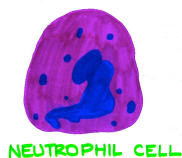
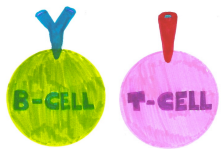
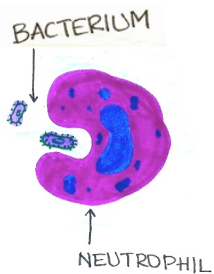
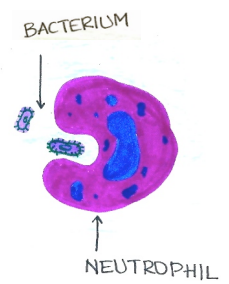
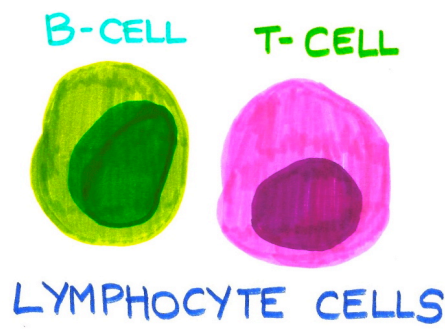
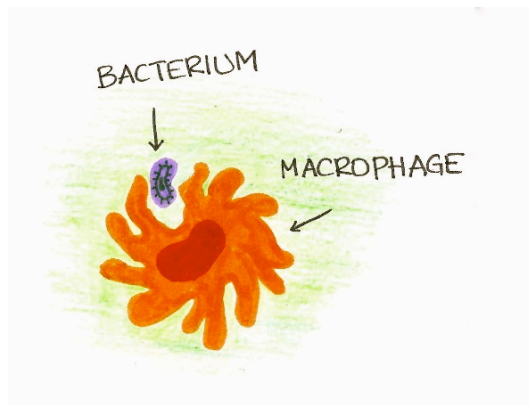


MACROPHAGE

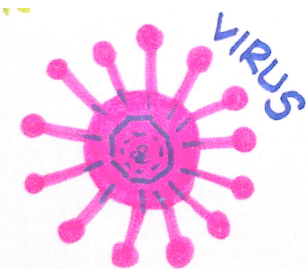


YOUR WEIRD AND WONDERFUL IMMUNE SYSTEM



YOUR WEIRD AND WONDERFUL IMMUNE SYSTEM

MACROPHAGE





This Book Belongs To:

.....

Paste a
Picture of
yourself
here!

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Foreword

This book is to help you understand the immune system in a colorful and interesting way. The immune system is an amazing network that has a lot of truly interesting and astonishingly clever functions. Your body does a lot of fantastic things that you don't notice. Your immune system is one of these amazing things. It's always at work and never sleeps or rests, because your immune system is responsible for keeping your body balanced and healthy!

I hope this book will help you understand how wonderfully the immune system works in protecting your body from germs and other dangers. Enjoy!

March 2012

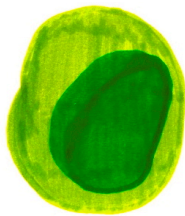
Marie Lawitschka



Introducing the cells

The Good ones ...
(Immune cells)

B-CELL

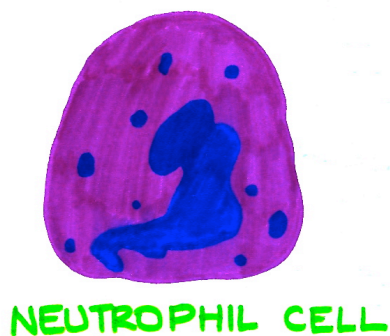
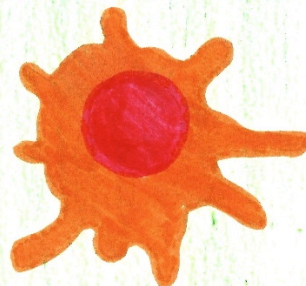


T-CELL



LYMPHOCYTES

MACROPHAGE

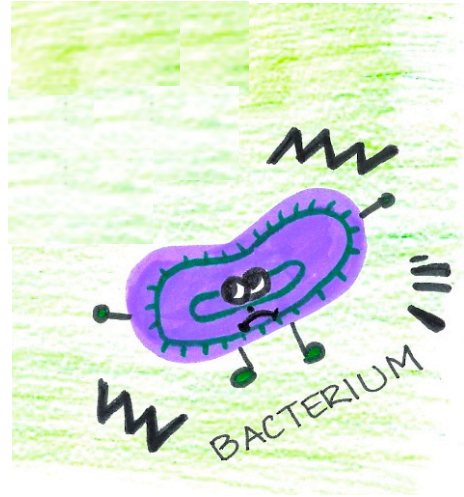
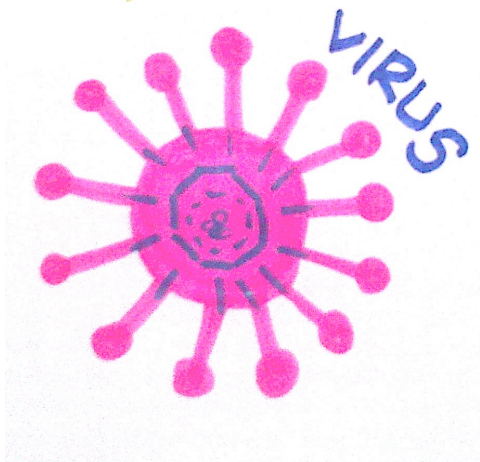


NEUTROPHIL CELL



DENDRITIC
CELL

The Bad ones ... (Pathogens)



