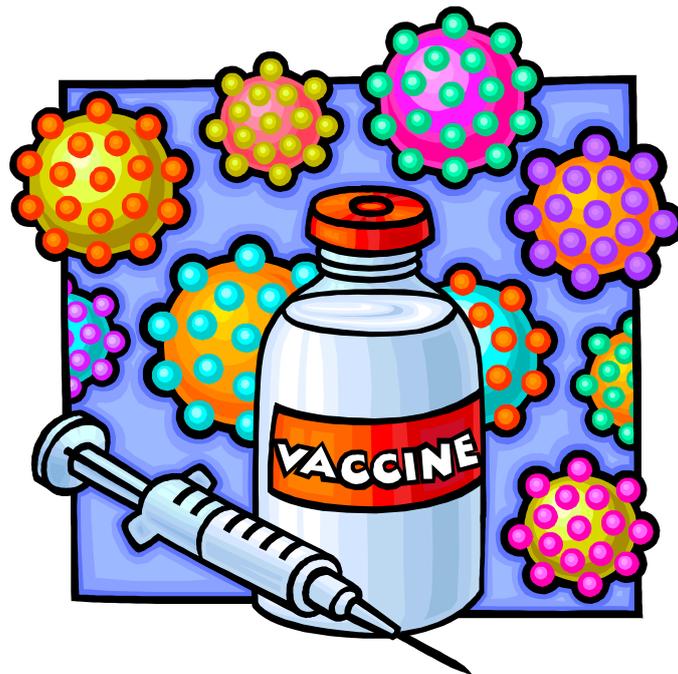


# Viruses and Vaccines



## Unit 4~ Lesson 1

### Viruses



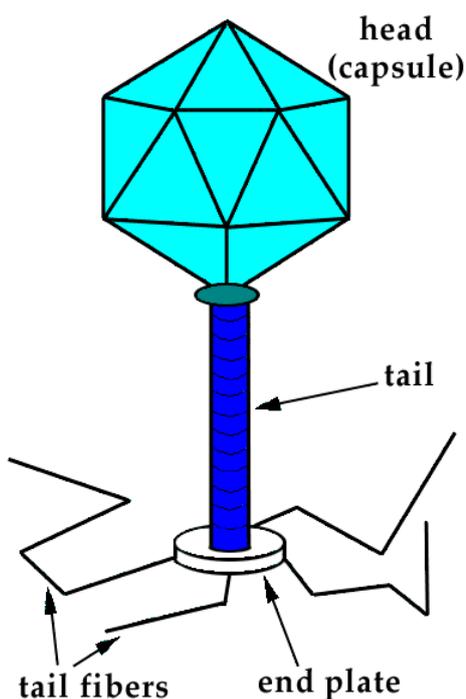
#### Background

##### What are viruses?

Viruses are tiny bundles of genetic material like DNA, carried in a viral shell called a **capsid** which is made up of proteins. Viruses are **parasites**, meaning they need a host like a plant or animal cell in order to live. This makes them strange little creatures, without a host the virus is **inert**, floating around about as alive as a brick wall. Once the virus comes into contact with a host cell, they will spring into action. They will infect and take over the cell like pirates attacking a ship. Viruses **cannot** metabolise nutrients, move around on their own, produce or excrete waste or even reproduce **unless** they are inside another organisms cells. Viruses have been the culprits of many human diseases like flu, HIV/AIDS, certain types of cancer and the common cold. We will be looking in more detail at AIDS and cancer in subsequent units.

##### What happens when viruses come in contact with host cells?

When a virus comes into contact with a host, it will insert itself into the cell and literally take over. The virus will change how the cell functions to carry out the functions that they desire themselves. Once they infect a cell, they burst out killing the cell and move on to infect the surrounding cells, killing them too. The virus's sole purpose is to reproduce many copies of itself. The diagram below depicts the structure of a virus.



##### One type of virus structure consists of:

- A **head**~ which contains genetic material such as DNA.
- A **tail**~ allows the virus to bind themselves to the surface of the host before they inject themselves into it. The tail can also be described as an “anchor” for the virus.
- **The tail fibres**~ also help in attachment of the virus to the host cell.

<http://www.ucmp.berkeley.edu/allife/virus.gif>

Viruses can affect both plants and animals and also bacteria. Below is a table which shows a list of viruses, the species they affect and the infection they cause.

