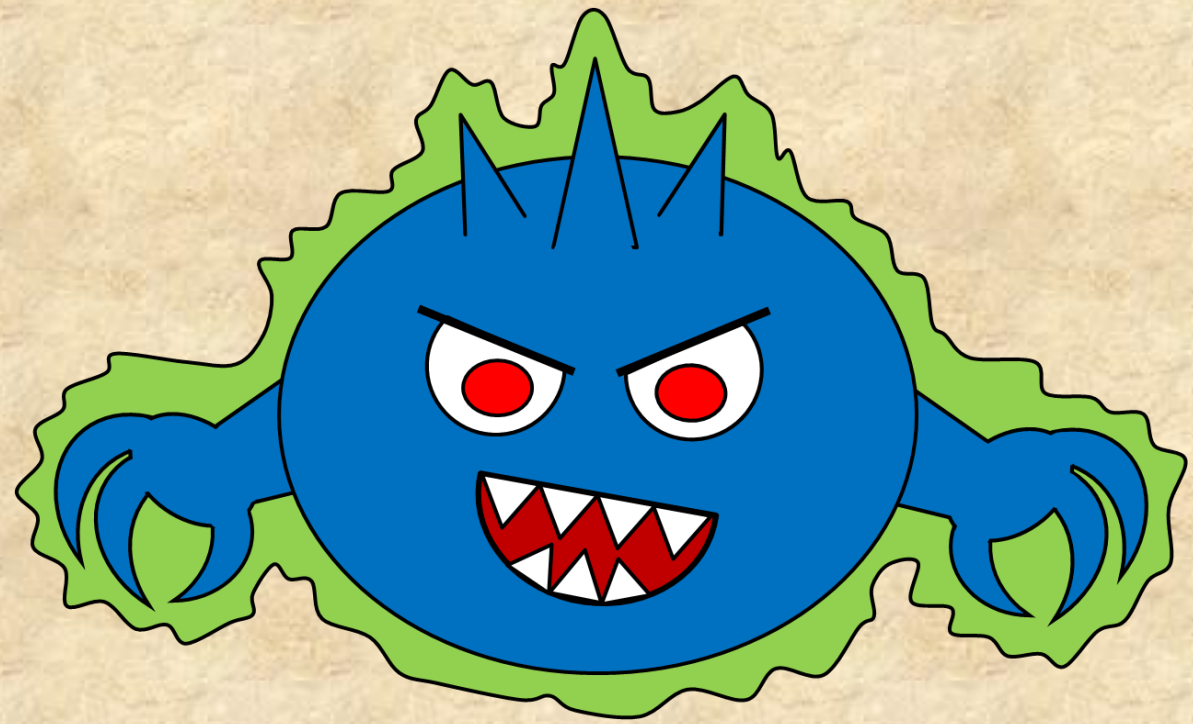
The Immunocytes against the Pneumococcus



Juan Carlos Aldave, MD

Allergy and Clinical Immunology

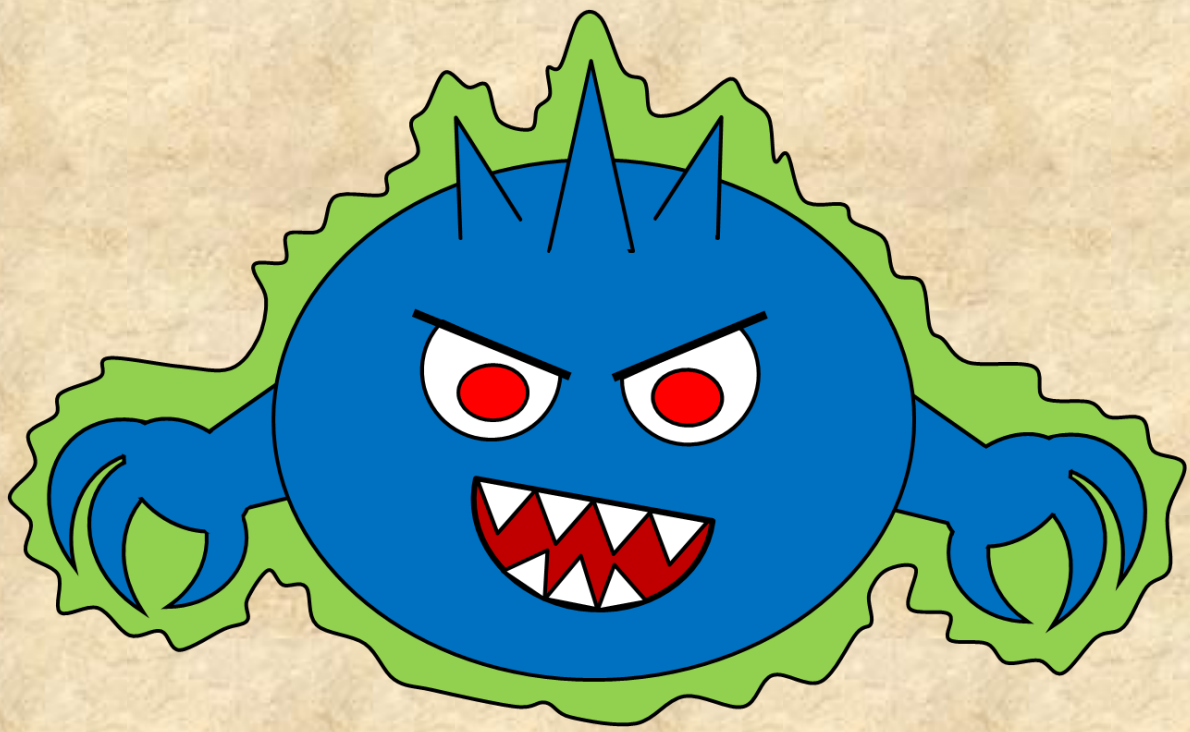
Around us, in the environment, there are many germs (microbes) that can harm us, causing illness or even death.