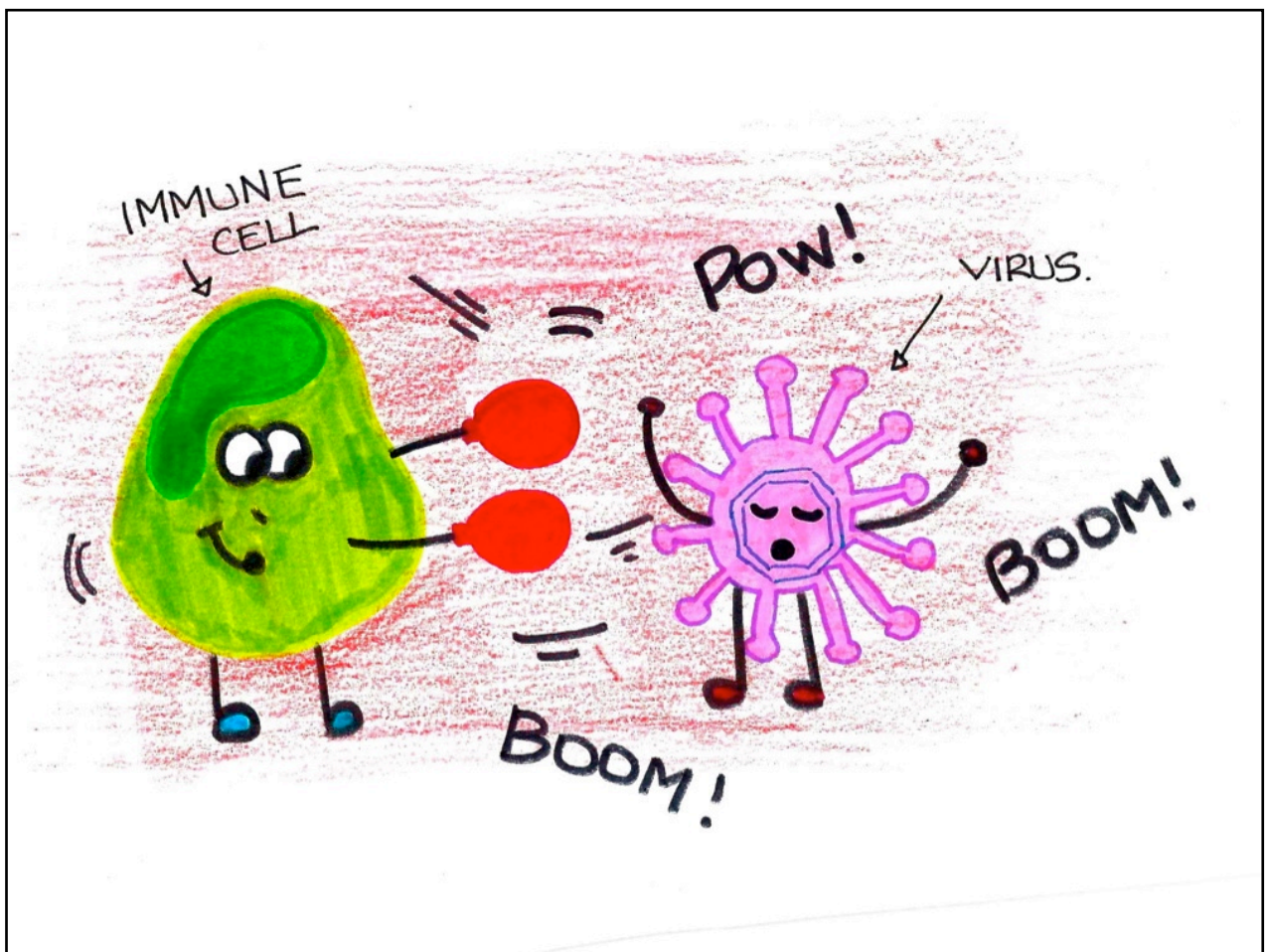
What is your Immune System?



Your immune system is a network in your body which is made up of special cells, proteins, tissues and organs. The cells of your immune system travel around and patrol your body. The job of your immune system is to defend your body from illnesses and diseases. From the top of your head to the tip of your toes, wherever there is an infection, immune cells rush to the site and knock out the germs to protect your body. Your immune system is very important for your body. Without your immune cells, a simple cold would kill you!

What does your Immune System do?

Your immune system fights invaders to keep your body healthy. It attacks anything foreign to your body, such as germs, and helps your body maintain a healthy balance.

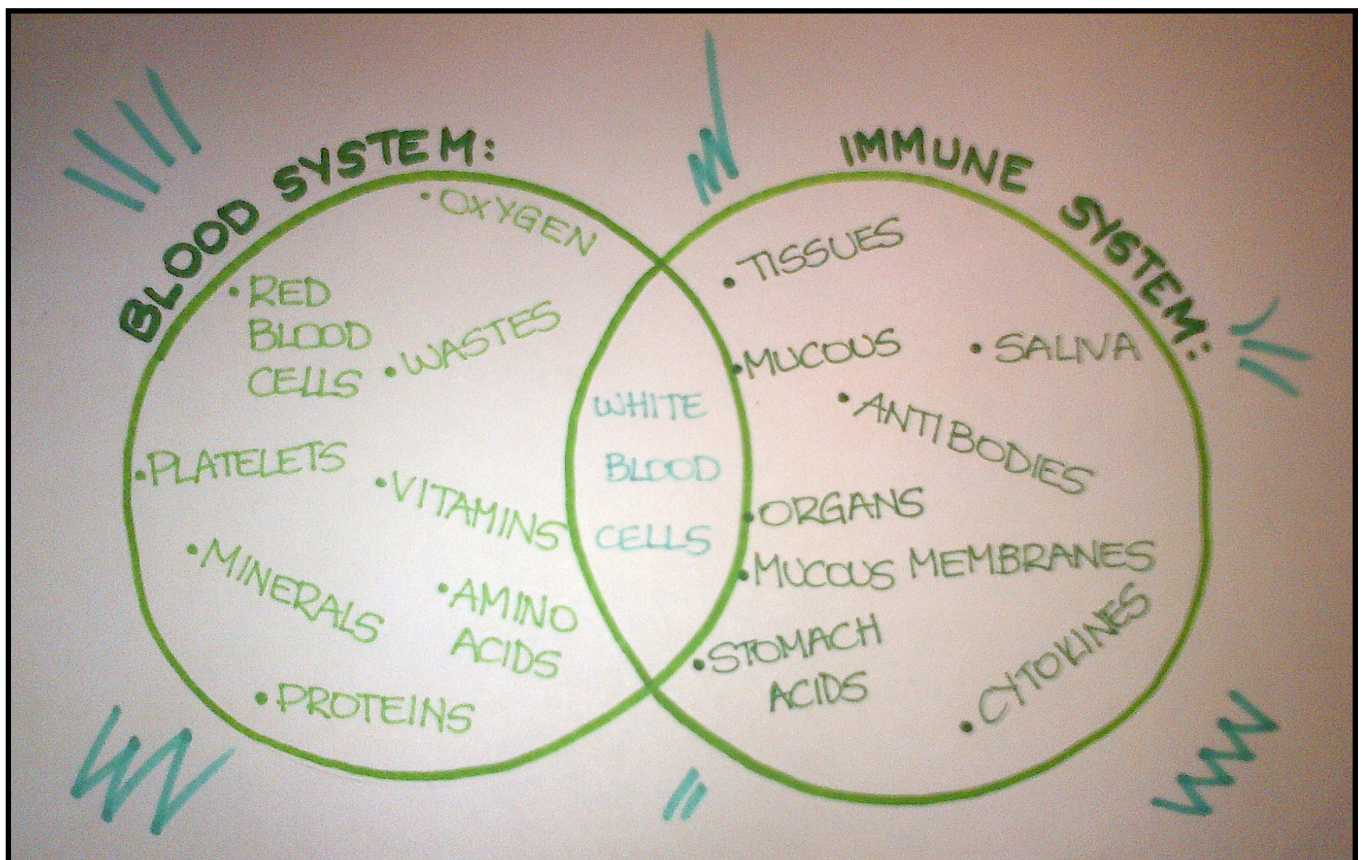


Where is your Immune System?

Your immune system is anywhere and everywhere in your body! An important part of your immune system are the white blood cells, which are spread all over your body. Because white blood cells are carried to all parts of your body by blood, your immune system is present from head to toe.



