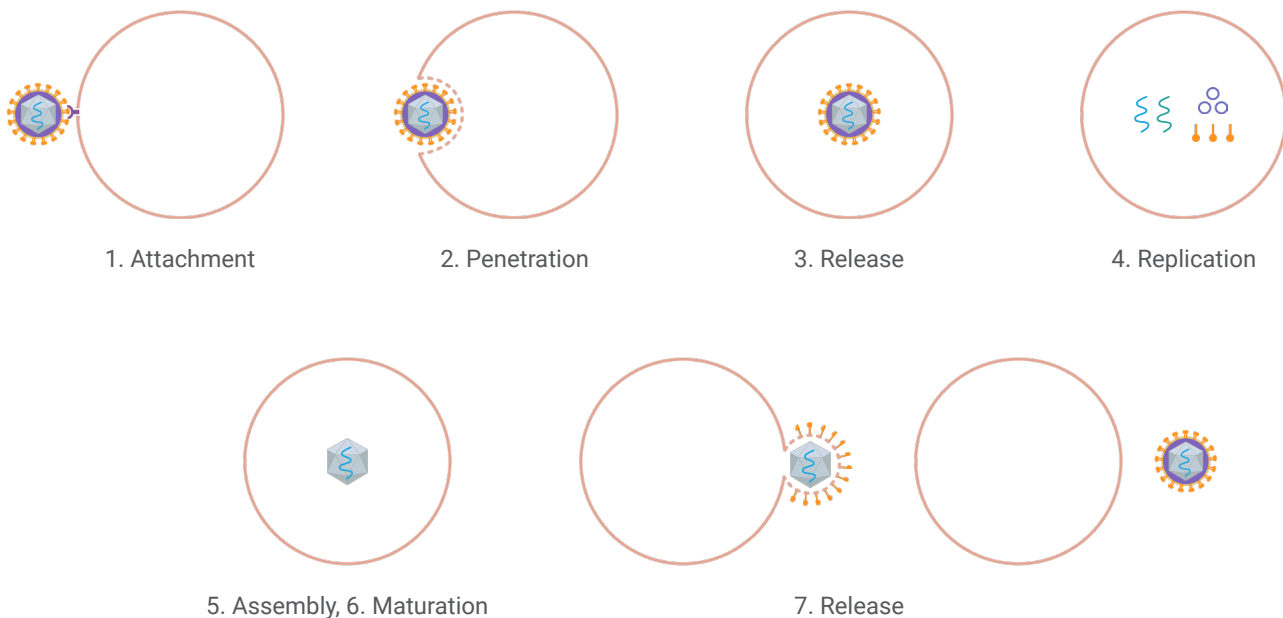
According to the International Committee on Taxonomy of Viruses (ICTV), viruses are classified by:

	Suffix	Example
<b>Order</b>	-virales	Unassigned
<b>Family</b>	-viridae	Flaviviridae
<b>Genus</b>	-virus	Hepacivirus
<b>Species</b>	-virus	Hepatitis C virus

## Viral replication

Viruses use the host cells' resources to replicate, since they lack these resources themselves. There are seven stages of virus replication:

1. **Attachment** to the host cell
2. **Penetration** into the host cell
3. **Release** of genetic information from the capsid
4. **Replication** of DNA/RNA and viral proteins
5. **Assembly** of new virion
6. **Maturation** of new virion
7. **Release** of virus from cell



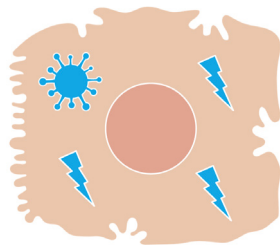
*These stages can be executed in different ways depending on the type of virus.*

## Pathophysiology

A virus can harm the host cell in two different ways:

### Cytopathic effects

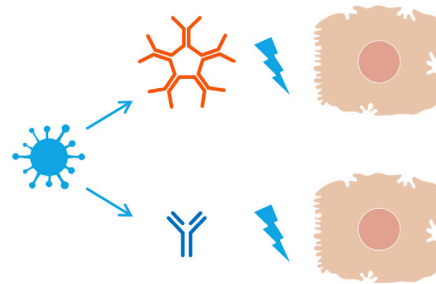
The virus harms by executing cytopathic effects within in the cell. These can include increases in cell membrane permeability, changes in cell shape, or cell lysis.



Active

### Immune system response

As a reaction to the viral intrusion, the host's immune system is activated and begins attacking the cell containing the virus.

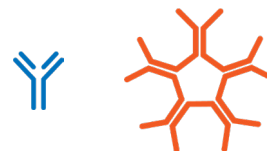


Passive

## Viral diagnostics

We can differentiate two types of measurements for diagnosing viral infections:

- We can measure the **virus itself** by quantifying surface proteins or the virus-specific DNA or RNA.
- We can measure the **activated immune system**, which acts specifically against the virus in question. For hepatitis viruses, this is done by measuring virus-specific IgM and IgG antibodies.



### Further Reading

Dimmock, NJ, Easton, AJ, and Leppard, KN. 2016. *Introduction to Modern Virology*. 7<sup>th</sup> Edition. Malden, Massachusetts: Blackwell Publishing.

Baron, S (editor). 1996. *Medical Microbiology*. 4<sup>th</sup> edition. Galveston, Texas: University of Texas Medical Branch at Galveston.