

NUTRITION AND THE IMMUNE SYSTEM

The **immune system** is a complex and efficient **defence** system made up of specialised organs, cells, and tissues that all work together to **destroy pathogens** and keep us healthy.

ANTIGENS

Antigens are **proteins** that are found on the **surface of the pathogen** and are unique to that pathogen.

LEUKOCYTES

There are various leukocytes which are able to **detect various types of antigens**, and are divided into two types; **phagocytes and lymphocytes**.

LYMPHOCYTES

Lymphocytes, divided mainly into **B cells and T cells**, detect a pathogen and then **produce antibodies**.

T CELLS

T cells can **kill** the pathogen themselves, **call** for more T cells and **direct the B cells** when to make antibodies as well as when to stop.

PATHOGENS

Pathogens are organisms that cause **disease**, such as a virus, bacteria or parasite. If pathogens manage to enter the body, messages are sent out, and the immune system then directs the correct **attacking cells** to the problem area to destroy these pathogens.

WHITE BLOOD CELLS

The immune system relies on white blood cells called **leukocytes** that are made in the **bone marrow**. These enter the **lymphatic system**, a network of vessels that help **clear toxins and waste** from the body.

PHAGOCYTES

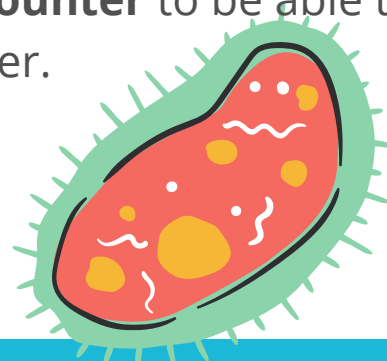
Phagocytes **surround** any pathogens in the blood and **engulf** them, also calling other phagocytes to help.

B CELLS

B cells **produce the antibodies**.

ANTIBODIES

Antibodies **attach to antigens** and are designed to only attach to certain antigens. They only **recognise**, and therefore **attack, bad antigens**. These antibodies are then **stored in the body for the next encounter** to be able to response faster.



NUTRIENTS

IMPORTANT TO THE IMMUNE SYSTEM

Research shows nutrition is an **important factor** that influences the immune system and has **key roles** at every stage of the **immune response**. Therefore it is important to eat a balanced diet especially rich in **immune boosting components** such as **protein, vitamins, and minerals** to enhance the resistance against infections.

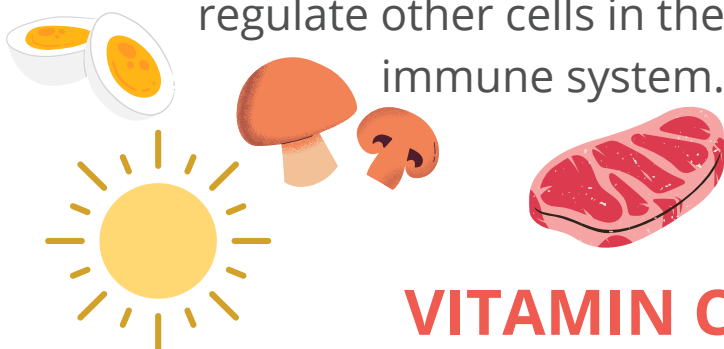
OMEGA-3 FATS

Omega-3 fats are involved in the **activation of immune cells** and the **regulation of the cell membrane** (the outer layers) structure and function. They also boost the immune system by **enhancing B cells ability to engulf pathogens** by increasing their signaling ability.



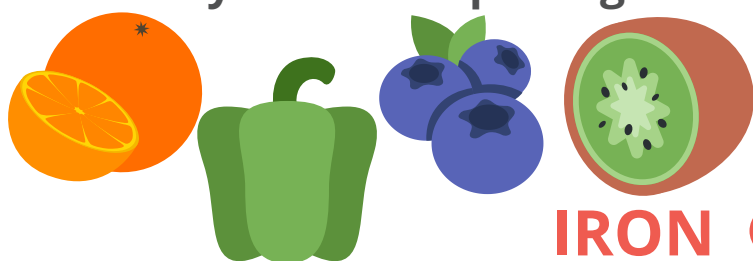
VITAMIN D

Vitamin D **regulates immune cells** function and **inhibits inflammatory processes** by **promoting the T cells** that regulate other cells in the immune system.



VITAMIN C

Improves the **response of phagocytes** and therefore the **ability to kill the pathogens**.



IRON

Iron is a **vital mineral** for both health and infection control. It is essential for **development and growth of the tissue** and **central components** of the immune system.



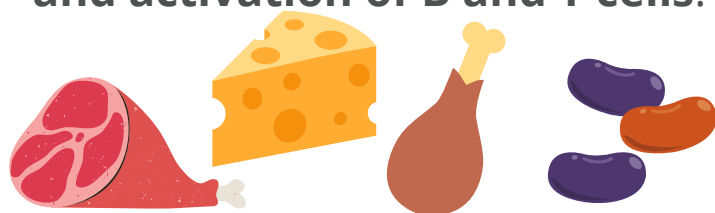
SELENIUM

Improves immunity and **reduces inflammation**. Also important in the **function of leukocytes**.



DIETARY PROTEIN

Protein plays an important role in the **formation of antibodies**. Particularly in the **production and activation of B and T cells**.



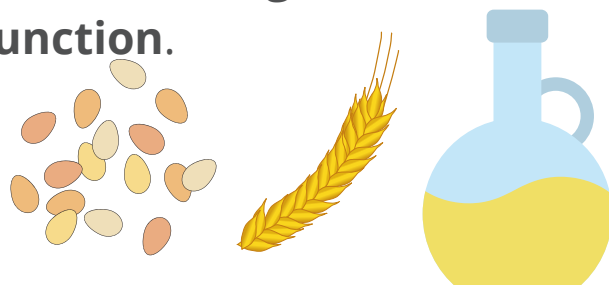
VITAMIN A

Acts as an **anti-inflammatory** factor in improving immune system function, involved in **development of T cells** and their different roles.



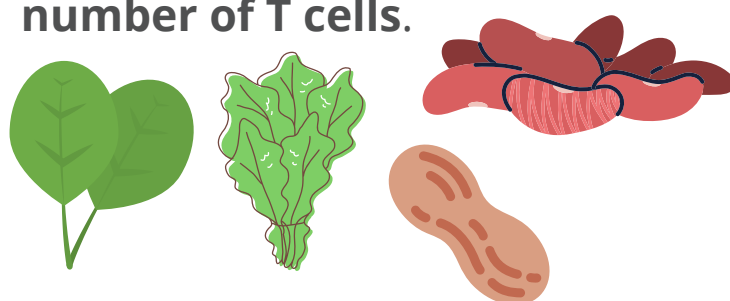
VITAMIN E

Found in **high concentration in immune cells**; enhancing the function of the immune system and reducing the risk of infection. It **regulates T cell function**.



VITAMIN B

Most particularly B1, B6 and B12, help in the **production of white blood cells**, enhancing the **number of T cells**.



ZINC

Zinc is essential for the **development and activation of T cells**.