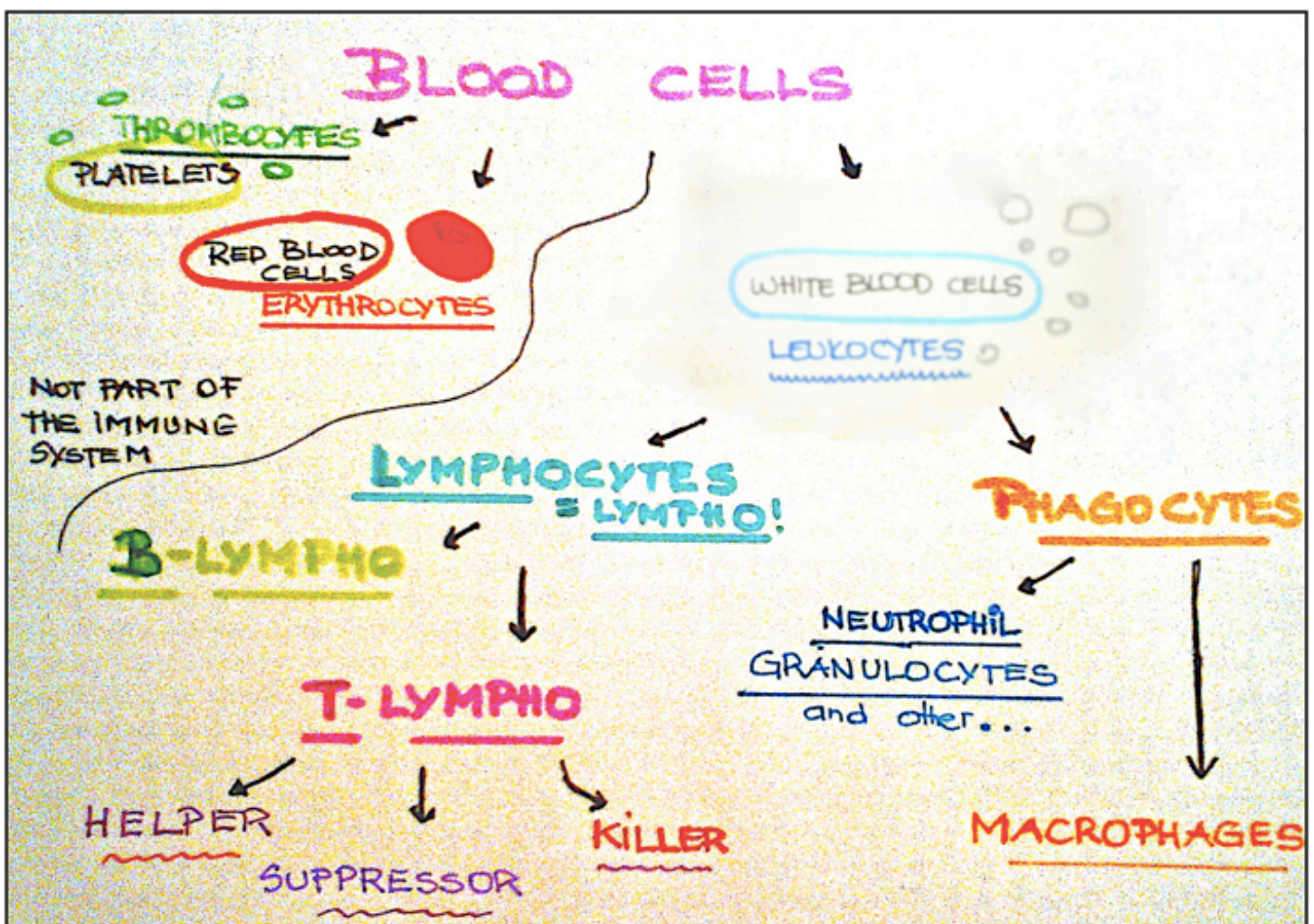
Your Blood System and your Immune System



Although the immune system may seem very similar to the blood system, they have different jobs to complete in your body. Some of the cells in your body may be required for both your blood system and your immune system, but there is still quite a difference between these two networks.

What cells are in your Immune System?

Your immune system is made up of a lot of different cells that work together to keep your body healthy. A lot of these cells are different types of **white blood cells**.



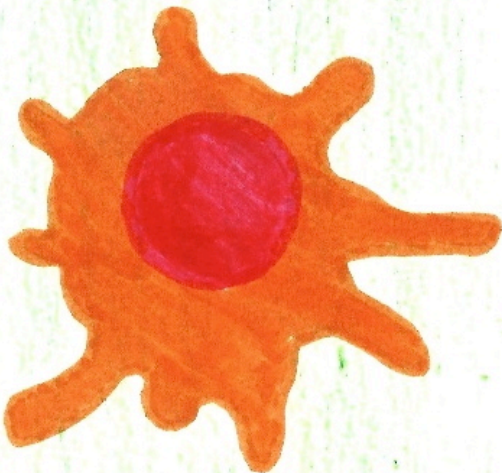
There are several different ways in which germs can enter your body. One of these is entering through a cut in your skin. If germs enter, immune cells move to the site and destroy the germs.

Neutrophils, a type of phagocyte, are an important part of these cells.



NEUTROPHIL CELL

MACROPHAGE



Another type of phagocyte is called **macrophage**. Macrophages destroy pathogens directly by engulfing them and eating them up.

The other group of white blood cells are called lymphocytes. They are the smallest in the family, but their job is very important. There are two types of lymphocytes: the B-lymphocytes and the T-lymphocytes. It's also very important to remember that there are two different types of T-lymphocytes which have different jobs in your body. Some of them are the helper cells and are called the 'Helper T-cells', while

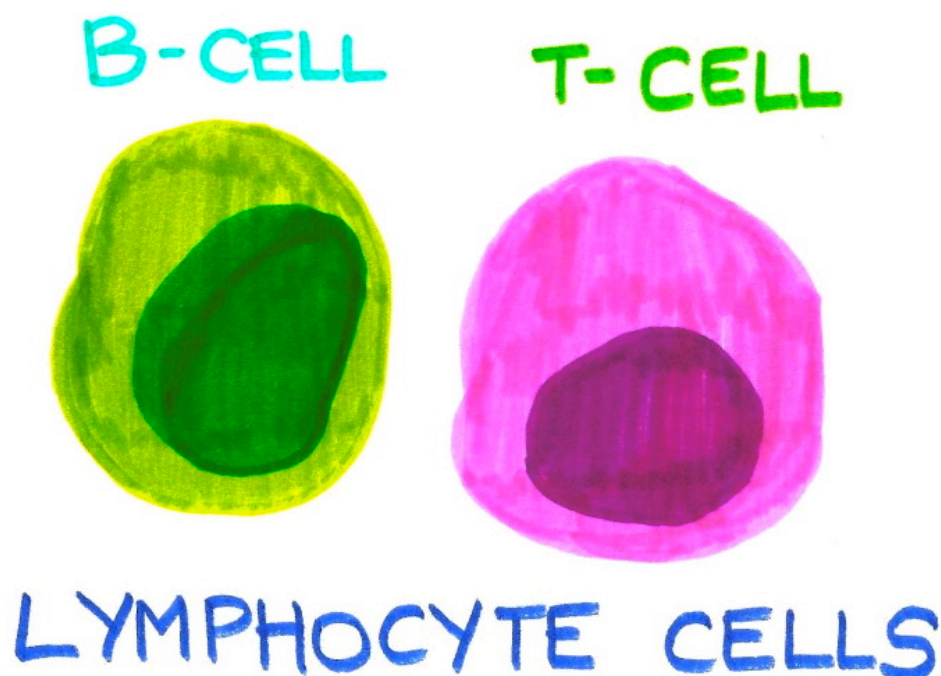
others do the actual job of killing and are referred to as the 'killer T-cells'. The job of the helper T-cells is to find

pathogens and then

call the killer T-cells or other cells

to help them keep

your body free from bacteria, fungi or viruses. The Helper T-cell may also call cells like B-cells or phagocytes to kill the unwanted germs. The B-cells produce special weapons against the pathogens called antibodies. Antibodies help your immune system to kill the pathogens in your body by sticking on their surface and then destroying them.