There are 4 major groups of germs: viruses, bacteria, fungi and parasites. We are exposed to these threats since birth, so we need to have many cells and molecules to defend our bodies.

We will call "immune system" to our body defenses, and "immunocytes" to the immune cells that protect us.

In this little book I will show you how our immunocytes fight and defend us from a very dangerous bacterium: the Pneumococcus.

Chapter 1:
The aggressive Pneumococcus

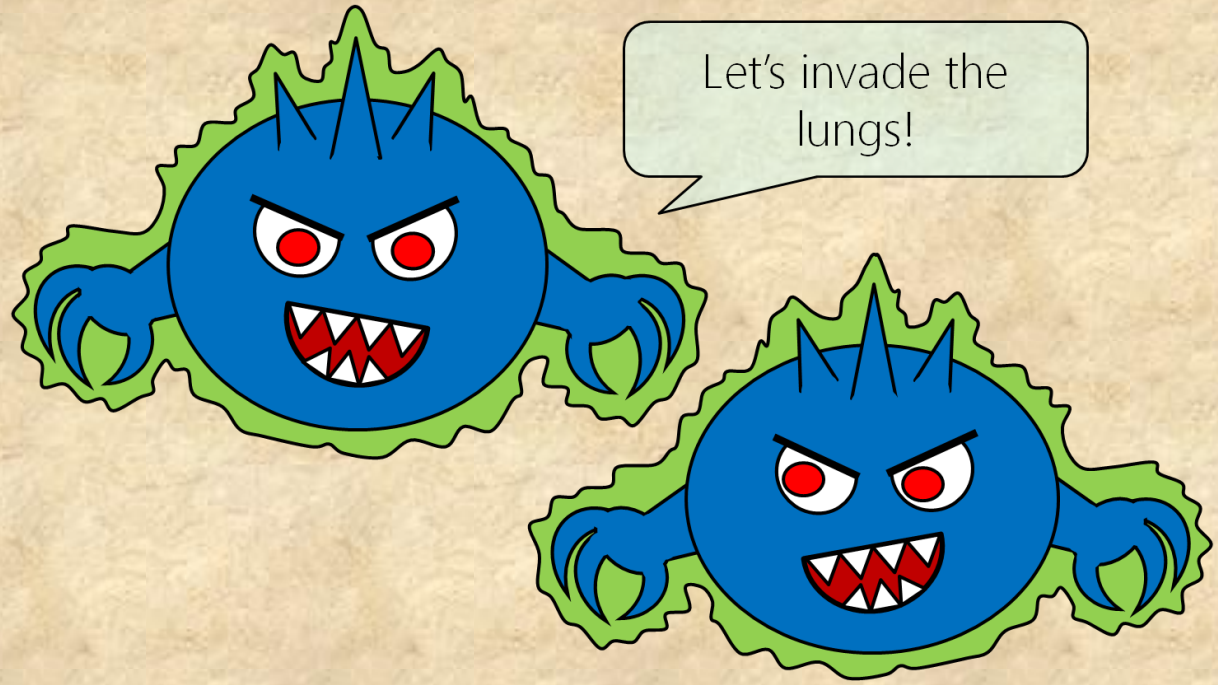


A frightening microbe can live hidden in our nose and throat: Streptococcus pneumoniae, also known as the pneumococcus. The enemy Pneumococcus (plural: Pneumococci) is a microbe that belongs to the kingdom of bacteria. He likes to walk in pairs. We cannot see him because he measures only 1.5 microns, about one thousandth of a millimeter.

Despite being very small, the Pneumococci are very dangerous for us because they can cause infections such as otitis (ear infection), sinusitis (infection of the paranasal sinuses), bronchitis (bronchial infection), pneumonia (infection of the lungs) or meningitis (infection of the meninges in the nervous system).

The Pneumococci takes advantages of any weakness in our defense system to invade our body. In the world, millions of children, youth, adults and elderly die each year due to infections by this bug.

In the next chapters we will learn how our immune system protects us from the threatening Pneumococci.



