

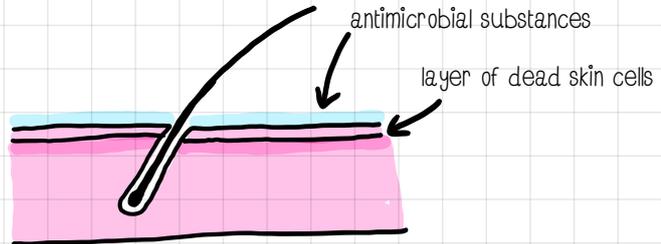
# Human defence systems

## Review

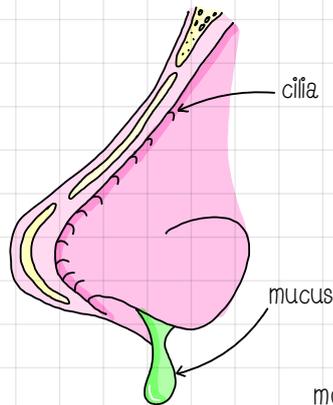
**Pathogens** are **microorganisms** that cause infectious **disease**. A pathogen may be a virus, bacteria, protist or fungi.

## Non-specific defence systems

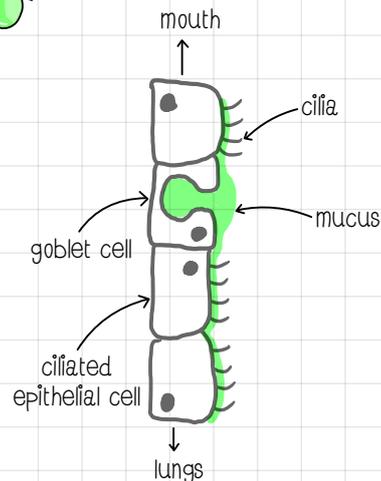
The **skin** is an impervious layer made from **dead** cells. The skin will secrete **antimicrobial** substances from sweat glands (e.g. lysozyme).



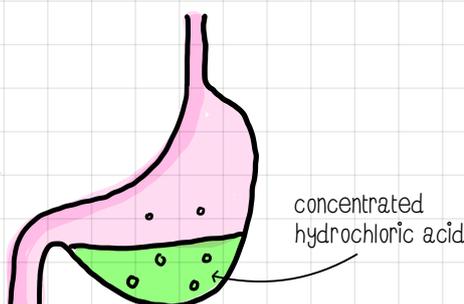
The **nose** produces **mucus** to trap any microbes or particles which enter during breathing. **Cilia** in the nasal passage will waft the mucus towards the top of the nose.



The **trachea and bronchi** are lined with specialised **epithelial cells**. Ciliated epithelial cells have cilia (small hairs) which waft mucus away from the lungs towards the mouth. Mucus is produced by goblet cells. The mucus traps particles and pathogens and prevents them entering and infecting the lung.



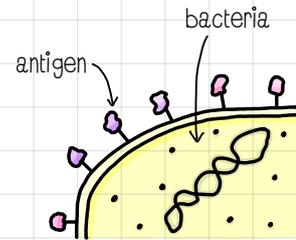
The **stomach** contains a high concentration of hydrochloric acid. The **hydrochloric acid** will kill microbes present in food which has been eaten.



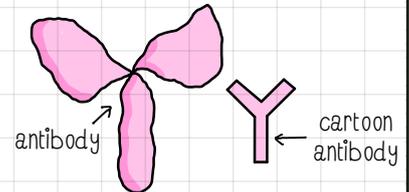
# Human defence systems...

## Key words

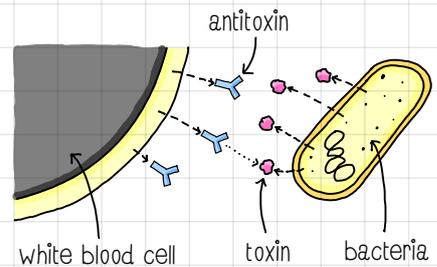
**Antigen** - Antigens are molecules (usually protein) found on the surface of a pathogen which are capable of stimulating an immune response.



**Antibody** - Antibodies are Y shaped protein molecules often called immunoglobulins. They are produced by the immune system in response to specific antigens. Each antibody is specific for one antigen.

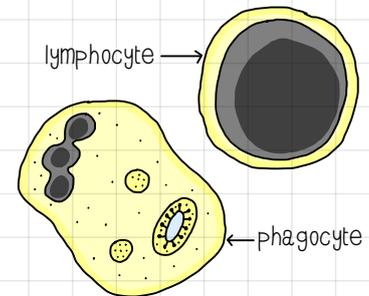


**Antitoxin** - Antitoxins are specialised antibodies which are made by the immune system to neutralise toxins produced by pathogens. The antitoxins neutralise the toxin but do not affect the pathogen.



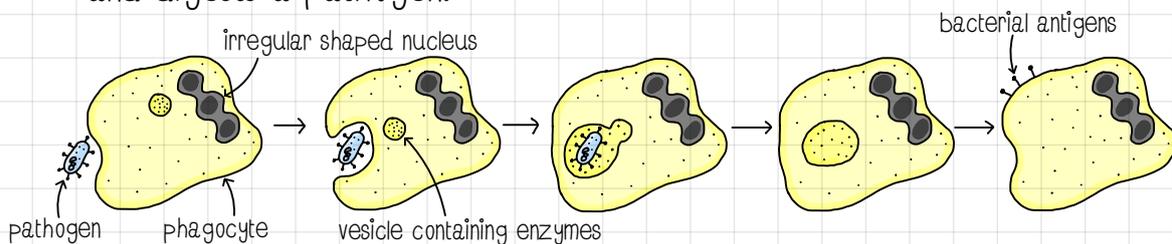
## The immune system

If a pathogen enters the body, the immune system uses white blood cells to destroy the pathogen.



## Phagocytosis

Phagocytosis is the process where a white blood cell (phagocyte) engulfs and digests a pathogen.



## Antibodies and antitoxins

White blood cells (lymphocytes) produce antibodies which attach to antigens on a pathogen. The antibodies can destroy the pathogen or cause them to stick together in clumps (agglutination) for the phagocytes to engulf.

White blood cells also produce specialised antibodies called antitoxins to break down toxins produced by pathogens.