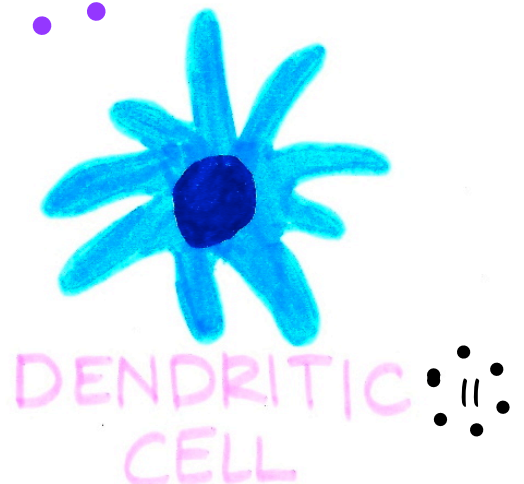




DENDRITIC
CELL



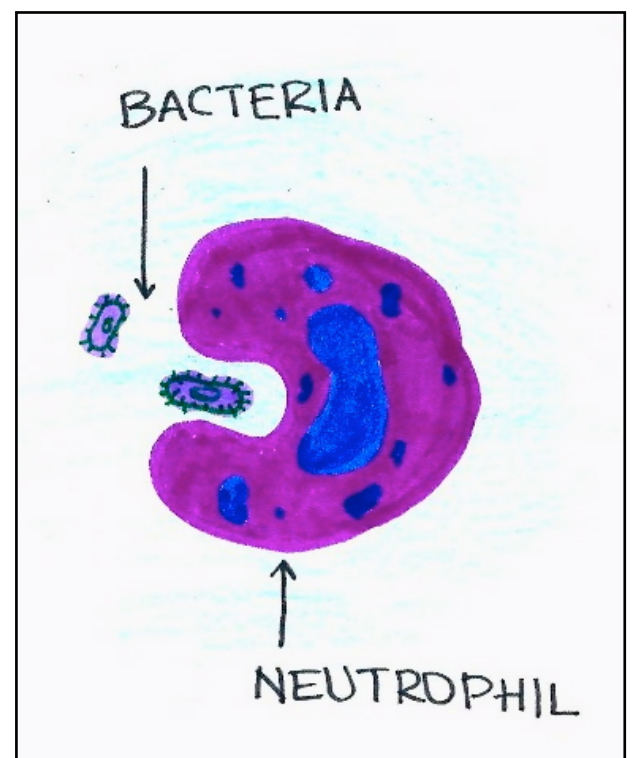
The last important white blood cell that you need to know about is called the **dendritic cell**. They are not only found in your blood, but also in your body tissues. The dendritic cell helps the Helper T-cell and tells the body **what type of pathogen** it is dealing with and how it can be destroyed. The dendritic cell swallows the germ and then puts it on its surface.



How does your Immune System kill Pathogens?

There are three main ways your immune system can kill pathogens and of course, many of your immune cells are important for this process.

Your immune system sometimes kills bacteria or viruses through eating and swallowing pathogens. The two types of phagocytes, neutrophils and macrophages, usually engulf pathogens and **eat them up**. This is their method of killing germs in your body.



BACTERIUM

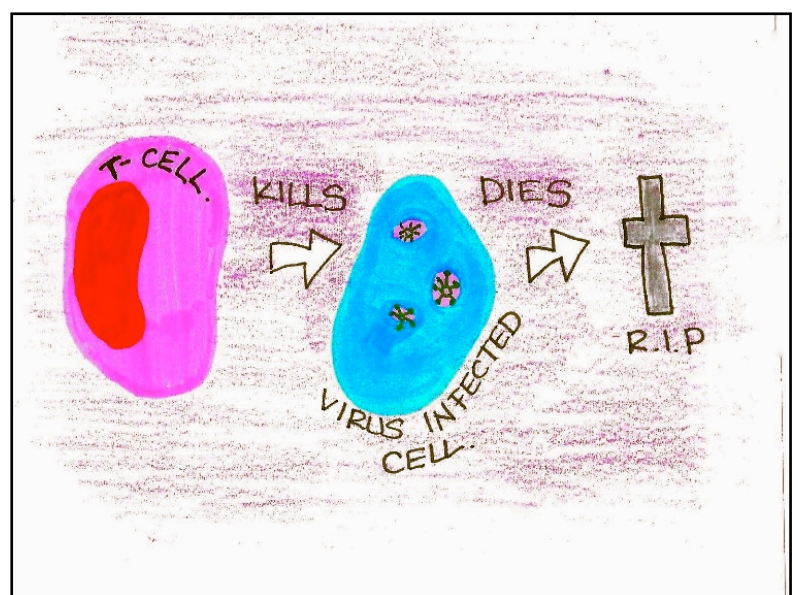


MACROPHAGE



In the picture on the left you can see the macrophage gulping up the bacterium. This is one of the ways our body saves us from dangerous bacteria.

Another way your immune system gets rid of germs is through **killing infected cells**. This is where T-cells come into play. Helper T-cells find the infected cells and then killer T-cells simply kill them to stop the infected cells from spreading the virus or bacteria in your body.



Your immune system also sometimes **kills** pathogens **with antibodies**. Once germs pass your most important physical barrier, the skin, they can be very harmful for your body. B-cells produce weapons called antibodies, which attach

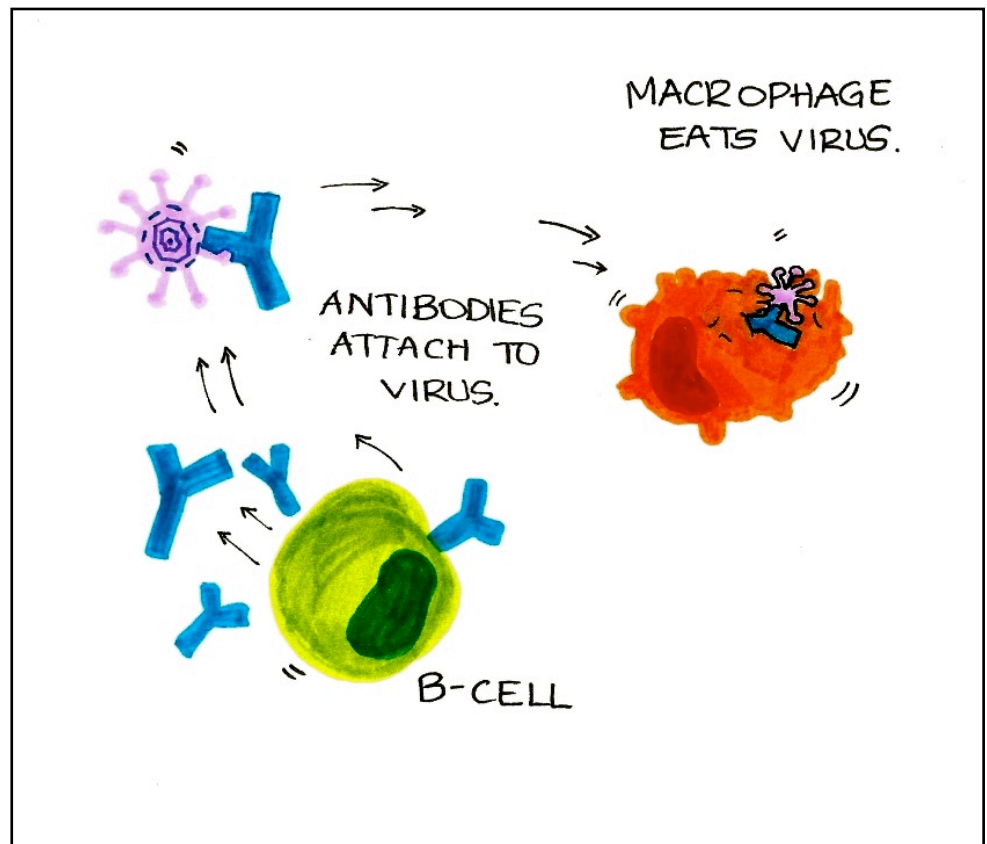
themselves

to the surface of pathogens to prevent them from **entering** cells.