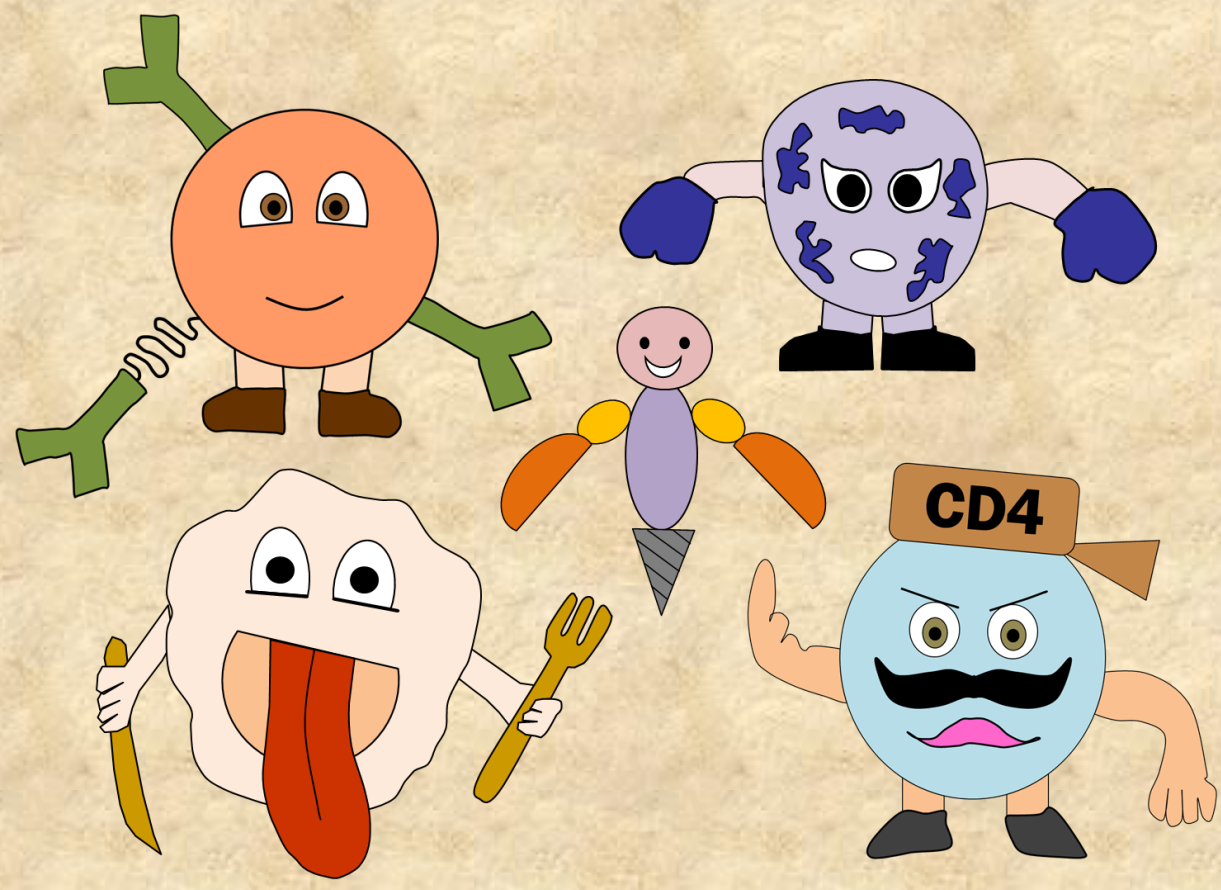
Please answer the following questions:

1. Where can the dangerous Pneumococcus live?
   In our _____ and _____.

2. Which kind of infections can be caused by the Pneumococci?
   _____

3. How many people die every year due to infections by the Pneumococcus?
   _____

Chapter 2:
The anti-Pneumococcus army



The Pneumococci are very dangerous bacteria capable to kill us. To eliminate these bugs from our body we need a powerful group of immunocytes that we will call: “the anti-Pneumococcus army”.

The leader of our anti-Pneumococcus army is the T CD4 lymphocyte, who empowers the other immunocytes to fight and destroy the invading Pneumococci. The B lymphocytes, the macrophages and the neutrophils are the other soldiers involved in this hard battle.

We also have a set of proteins that help our immune cells to kill the Pneumococci. These proteins are known as the "complement system".

In the next chapters we will study each member of our anti-Pneumococcus army. Let's answer the following review questions:

1. Who commands our anti-Pneumococcus army?

   _____

2. Which are the soldiers of our anti-Pneumococcus battalion? Paste the correct stickers.

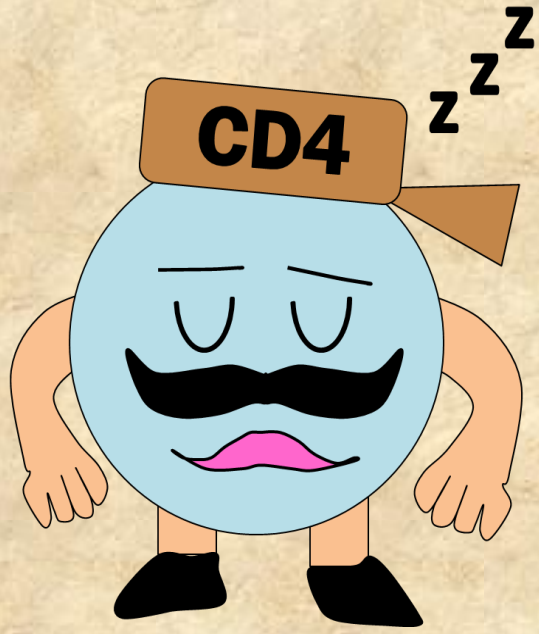
Felix, the T CD4 lymphocyte

Moli, the B lymphocyte

Fefon, the macrophage

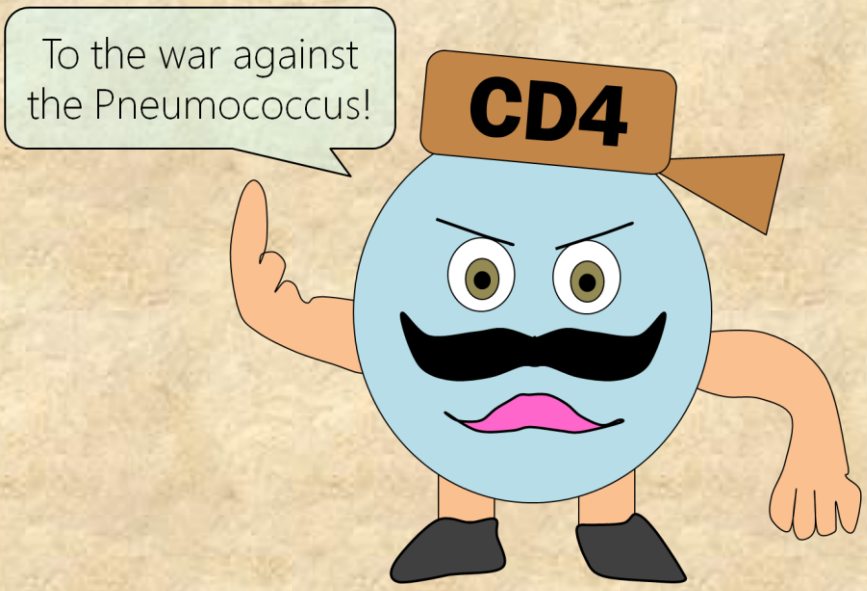
Robert, the neutrophil

Chapter 3: Felix, the leader of our anti-Pneumococcus army



Look at Felix, our T CD4 lymphocyte. His major ability is to help the other immunocytes for an optimal activation and function.

