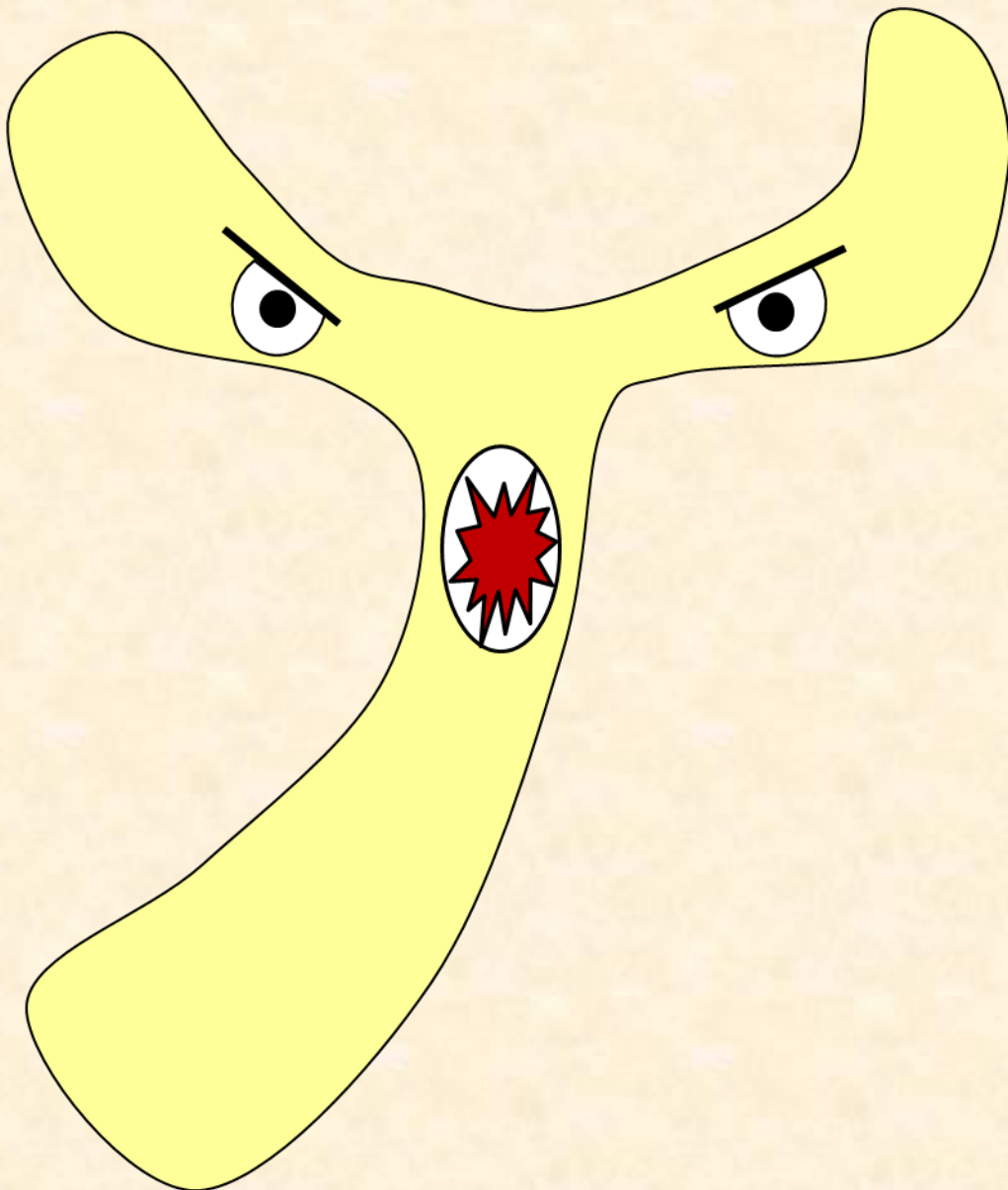


The Immunocytes against Candida

The importance of our TH17 army



Juan Carlos Aldave Becerra, MD

Allergy and Clinical Immunology

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

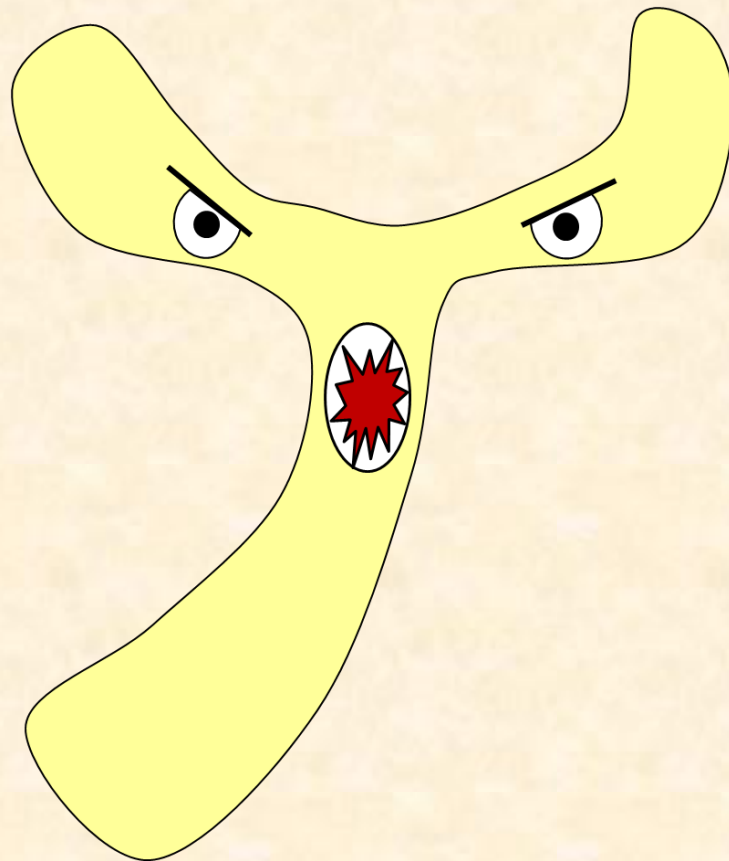
There are 4 major groups of microbes: viruses, bacteria, fungi and parasites. We are exposed to these threats since birth, so we need to have many cells and molecules to defend our bodies.