Antibodies attach themselves

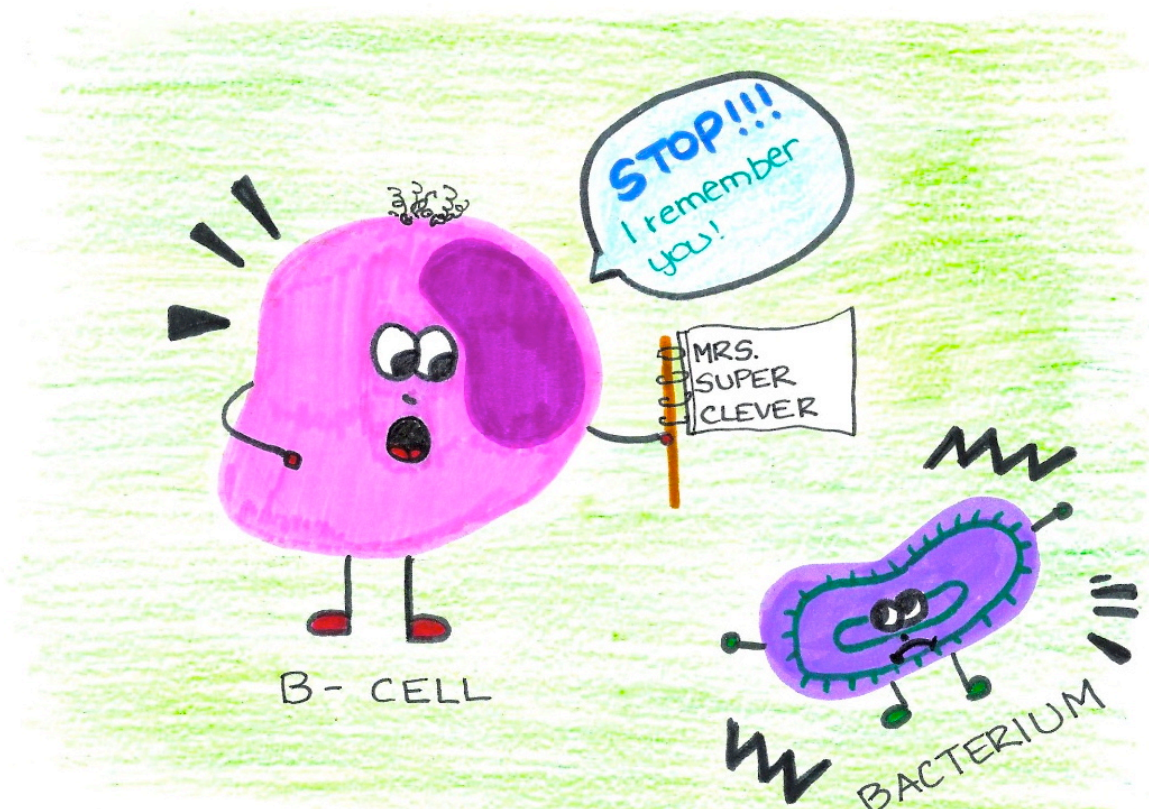
onto

pathogens, which then flags them as food for macrophages. Of course macrophages can also eat pathogens without antibodies on them, but this special weapon of your body makes it a lot easier.



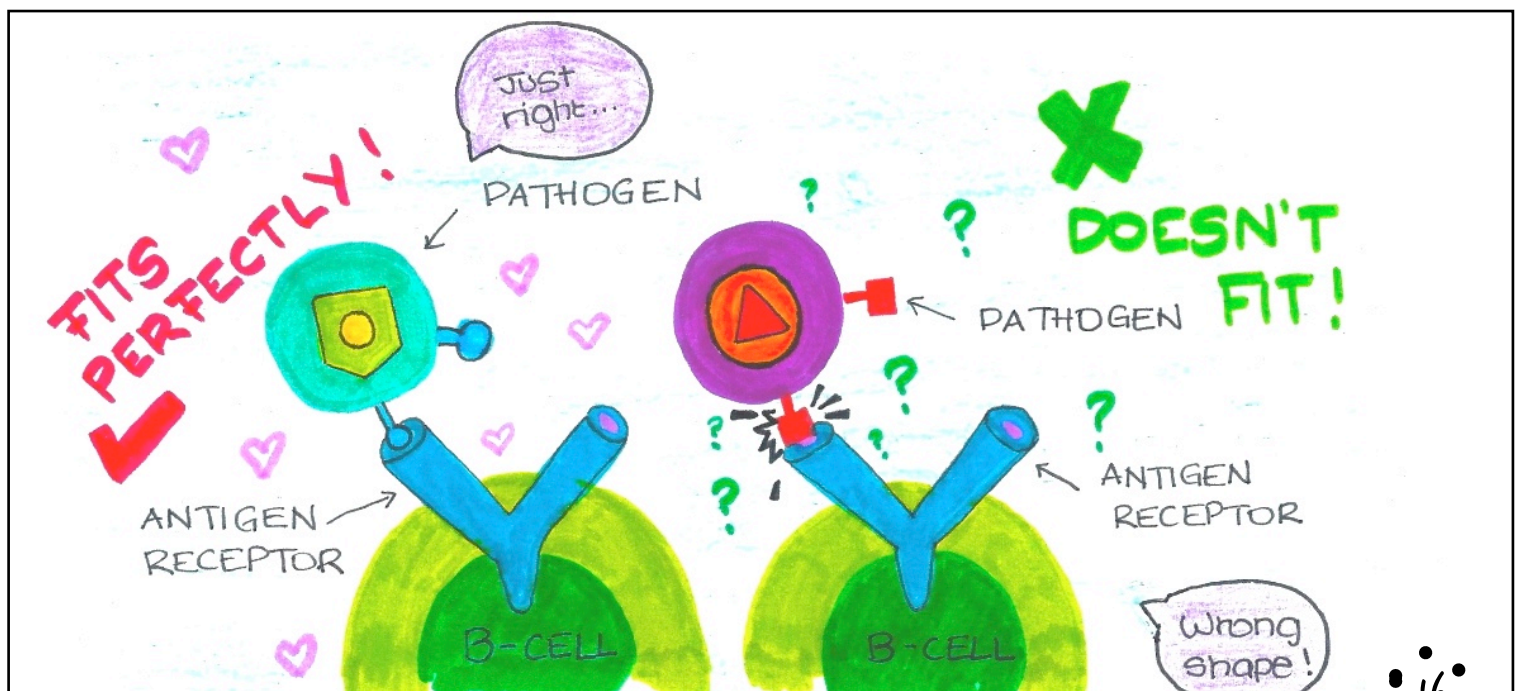
How does the Immune system work?