When Felix recognizes an invasion by the Pneumococci, he wakes up and empowers the other soldiers into the battle.



For example:

- Felix helps the B lymphocytes to produce better antibodies against the Pneumococci.
- He also empowers the macrophages to eat the threatening bacteria.
- Even more, Felix can attract our neutrophils to the battle.

Felix is an essential immunocyte to protect our life. In the next chapter I will introduce you another very important immunocyte: Moli, our B lymphocyte.

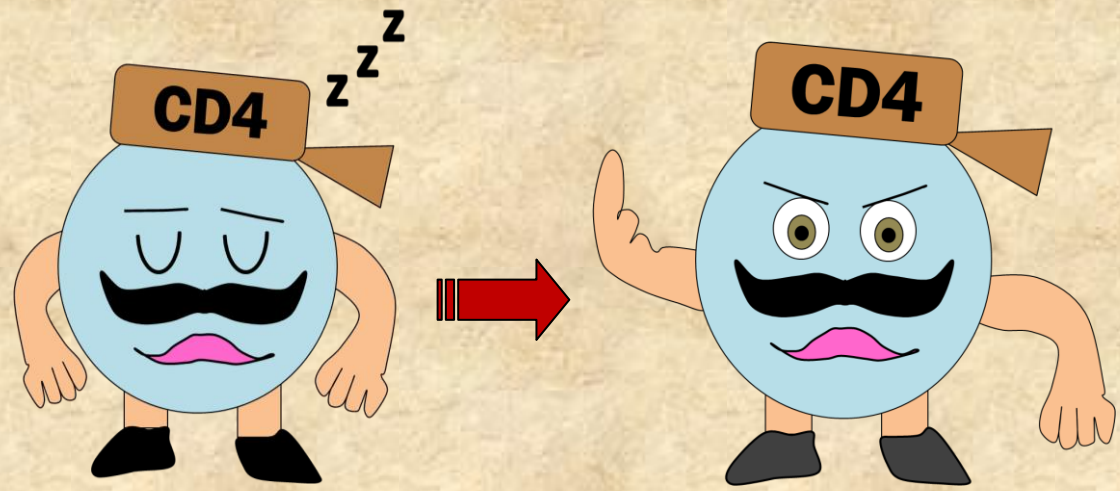
Please help Felix to answer the following questions:

1. Who is the leader of our anti-Pneumococcus army?

   _____

2. What happens when Felix recognizes the invading Pneumococci?

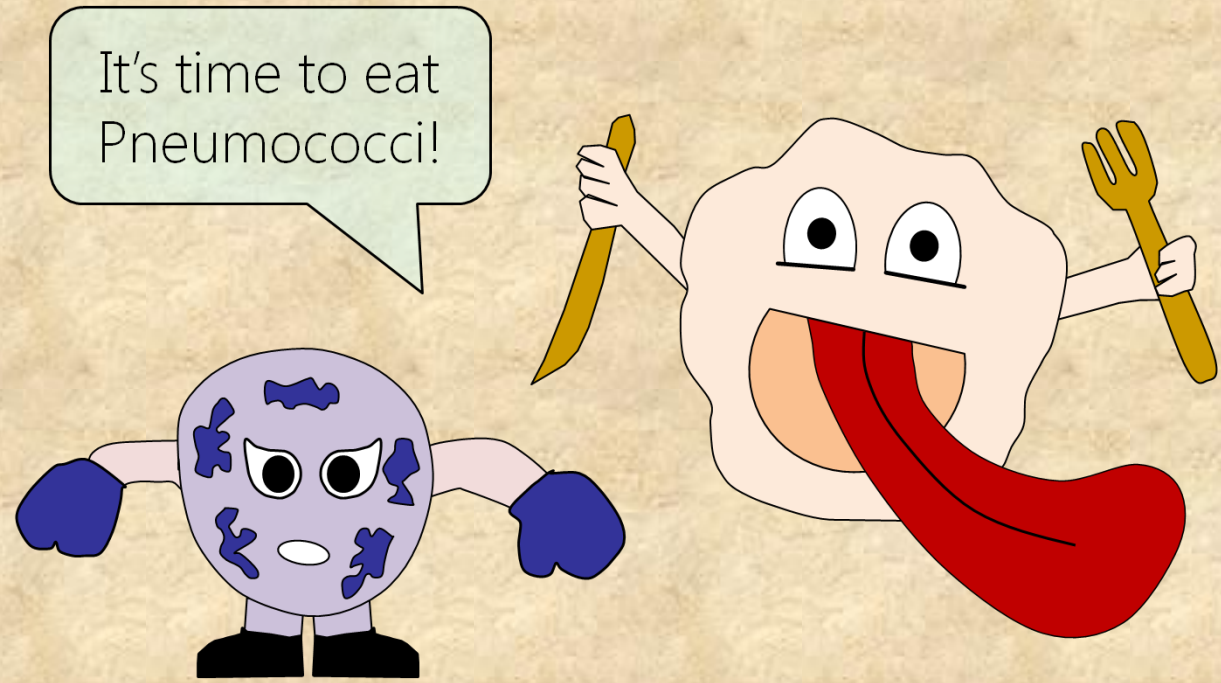
   _____



3. Why does Felix help the B lymphocytes?

   _____

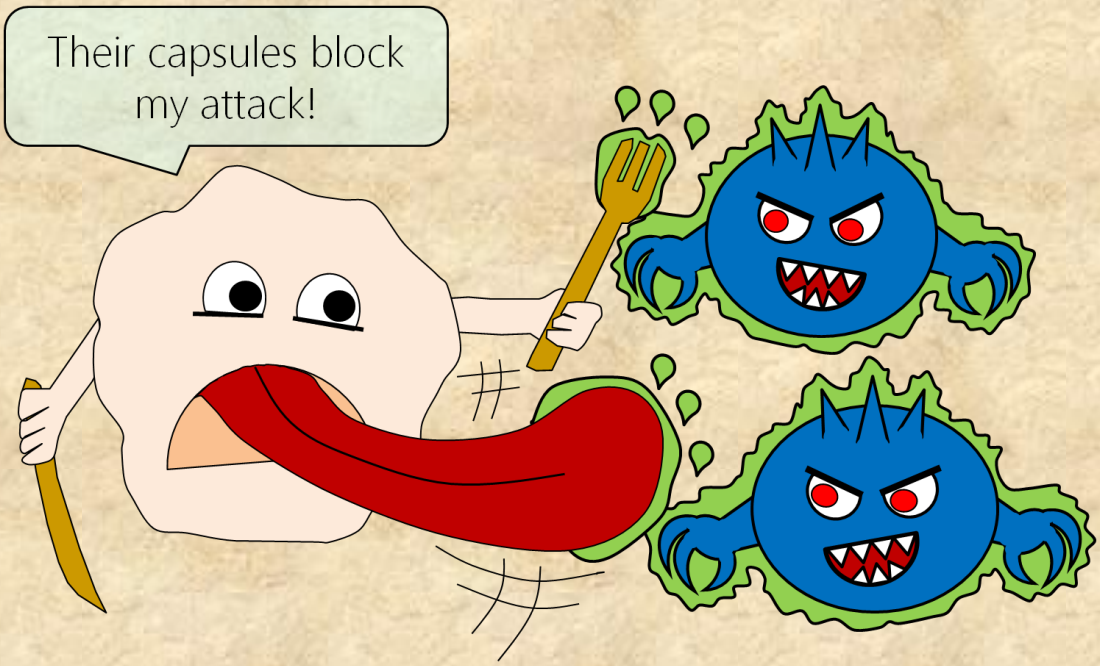
Chapter 4:
Let's eat the Pneumococci!



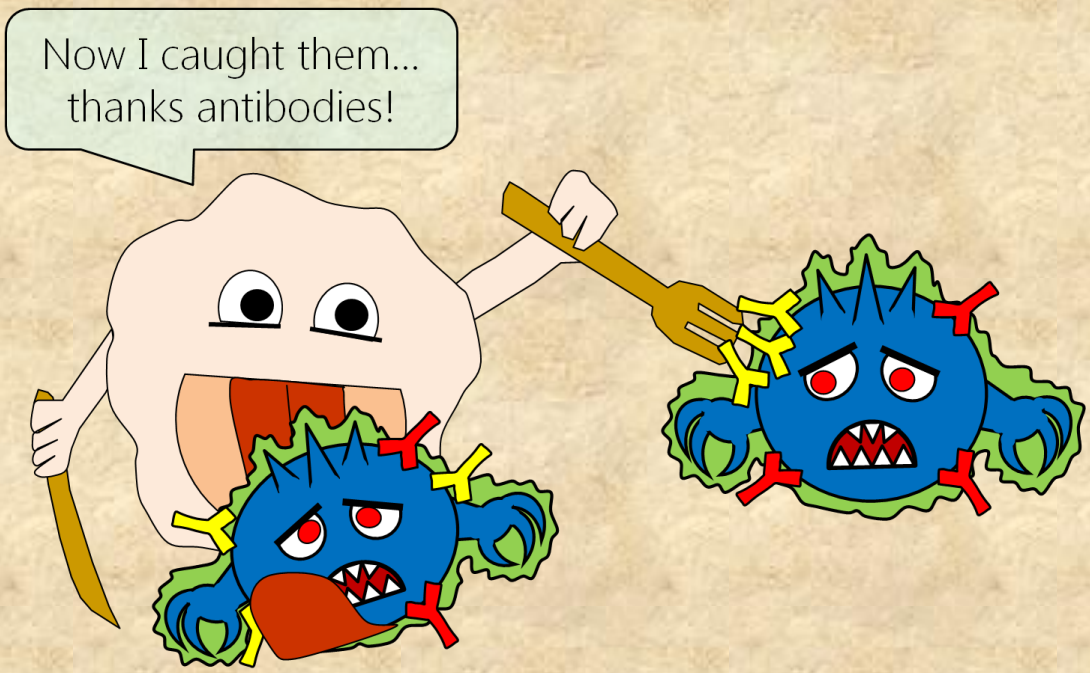
In the book "The Immunocytes" we met Fefon, our macrophage, and Robert, our neutrophil. Fefon and Robert are two immunocytes that love to eat. That is why they are also called "phagocytes".

The main function of Fefon and Robert in this battle is to eat the Pneumococci. Robert can also throw toxic substances to kill the bacteria.

But the Pneumococci also have powers, like their "capsule", which is a barrier that protects them from the attack of Fefon and Robert.



Our antibodies and proteins of the complement system help Fefon and Robert to triumph over the barrier of the capsule.