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 dangerous fungi such as *Candida albicans*.

Chapter 1:

The enemy *Candida albicans*



The enemy *Candida albicans*, which we will call only *Candida*, is a microbe that belongs to the kingdom of fungi. It can live in many places of the environment, very close to our body, especially in sites with high level of humidity. The *Candida* is very little; it measures 3 micrometers, equivalent to a millimeter divided into 300 pieces.

Despite its very small size, the *Candida* represents a big threat to us because it can cause infections in our tissues such as our mouth or skin. These infections by fungi are called "mycosis".

Every year millions of people around the world get sick because of Candida infections. The Candida takes advantage of any weakness in our body to try to invade us; hence it is called an "opportunistic" microbe.

The Candida is a constant danger to us. Therefore, we need to have strong protective mechanisms in our body.

In the next chapter we will learn how our skin and mucosal tissues work as our first defensive barrier against the invasion by Candida.

Please answer the following questions about this very dangerous fungus:

1. What kind of microbe is the Candida? Check the correct answer:

Bacteria	_____	Virus	_____
Fungus	_____	Parasite	_____

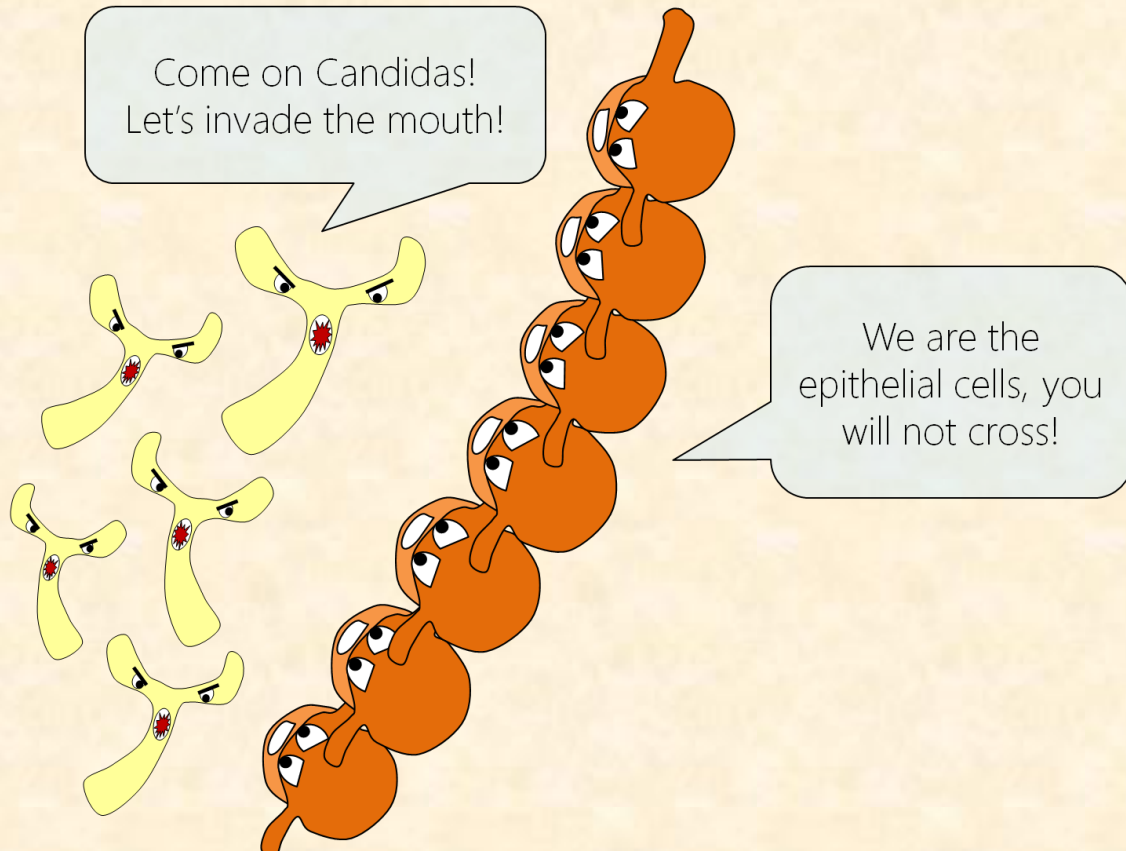
2. What is the size of the Candida?

_____ micrometers, equivalent to a millimeter divided into
_____ pieces.

3. Why is the Candida dangerous to us?

4. Why do we say that the Candida is an "opportunistic" microbe?

Chapter 2: Our first defensive barrier against Candida



The fungus *Candida* can live in almost any environment, even on some surfaces inside our body such as the intestinal mucosa or the oral mucosa.

