

The Lymphatic System

We have already learned that the role of blood circulation is to carry certain substances away from the cells to be eliminated.

This does not take place directly between the blood and the cells but in the liquid that surrounds our cells called *extracellular fluid*.

This liquid is the basis of the *lymphatic system*.

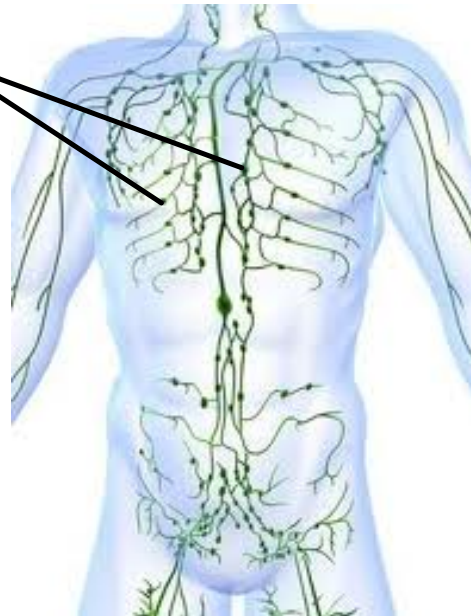
If our cells were to keep the waste they produce they would die. Waste products are expelled into the extracellular fluid where the lymphatic system returns them to the blood and transports them to the various organs that eliminate them from the body.

The lymphatic system is made up of vessels that transports extracellular fluid, inside the vessels is a fluid called lymph.

Lymph Node

Lymph circulates through the body travelling through variously situated lymph nodes which filter it.

Inside a lymph node there is a lot of white blood cells so the lymph nodes are battle grounds where the body fights its enemies.



The human organism reacts to viruses and bacteria from the external world and considers them "invaders".

Once these 'invaders' make their way into our body they can be found in the extracellular fluid, the lymph or the blood.

All three of these liquids contain white blood cells which are the body's "defenders"

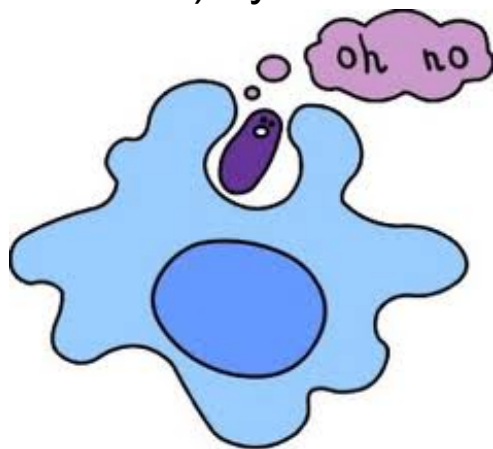


White blood cells (WBCs), or leukocytes, are a part of the immune system and help our bodies fight infection. They circulate in the blood so that they can be transported to an area where an infection has developed.

There are two ways that white blood cells can act to defend the body:

1) They can ingest invaders through phagocytosis

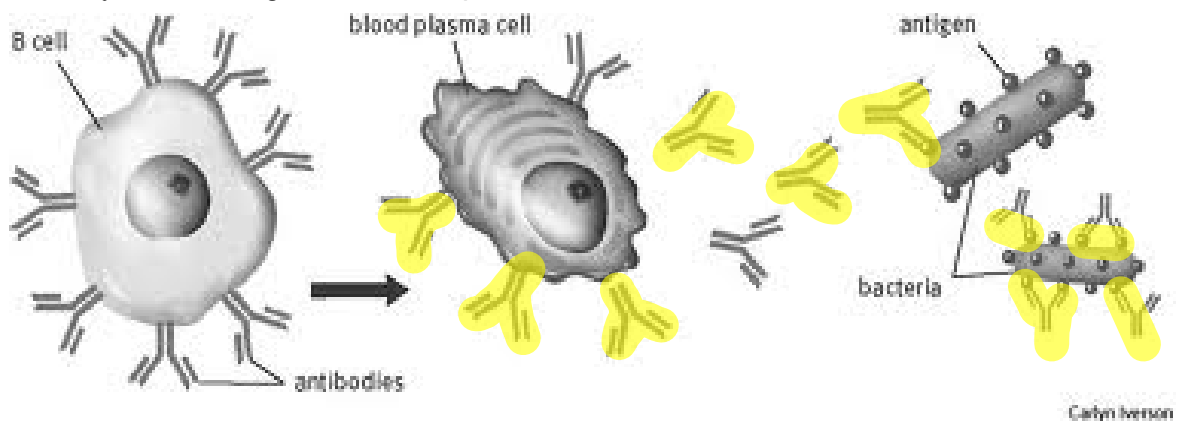
- The membrane of a white blood cell engulfs the invader. Once the invader is inside the white blood cell it is destroyed by a substance that is secreted (or released) by the white blood cell.



2) They neutralize invaders by secreting substances called antibodies

- Antibodies recognize antigens (a substance that triggers the white blood cell to produce antibodies)
- Antibodies then attach themselves to the antigens which neutralizes the invader and prevents it from reproducing or attacking other cells. Once neutralized, the invader is eliminated.

- Antibodies prevent invaders from entering or damaging cells by binding to them; stimulate removal of invader by other cells; trigger destruction of invader by stimulating immune responses



The antibodies produced by white blood cells have two features

1) They are specific

They can only recognize antigens for which they were produced.

So each new/different antigen needs a new antibody

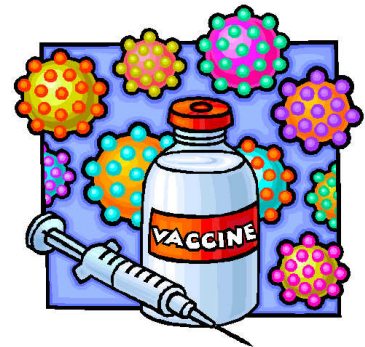
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2) They are immunizing

The white blood cells remember (sometime for a lifetime) how to produce a particular antibody. That is why we have certain diseases only once in our lives (ex: chicken pox).

Vaccinations

- Immunity booster to a certain virus
- Can be to prevent or improve the effects of a future infection
- Can be therapeutic ex. Vaccines against cancer
- Immune system recognizes vaccines as foreign, destroys them, 'remembers' them
- Upon entry of virus, immune system recognizes foreign invaders, neutralizing and destroying cells infected by them
- Vaccines do not guarantee complete protection from a disease
- Sometimes the immune system does not respond properly or at all ex. low immunity due to diabetes, steroid use, HIV infection
- Typical Vaccinations: Polio, Hepatitis A,B, Tetanus, Diphtheria, Chicken pox



Notes on Lymphatic System

If our cells were to keep the waste they produce they would die.

Waste products are expelled into the extracellular fluid (which is a clear liquid that surrounds our cells).

White blood cells defend the body in two ways**1- They ingest invaders through phagocytosis**

The membrane of a white blood cell engulfs the invader and the invader is destroyed by a substance secreted by the white blood cell.

2- They neutralize invaders by secreting substances called antibodies

Antibodies recognize antigens (a foreign substance) and attach themselves to these antigens which neutralize the invader and prevent it from reproducing or attacking other cells. It is also eliminated because of the neutralization.