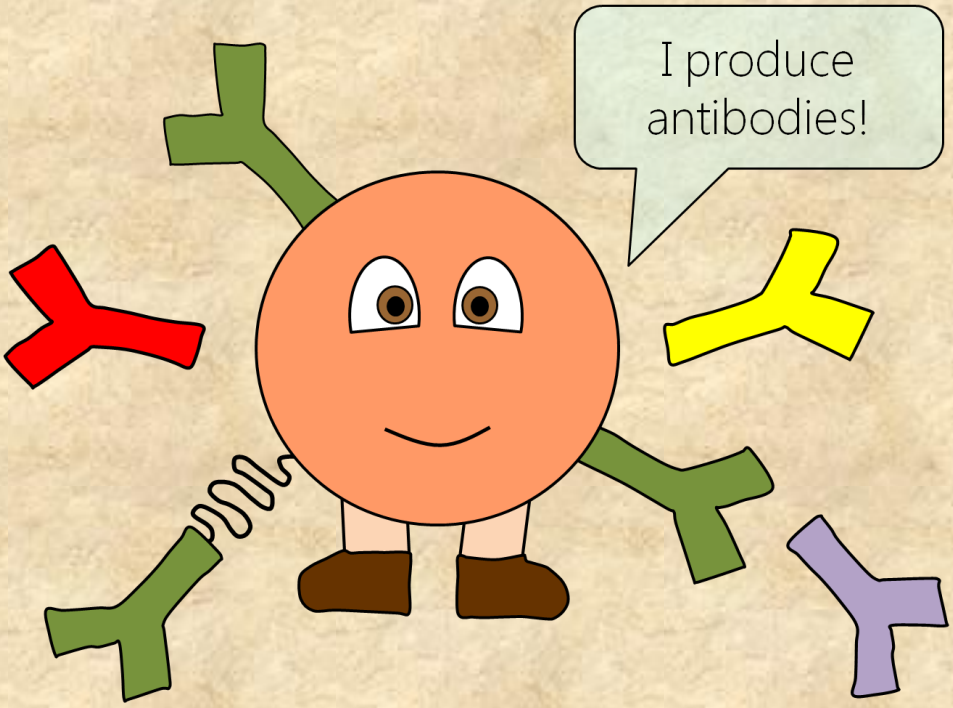
1. What is the main function of Fefon and Robert?

_____

2. Who helps the phagocytes to overcome the capsule barrier?

_____

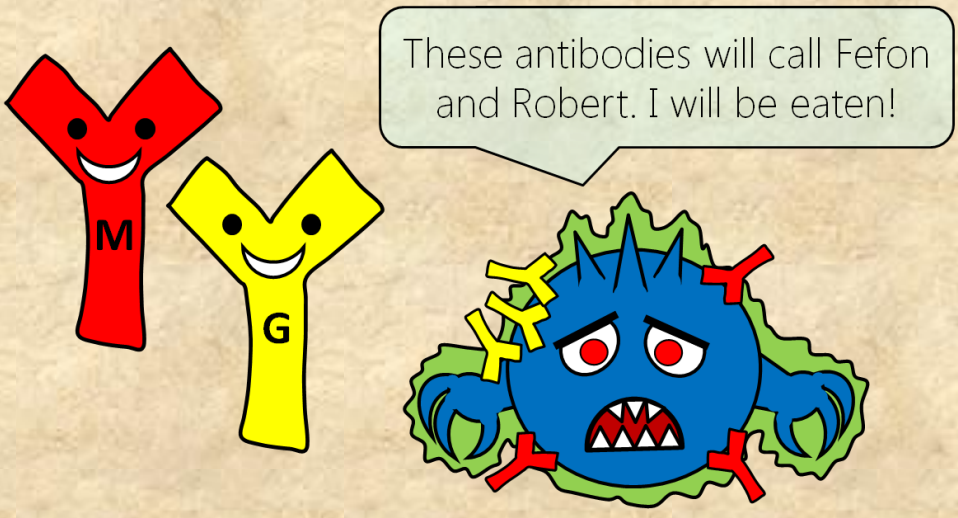
Chapter 5:
Moli, the factory of antibodies



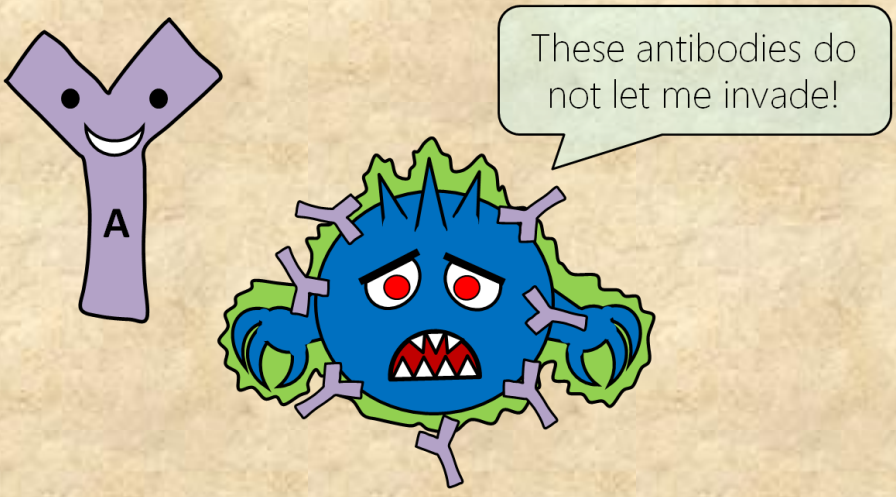
The principal job of Moli, our B lymphocyte, is to produce antibodies, also called immunoglobulins. There are 5 classes of antibodies: G, A, M, D and E.

At the beginning of the invasion by the Pneumococci, Moli produces large amounts of type M antibodies to contain the infection. Then, with the help of Felix, Moli acquires the ability to fabricate type G and type A antibodies to eliminate the Pneumococci and to protect against future infections.