Fortunately, the cells lining our skin and mucosas, which are called "epithelial cells", act as a barrier so that the *Candida* cannot invade our tissues. We will name Vilma to one of our epithelial cells.

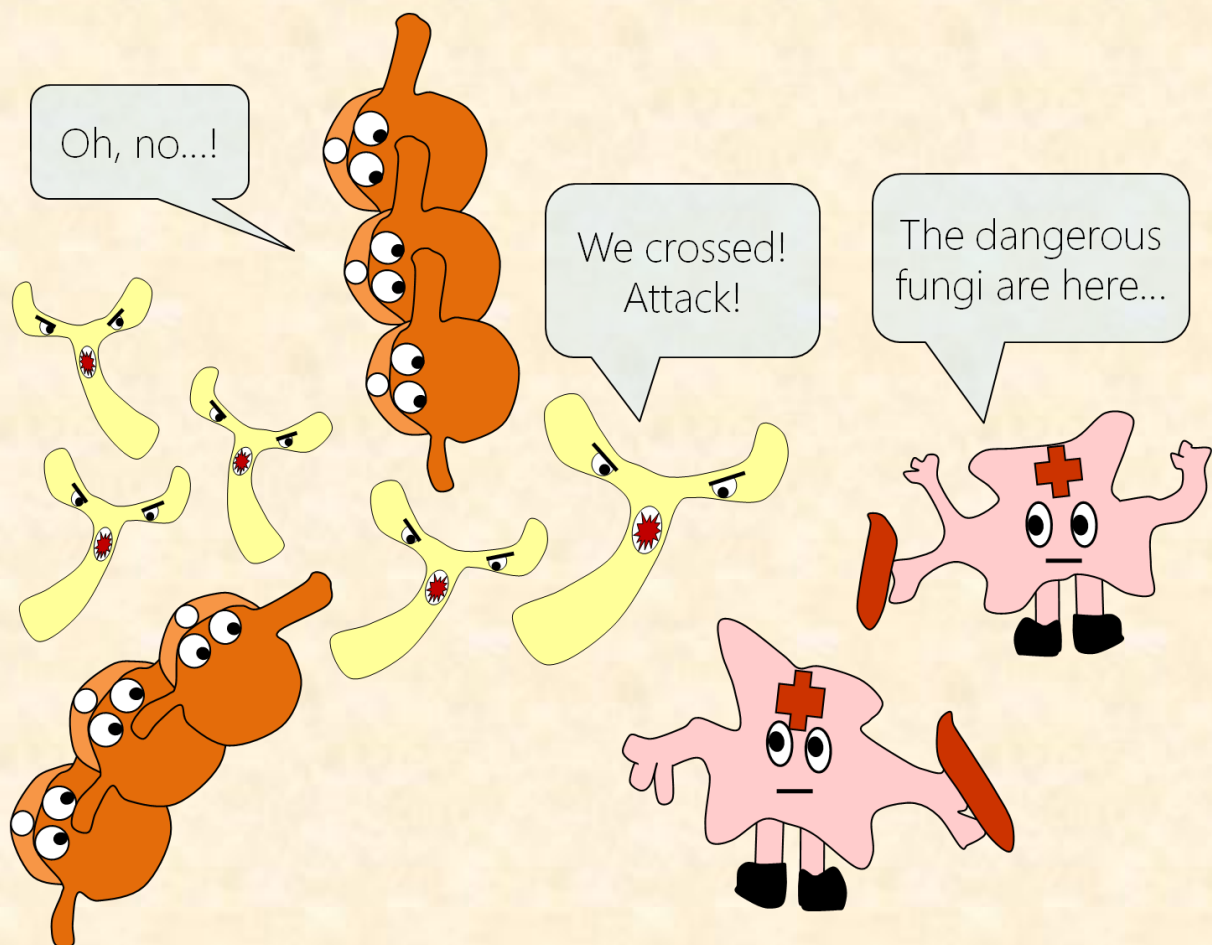
In addition, our epithelial cells are capable of producing toxic substances that can directly kill the *Candida*. These toxic substances are called "antimicrobial peptides".

Most times our epithelial cell barrier protects us from the infections by Candida. However, in some cases, the Candida can reproduce and cross the barrier. When such dangerous incident occurs, we need our immune cells to defend us. In the following chapters I will show you the battle of our immunocytes against Candida.