When pathogens enter your body, they will mostly be destroyed. But that's not all! Your immune system is very clever and has a lot of functions; it also remembers the pathogens that enter your body. So the next time your body catches the same viruses or bacteria, your immune system will have a faster and better response. The cells that are responsible for remembering the pathogens are called memory cells. Although immunological memory protects you from getting sick with the same type of pathogen again, it can't help if you are infected by a new germ. As you get older, your immunological memory expands, in fact, your immune system can memorize an amazing number of germs.

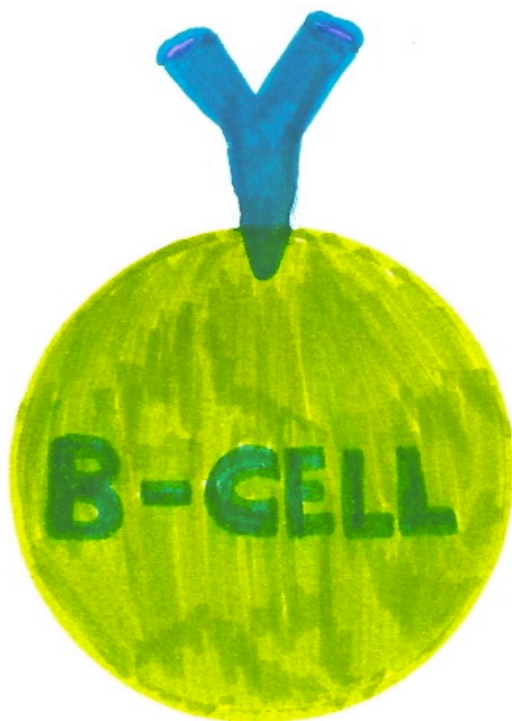


Depending on the antigen that entered your body, your immune system reacts. But how does your body know which type of pathogen it is dealing with? And how can your immune cells know how to best get rid of it?

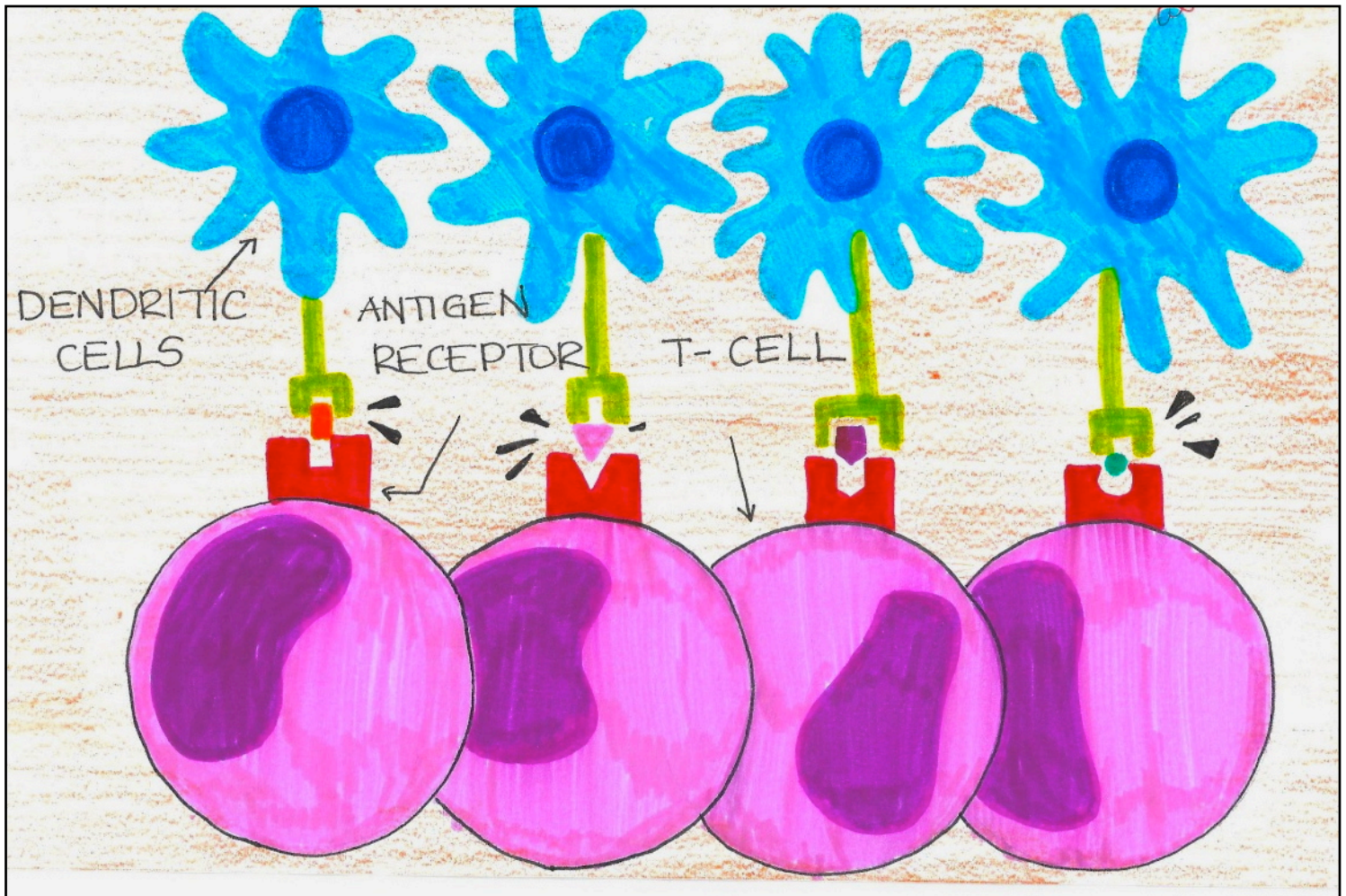
The job of telling the difference between pathogens belongs to the lymphocytes. They have special tools on their surface called antigen receptors. At the end of these receptors there are holes with specific structures. Each receptor has its own shape. In fact, there are over 10 billion different kinds of antigen receptors in your body. The shapes in the receptors only match specific antigens. Through this, the lymphocytes can identify which methods and cells they need to use to kill these viruses or bacteria.



B- and T- cells both use the same methods, after all they are both lymphocytes. The difference between their receptors is their form; T-cells have tube shaped receptors, while B-cells have 'Y' shaped receptors. These two pictures show their differences and what it looks like when a receptor doesn't match the antigen.