Type M and type G antibodies stick to the capsule of the Pneumococcus and promote his destruction by phagocytosis and activation of the complement system.



Type A antibodies "neutralize" the Pneumococcus in our fluids (e.g. mucus, saliva) to prevent the invasion of our body.



1. What is the principal job of Moli?

   _____

2. What types of antibodies are produced by Moli…

   … during an initial infection? _____

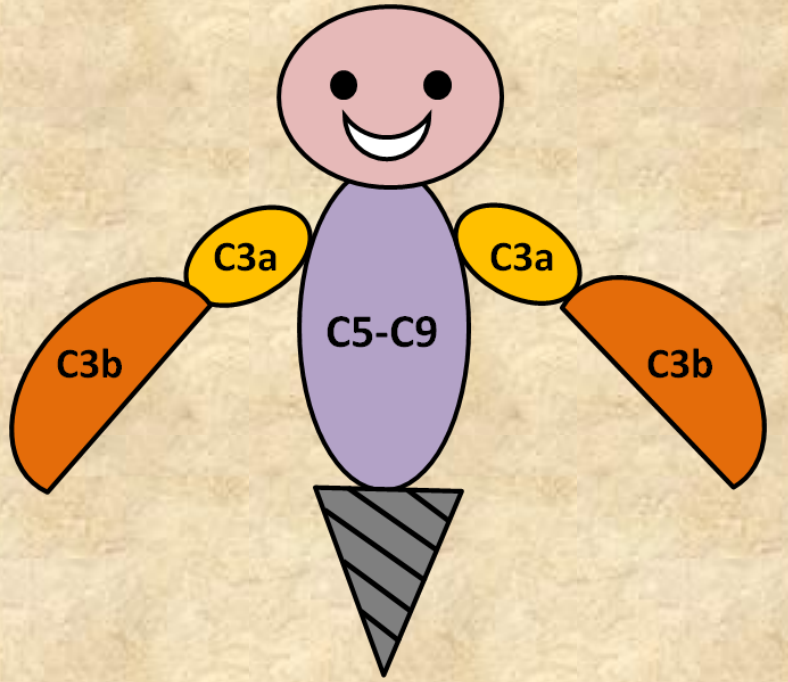
   … after receiving help from Felix? _____

3. How these antibodies protect us from the Pneumococcus?

   Type G and type M: _____

   Type A: _____

Chapter 6:
The complement system



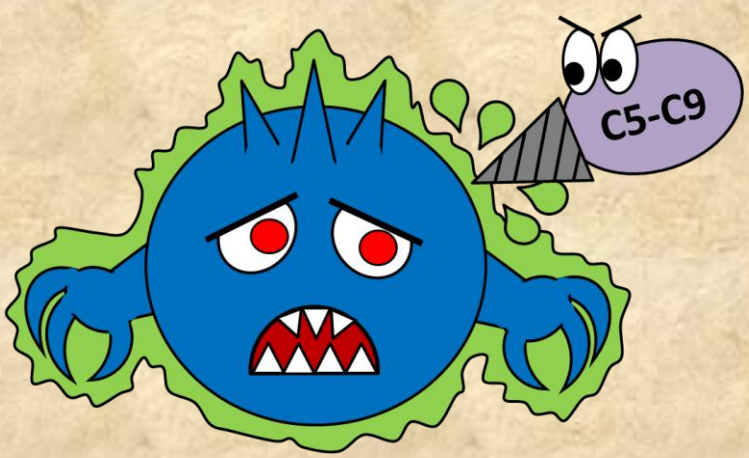
The complement system is composed by around 30 proteins that "complement" the attack of our immunocytes against the Pneumococci. The complement system is activated when it detects the presence of harmful microbes inside our body.

In the battle against the Pneumococcus, the complement system has several functions:

- Some proteins of the complement system, such as the protein C3b, stick to the capsule of the Pneumococcus to promote his elimination by our phagocytes Fefon and Robert ("opsonization").

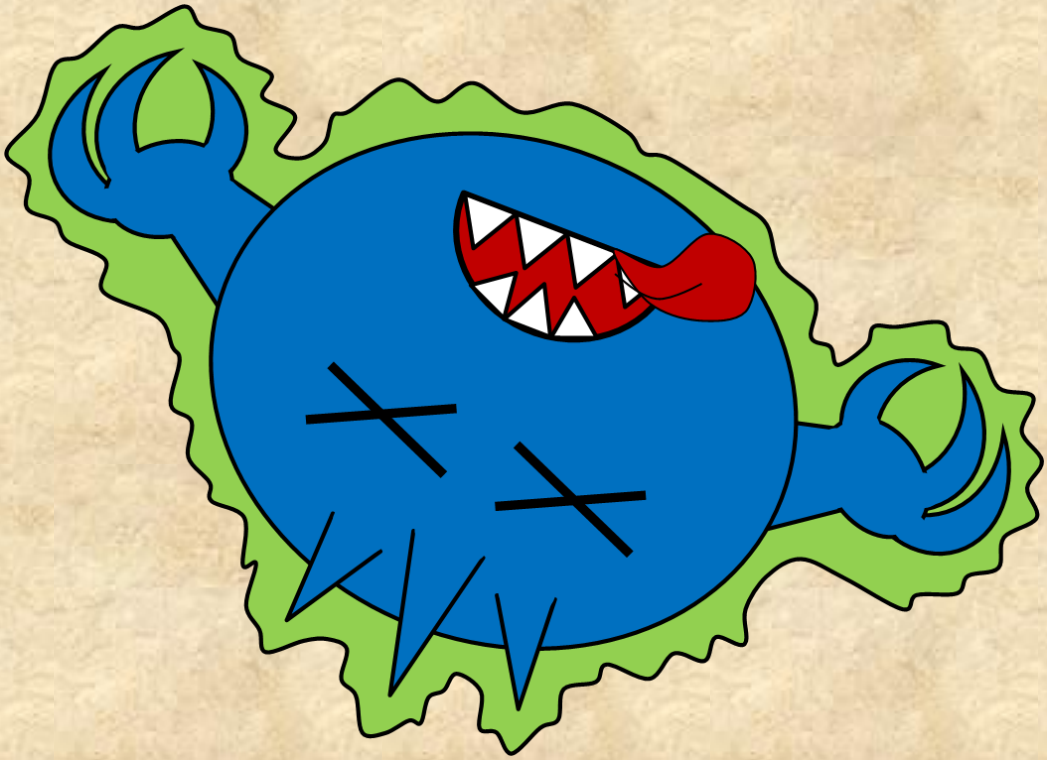
- Other proteins, such as C3a, travel from the site of infection to announce the danger, so that more immunocytes can arrive.