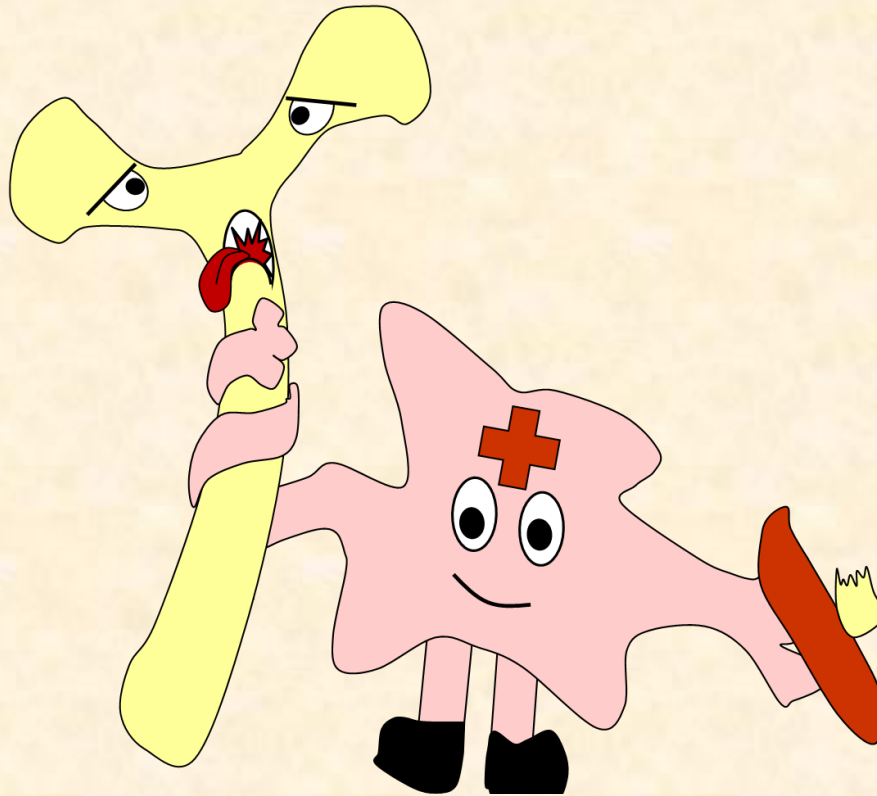
Please answer the next questions:

1. How do Vilma and her friends (epithelial cells) defend us?

2. What are our "antimicrobial peptides"?



Chapter 3: Bertha initiates the battle against the Candida



Sometimes the Candidas can reproduce and cross the epithelial barrier of our skin or mucosas, resulting in a danger to our tissues.

Fortunately, below the epithelial cells we have a network of immune cells that can detect microbial danger to initiate the battle. Our main 'danger-detector' cell is Bertha, the dendritic cell.

Bertha, who is five times larger than the Candida, traps the invader fungi and eats them in a process called "phagocytosis". After eating some Candidas, Bertha cuts them into small pieces. These pieces are used to activate the commanders of the anti-fungal army: our TH17 lymphocytes.

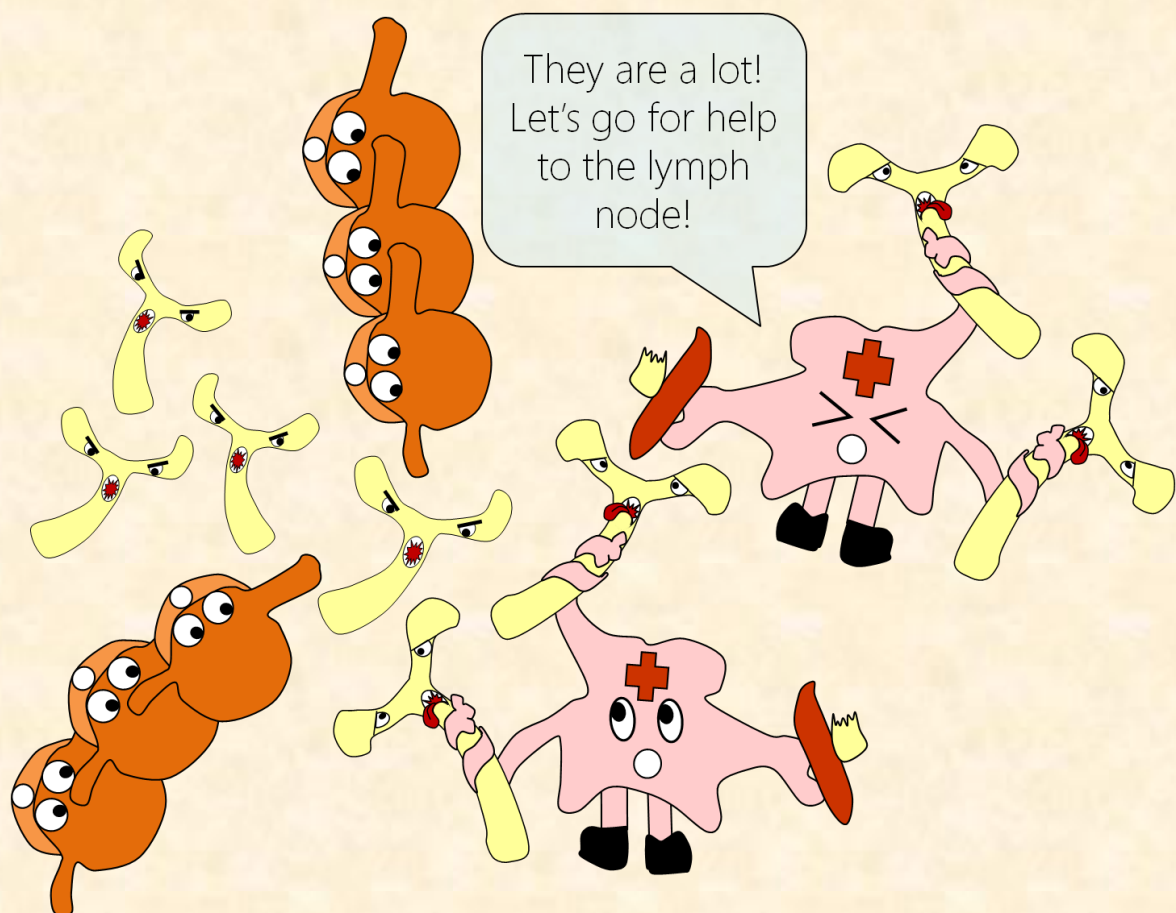
Let's help Bertha to solve these questions:

1. Where are our 'danger-detector' cells located?

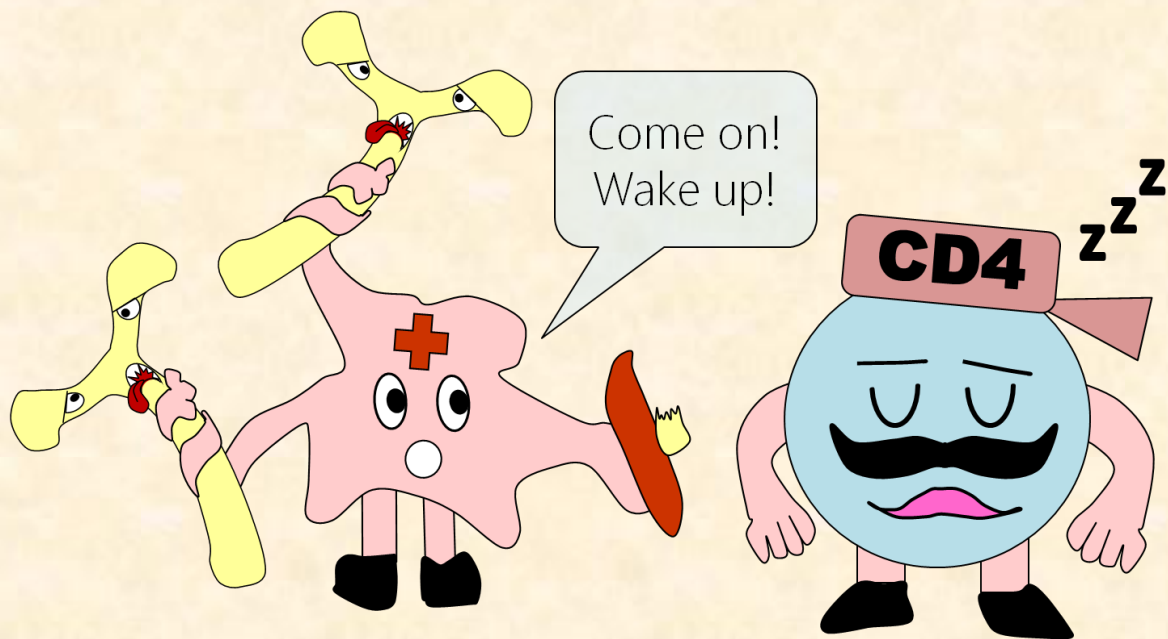
2. What is the name of our most important 'danger-detector' cell?

_____, the dendritic cell.

3. What is the reaction of Bertha when she encounters the Candidas?



Chapter 4: Waking up our TH17 commanders



In the book "The Immunocytes" we met Felix, our T CD4 lymphocyte. We learned that his main function is to collaborate with the other immunocytes to activate them or enhance their action.

Well, after eating some Candidas and cutting them into pieces, Bertha travels from the site of infection to the lymph nodes to encounter Felix. Lymph nodes are bean-shaped organs that serve as headquarters of our immunocytes.

When Felix recognizes the Candida fragments, he specializes and converts into Superfelix, our CD4 TH17 lymphocyte, the commander of our anti-Candida army.

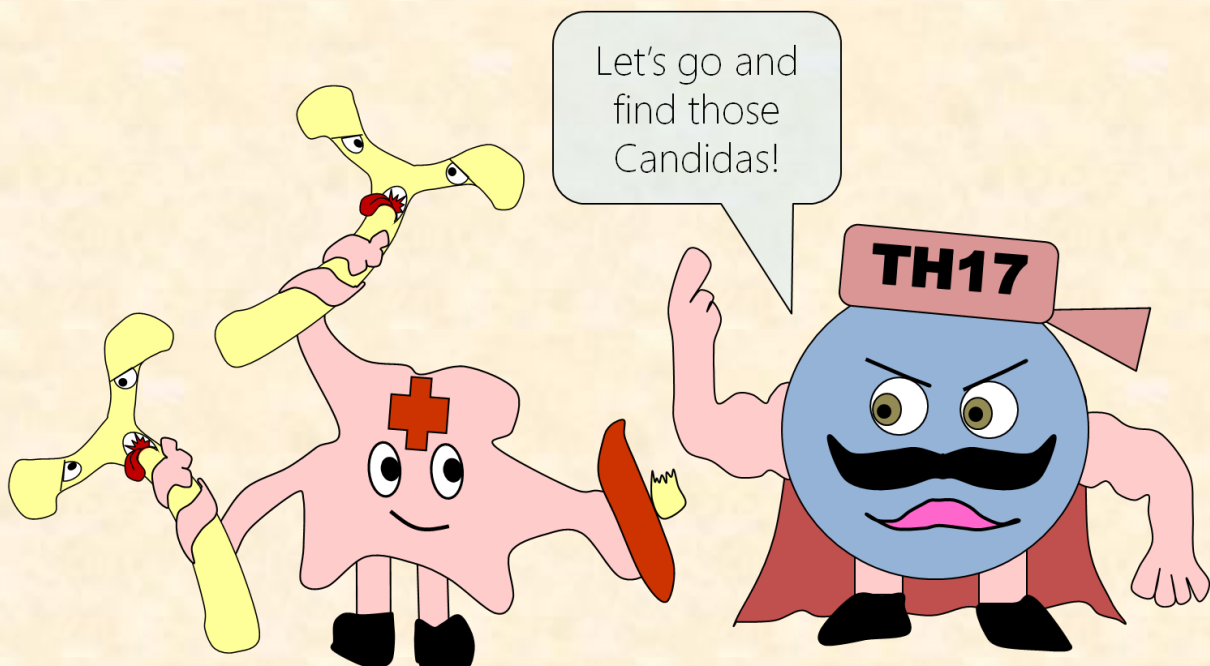
In the next chapter we will see how Superfelix travels from the lymph nodes to the place of infection to promote the total elimination of the invader Candidas.