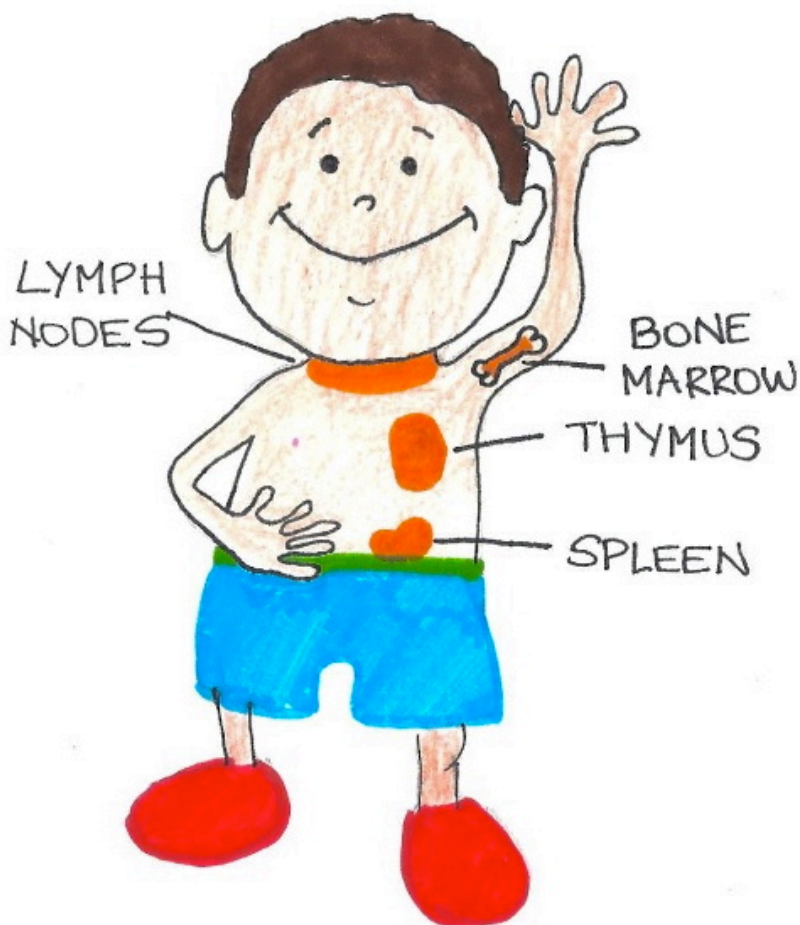
Dendritic cells help lymphocytes to recognize pathogens. They present the pathogen to the lymphocytes, which then checks if its receptor matches the antigen. Dendritic cells are like waiters who serve a dish to a customer.



B-cells have another very important job and function. When the B-cell releases its receptor, it turns into an antibody that travels around the whole body and attaches its self to viruses and bacteria to help kill them.

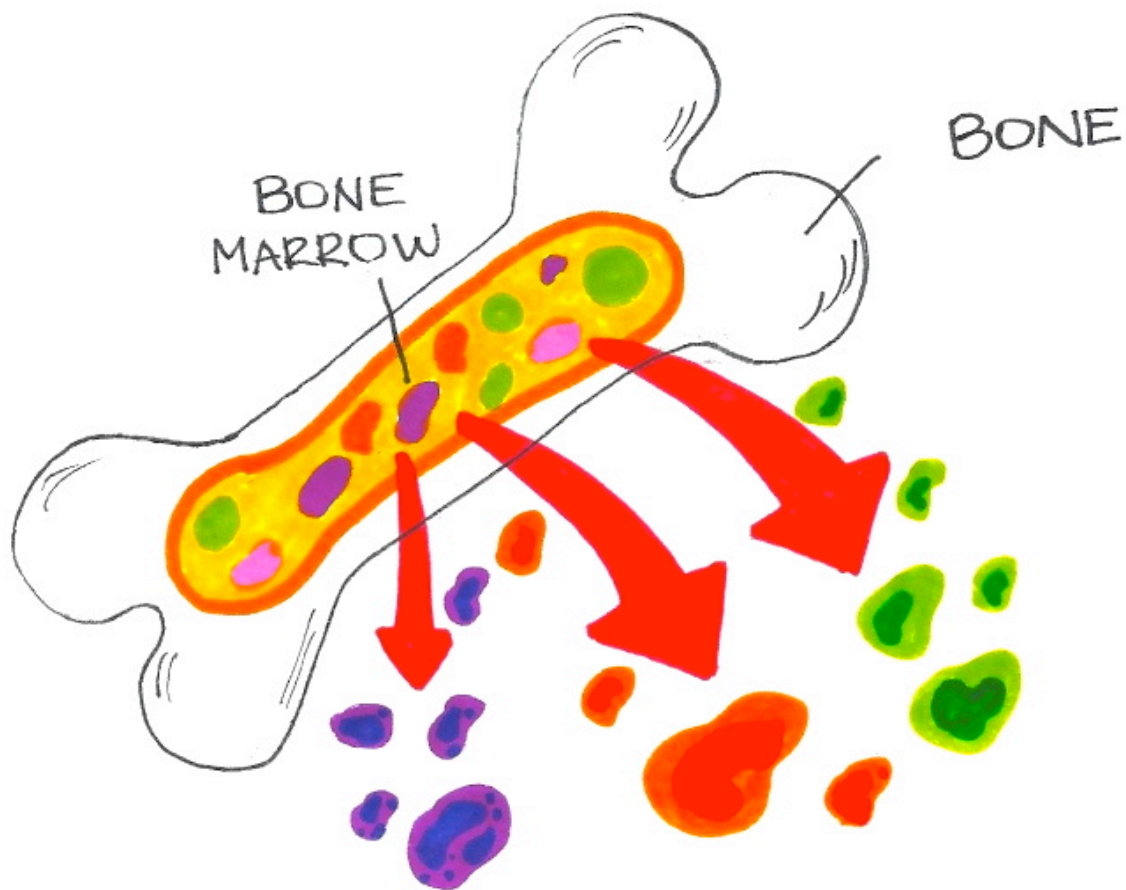
Where are the cells of our Immune System made?

Generally Speaking, most of the cells are made in your bones. In the centre of your bones, there is a soft yellowish jelly called the bone marrow. This is where blood stem cells and other cells are created.



The development and growth of immune cells may also happen outside of the bone marrow. For example, T-lymphocytes are matured in the thymus, which is located beneath your breast bone. Other cells are created in the lymph nodes or the spleen.

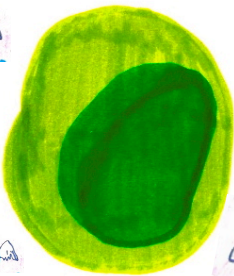
So, all together, the home of the immune system is in the bone marrow, the thymus, the spleen and the lymph nodes.



Once the cells leave their home, they travel around the whole body, patrolling it and killing any foreign germs.

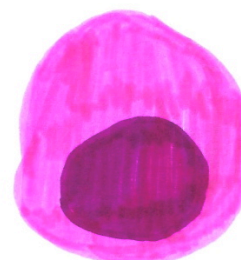
How do Immune cells help each other?