- The proteins C5, C6, C7, C8 and C9 ("membrane attack complex") make holes in the membrane of the Pneumococcus.



In these ways, our complement system helps our soldiers to fight.

Chapter 7:
The death of the Pneumococcus



The powerful attack of our immunocytes and our complement system protects us from deathly microbes such as the Pneumococcus.

Thus, it is very important that our defense system works properly. If our immune system weakens, the Pneumococcus and other bugs will take advantage to cause severe infections, putting us at risk of death. For example, the Pneumococcus produces very severe infections (e.g. pneumonia) in children who cannot produce antibodies, T cells, neutrophils or proteins of the complement system due to genetic defects (primary immunodeficiencies).

How can we support our immune system?

There are several vaccines that help us to prevent infections by the Pneumococcus. Everyone should receive them, especially children under 5 years old, elderly over 65 years old, and people with chronic diseases such as asthma or diabetes mellitus.

You must look for medical advice when you have symptoms of a bacterial infection. Medical doctors can provide medications that kill the Pneumococci when our immunocytes need help. These drugs are called "antibiotics".

Let's end this beautiful book by answering the following questions:

1. Which immunocytes protect us from the Pneumococcus?

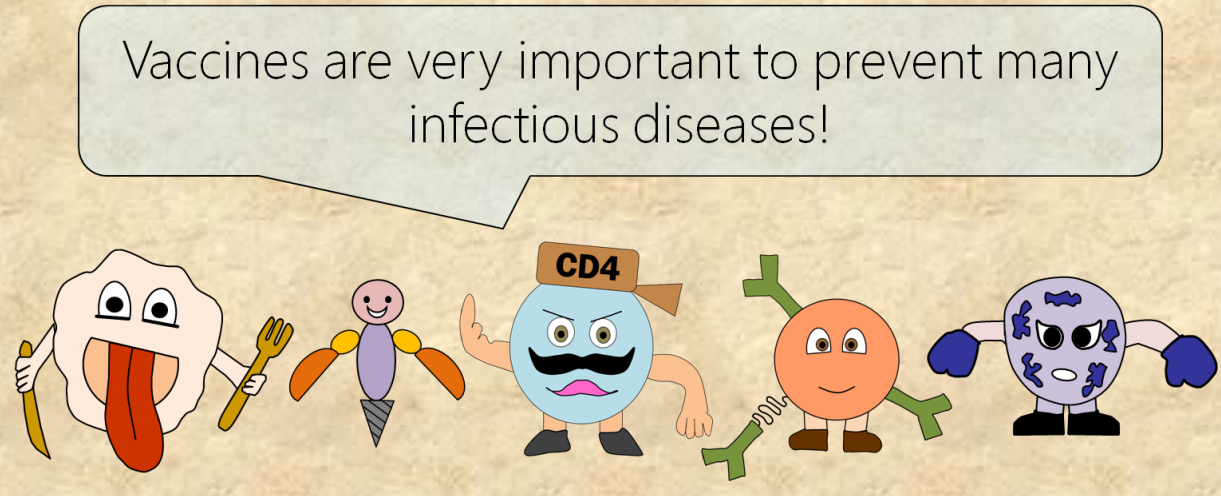
   _____

2. What happens when our immune system is weakened?

   _____

3. What is the role of the anti-Pneumococcus vaccines?

   _____



In this little book we have learned how our immunocytes defend us from infections caused by the Pneumococcus, a deathly bacterium.

Do not miss the following sticker book, where I will show you how our immunocytes recognize and destroy the malignant cells that produce cancer.

Juan Carlos Aldave, MD

Allergy and Clinical Immunology

Contributors:

- Dr. Juan Félix Aldave Pita.
- Bertha Alicia Becerra Sánchez.

Sponsors:

- Jeffrey Modell Foundation.
- Luke Society International.

"For God so loved the world that he gave his one and only Son, that whoever believes in him shall not perish but have eternal life". John 3:16

10 Warning Signs of Primary Immunodeficiency

Primary Immunodeficiency (PI) causes children and adults to have infections that come back frequently or are unusually hard to cure. 1:500 persons are affected by one of the known Primary Immunodeficiencies. **If you or someone you know is affected by two or more of the following Warning Signs, speak to a physician about the possible presence of an underlying Primary Immunodeficiency.**

1. 
Four or more new ear infections within one year.

2. 

Two or more serious sinus infections within one year.

3. 
Two or more months on antibiotics with little effect.

4. 
Two or more pneumonias within one year.

5. 

Failure of an infant to gain weight or grow normally.

6. 
Recurrent, deep skin or organ abscesses.

7. 
Persistent thrush in mouth or fungal infection on skin.

8. 
Need for intravenous antibiotics to clear infections.

9. 

Two or more deep-seated infections including septicemia.

10. 
A family history of PI.

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www.INFO4PI.org

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