Please help Superfelix to solve the following problems:

1. Where does the encounter between Felix and Bertha occur?

2. What happens when Felix recognizes the Candida fragments presented by Bertha?

3. What is the name of the commander of our anti-Candida army?



Chapter 5: Superfelix, the commander TH17



Superfelix is our TH17 lymphocyte, the commander of our anti-Candida army. He belongs to the group of T CD4 lymphocytes.

Superfelix develops in the lymph nodes after recognizing the Candida fragments presented by Bertha, our dendritic cell.

To fulfill his function Superfelix travels to the mucocutaneous sites where the Candidas are invading. Once there he makes two very important actions:

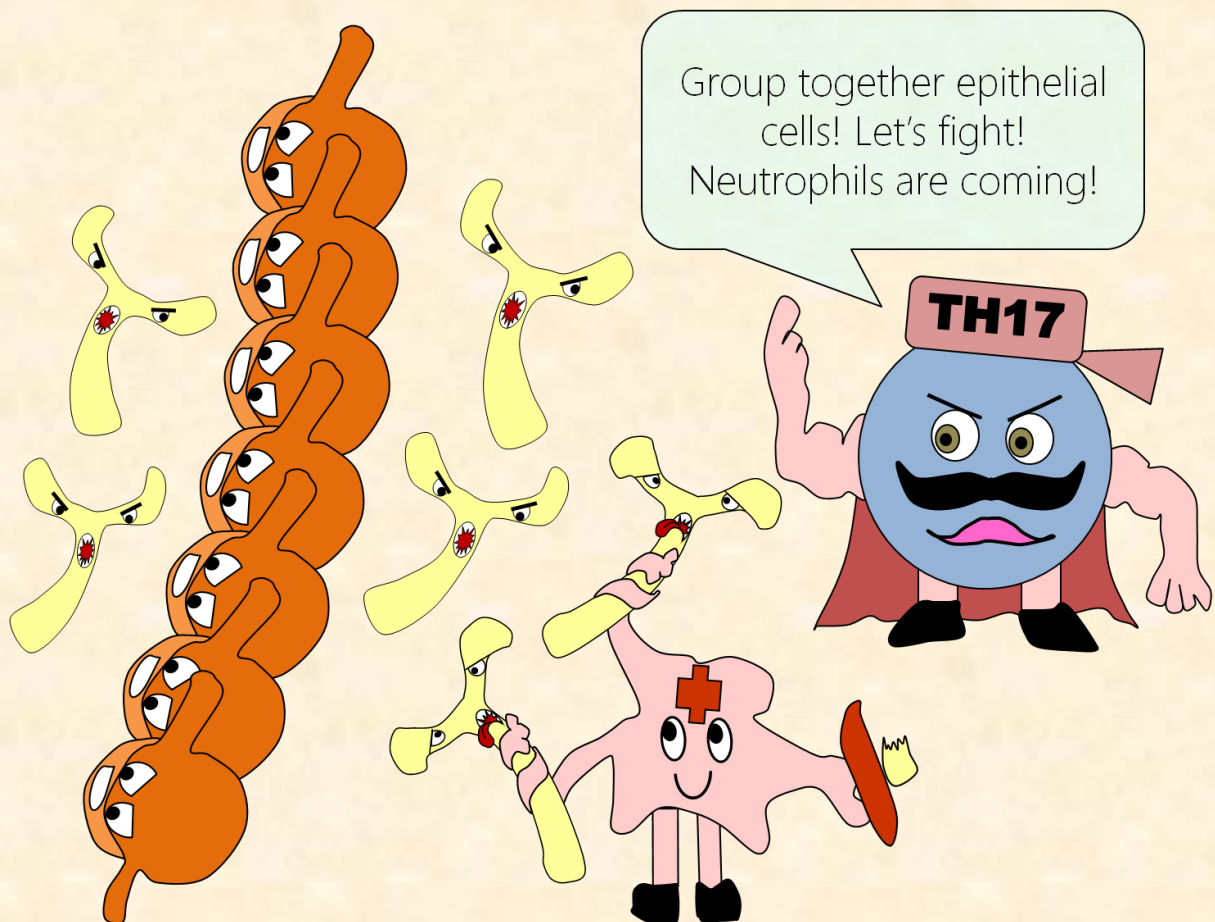
- He stimulates epithelial cells to produce substances that weaken the Candidas, called "antimicrobial peptides".

- He attracts the best warriors against Candida for the final battle: the neutrophils.

