The Immunocytes against Candida

The importance of our TH17 army

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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"?
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?
   _________________________________________________________________

They are a lot!
Let’s go for help to the lymph node!
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?
_____________________________________________________________________________

Let’s go and find those Candidas!
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?

________________________________________________________________________

________________________________________________________________________

Group together epithelial cells! Let’s fight! Neutrophils are coming!
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.

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“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
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