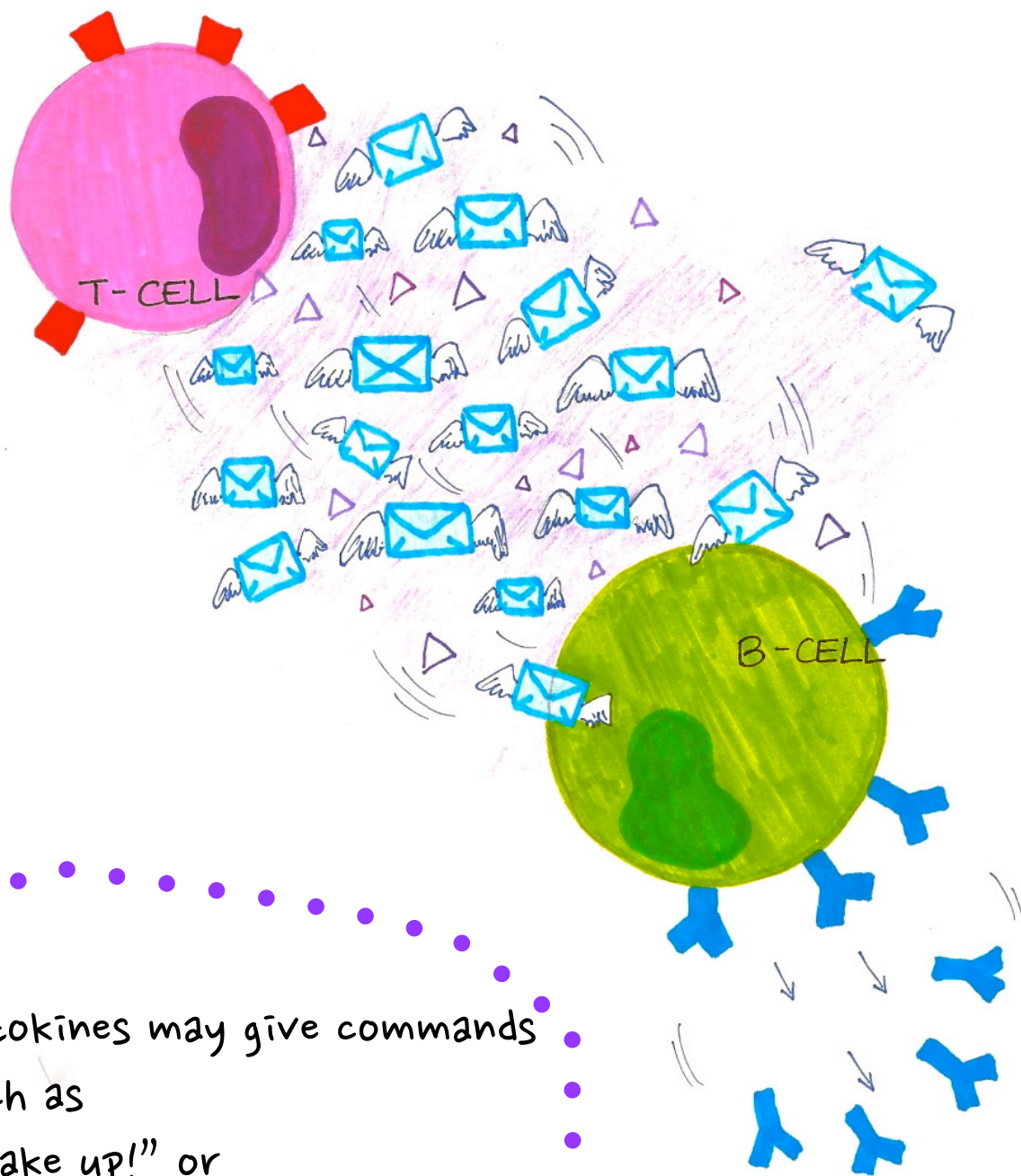
B-CELL



Wherever immune cells meet, they can exchange information. In other words, they talk to one another. They communicate through 'letters'. In fact, these letters are different molecules which are released by some cells and taken into 'letterboxes' of other cells. Some of these letters are called cytokines and their 'letterboxes' are called cytokine receptors.

T-CELL





cytokines may give commands such as
“wake up!” or
“Activate!” or
“Grow!”. This communication between your cells is very important for the immune system to function flawlessly.

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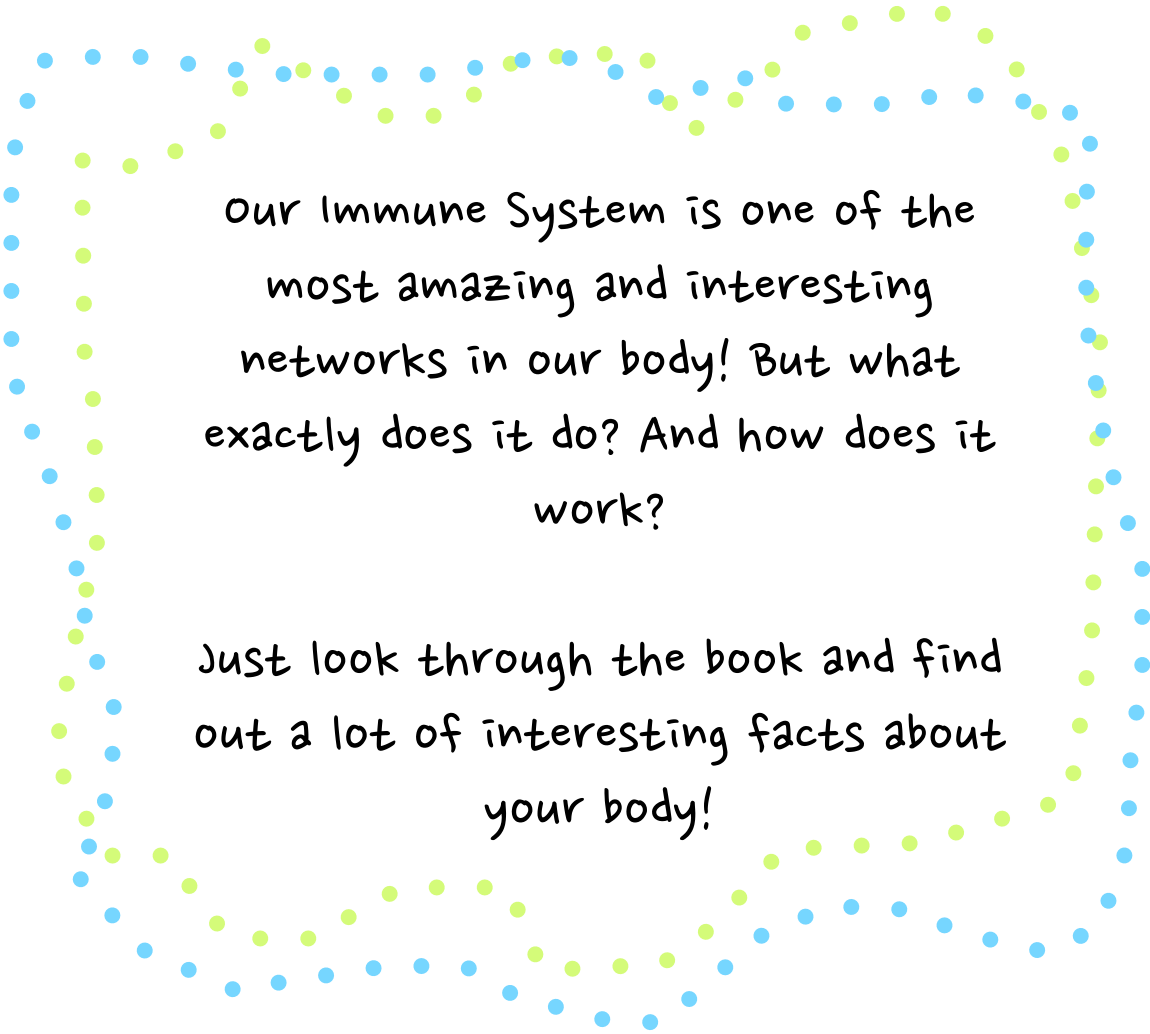
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Our Immune System is one of the
most amazing and interesting
networks in our body! But what
exactly does it do? And how does it
work?

Just look through the book and find
out a lot of interesting facts about
your body!