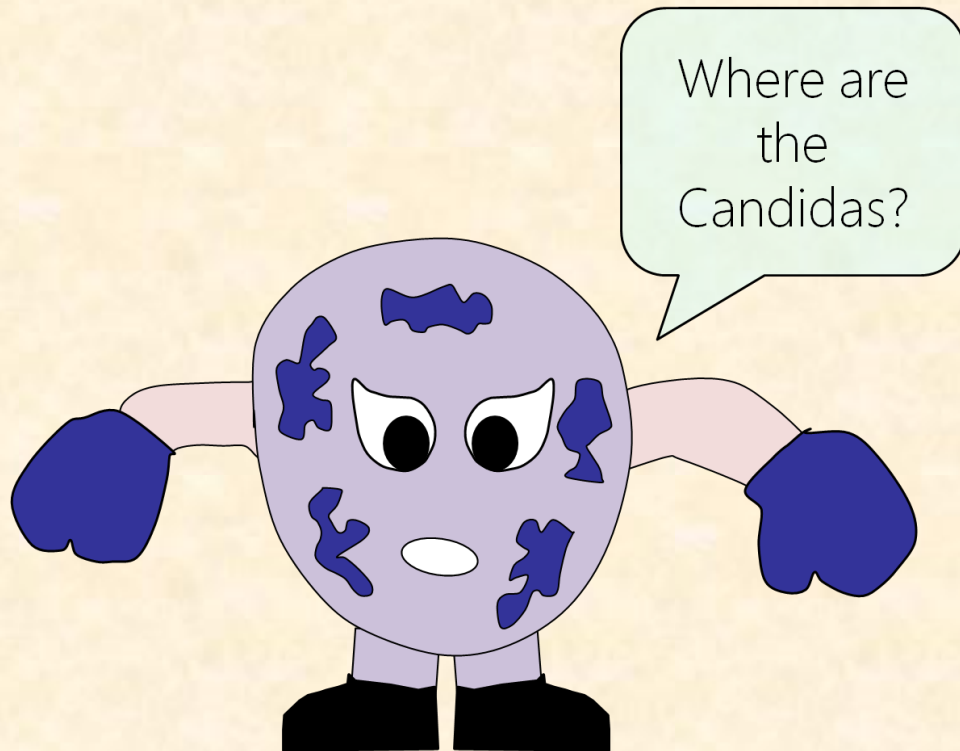
Please solve the following questions about our commander Superfelix, the TH17 lymphocyte.

1. Who activates Felix to convert into Superfelix, our TH17 lymphocyte?

2. What are the functions of our TH17 lymphocytes?



Chapter 6: The attack of Robert the neutrophil



Do you remember Robert the neutrophil? (See the book "The Immunocytes"). Robert and his friends neutrophils are our immunocytes responsible for the complete destruction of the Candidas.

We have millions of neutrophils in our blood. Superfelix, our TH17 lymphocyte, gives them the signal to travel to the infected tissues to fight.

When neutrophils reach the infection site, they attack the Candidas by eating them and throwing them toxic substances. Neutrophils usually die in the battle, so we remember them as "war heroes".

We have another group of immunocytes that are also capable to eat the Candidas. They are our big macrophages.

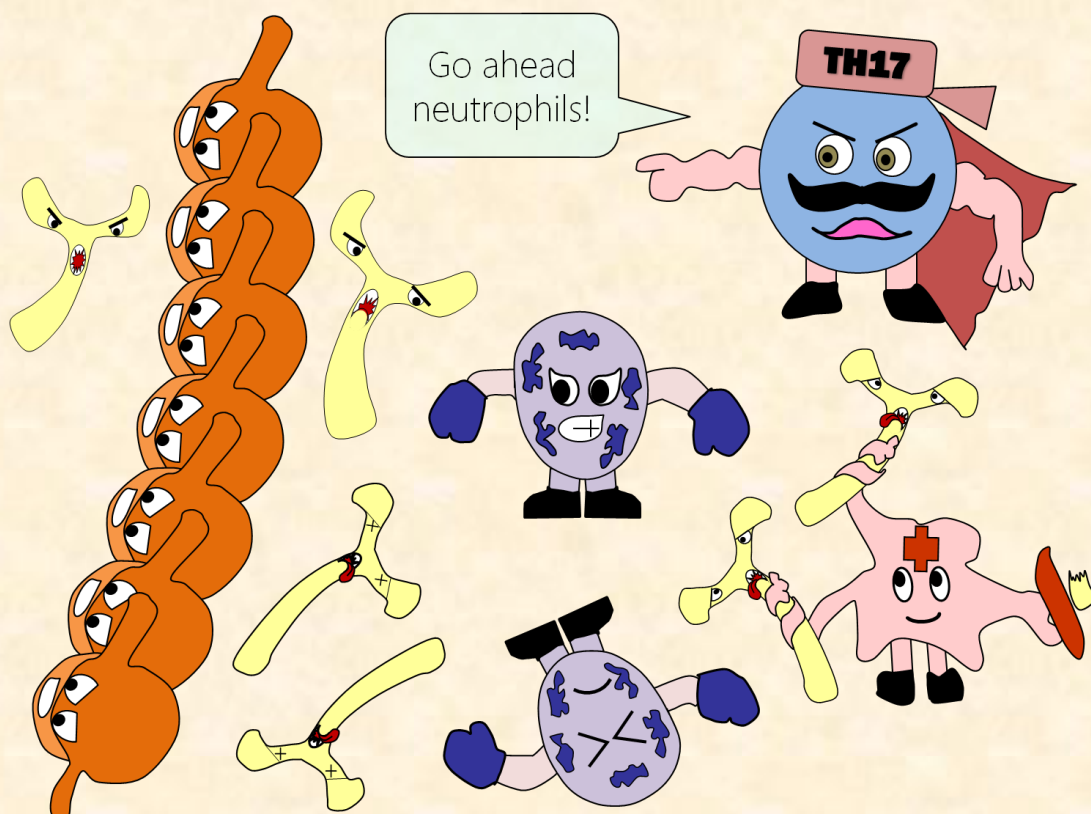
Let's help Robert to solve the following questions:

1. Why are our neutrophils important?

2. Who calls our neutrophils to the battle?

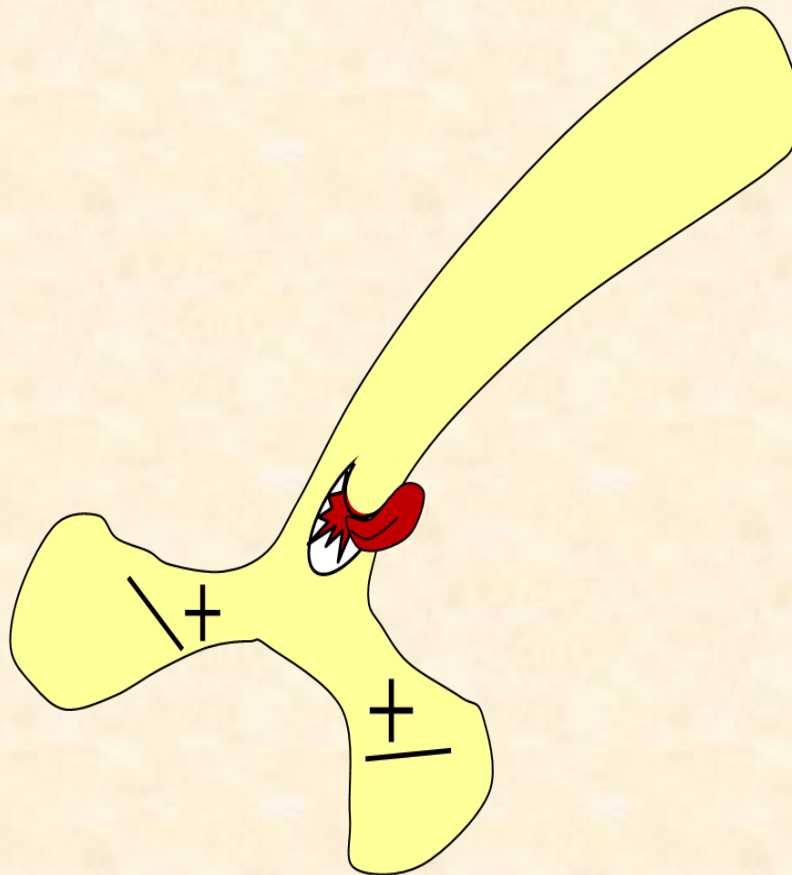
3. How does Robert fight against the Candidas?

4. Why do we remember our neutrophils as "war heroes"?



Chapter 7:

The death of the Candida



The cooperative work of our epithelial cells, our dendritic cells (Bertha), our TH17 lymphocytes (Superfelix) and our neutrophils (Robert) allows us to survive against most Candida infections.

The action of each of our immunocytes allows us to destroy these dangerous fungi, and hence to preserve our lives.

For that reason it is very important that our defense system (immune system) functions properly. If our immune system

weakens, the Candida and other hazardous microbes will take advantage to cause infections, putting us at risk of death.

There are several medications that can help us to fight Candida infections. These drugs are called "antifungals" or "antimycotics" for their ability to destroy fungi. Some antifungals are: fluconazole, itraconazole, voriconazole, terbinafine, nystatin or caspofungin.

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

1. Which immunocytes protect us from the fungus Candida?
Paste the stickers.

Superfelix, the TH17 lymphocyte

Bertha, the dendritic cell

Vilma, the epithelial cell

Robert, the neutrophil

2. What happens when our immune system is weakened?

3. What are the antifungal drugs?

In this little book we have learned how
our immunocytes protect us from
infections caused by the fungus Candida.

Do not miss the following sticker book,
where I will show you how our
immunocytes fight against the lethal
enemy Mycobacterium tuberculosis.

Juan Carlos Aldave, MD

Allergy and Clinical Immunology

Contributors:

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

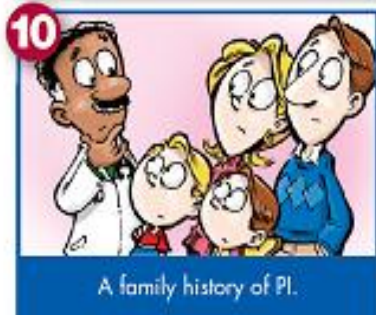
Sponsors:

- Jeffrey Modell Foundation.
- Luke Society International.
- Asociación Peruana de Ayuda al Inmunodeficiente Primario (ASPAIP)

"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.**



"This book was made possible, in part, by a grant provided by the Jeffrey Modell Foundation C.H.I.L.D.R.E.N. Program"

www.INFO4PI.org

Series: Funny Immunology to save lives.

(editions in English and Spanish)

- Book 1: The immunocytes
- Book 2: The TH17 army against Candida
- Book 3: The TH1 army against Mycobacteria
- Book 4: The TH2 army against worms
- Book 5: The battle against Pneumococcus
- Book 6: The immunocytes against cancer
- Book 7: Tregs: controlling the immune army
- Book 8: When immunocytes get sick...
- Book 9: When immunocytes go crazy...

Orders:

Jirón Domingo Cueto 371, Of. 301, Lince, LIMA 14

Lima, Peru

Phones: +51 948-323-720

+51 988-689-472

jucapul_84@hotmail.com

funny.immunology@gmail.com

www.alergomed.org/immunocytes