<b>Virus</b>	<b>Species Affected</b>	<b>Infection</b>
<b>Human Immunodeficiency Virus (HIV)</b>	Humans	Acquired Immune Deficiency Syndrome (AIDS)
<b>Paramyxovirus</b>	Humans (Children)	Pneumonia Measles Mumps
<b>Flavivirus</b>	Humans	Yellow Fever
<b>Rhabdovirus</b>	Dogs Rodents Humans	Rabies Tetanus Lock jaw
<b>Tobacco Mosaic Virus</b>	Tobacco plants	Tobacco Mosaic
<b>Human T Cell Leukaemia Virus (HTLV)</b>	Humans	Adult T Cell Leukaemia (A form of cancer)
<b>Orthomyxovirus</b>	Humans Animals	Influenza
<b>Herpes Simplex Virus</b>	Humans	Coldsores



## Questions

**Why are viruses known as parasites? Why do they need a host in order to survive?**

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**Why do you think viral infections are harder to treat in comparison with bacterial infections?**

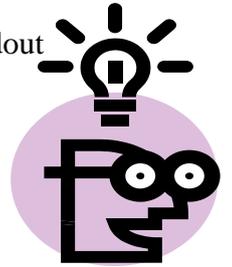
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## Task Time

### Getting to know Viruses

Read through the following segments containing information on four different viruses. Try to figure out which virus is being discussed and who it affects.

#### Virus 1

- It lies dormant in clusters of tissue until triggered by sunlight, fever, physical or emotional stress.
- It attacks the skin and produces small, irritating and sometimes painful fluid-filled blisters.
- The blisters and ulcers of are filled with virus and are highly contagious until they heal.

#### Virus 2

- It is known as a retrovirus.
- Infection occurs by the transfer of bodily fluids.
- Side effects may not be apparent for many years.
- I weaken the immune system of sufferers.
- More than 25 million people have died from this infection since it was first recognised in December 1981.

#### Virus 3

- It affects the skin and mucous membranes of humans.
- There are over 100 different types of this virus.
- It causes small, rough tumours, typically on hands and feet, that can resemble a cauliflower or a solid blister.
- Over 50% of people will be affected by this virus at one stage in their life.

#### Virus 4

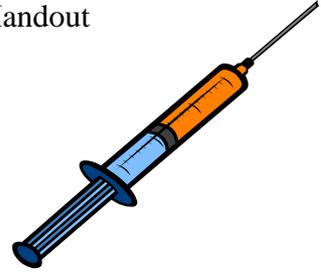
- This is a highly contagious and sometimes fatal disease of cattle and pigs.
- Humans are very rarely affected by this disease.
- A serious outbreak of the virus in 2001 in Britain led to thousands of cattle being slaughtered and the cancellation of many sporting events and leisure activities.

**Answer Sheet**

<b>Virus 1</b>	
<b>Virus 2</b>	
<b>Virus 3</b>	
<b>Virus 4</b>	

## Unit 4~ Lesson 2

### Vaccines



### Background

#### What are vaccines?

Vaccines are medications that are used to stimulate our body's immune system to generate a response that will protect us from disease. The first vaccination was carried out by Edward Jenner almost 200 years ago. He noticed that dairy maids who had had cowpox infection did not succumb to the deadly smallpox infection that was rampant at the time. To test his theory, he infected a young boy with cowpox and a couple of weeks later with smallpox. The boy survived and therefore was protected from the infection.

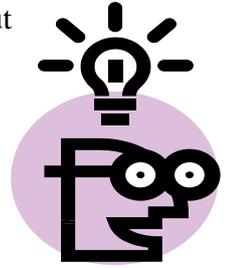
#### So how does vaccination work?

When pathogens like bacteria and viruses enter our body they are recognised by our immune system as **foreign** an immune response will be generated to try and eradicate the infection. **Antibodies** are proteins that are found in our bodies that target pathogens and try to neutralise them so that they cannot cause any harm. The antibody will bind to a region on the surface of the pathogen, known as an **antigen**. The antibody will remember the antigen it targeted and the memory is stored in our immune systems for any subsequent attack. This is the basis of how vaccination works. Vaccines can consist of the following:

- Live, but weakened forms of the pathogen/virus
- Killed or inactivated forms of the pathogen/virus
- Purified forms such as proteins

#### How will vaccines protect us from future illnesses?

Vaccines are safe because the viruses used in vaccines have been severely altered in laboratories by one or several methods. Scientists do this in several ways. Take for example the measles and mumps vaccine. Scientists weaken the virus's ability to reproduce itself. Normally these viruses cause illness by reproducing themselves thousands of times in the body. The virus used in a vaccine may reproduce itself 20 times or less. This is enough to allow our immune response to generate an attack against the virus without catching the infection. The antibodies that are produced from this attack are stored and will help protect against any future attacks of the virus. Another strategy is to deactivate a virus by killing it with a chemical. Now the virus cannot reproduce at all, yet the presence of the dead virus in the body still generates a response by producing antibodies.



## Task Time

### Measles Mumps and Rubella Vaccination

You are a reporter working for a national newspaper. Your job is to research the MMR vaccination in Ireland and write an article on it. Find out as much information as you can about the vaccination i.e. why it is so important to be vaccinated against these infectious diseases.

