T regulatory lymphocytes

Controlling the immune army

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Allergy and Clinical Immunology

Around us, in the environment, there are many microbes that can harm us, causing illness or 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 learn to tolerate some foreign substances that are beneficial to us, such as the molecules of food.

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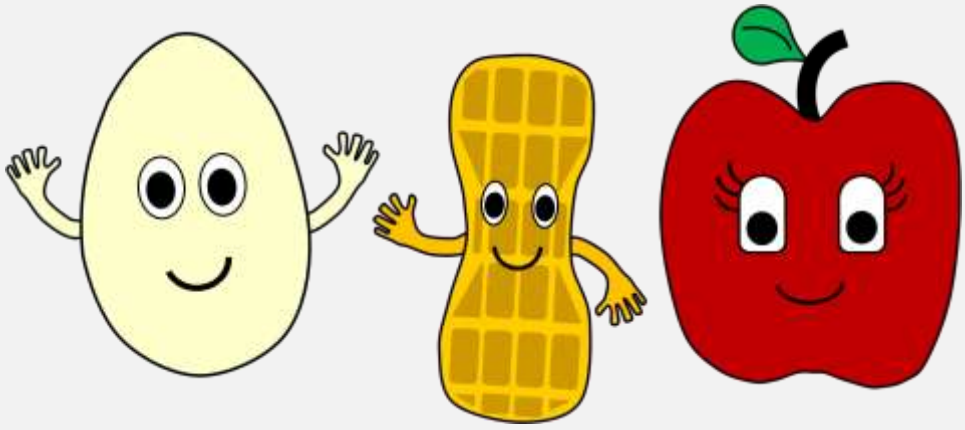
Chapter 1: The foreign substances that we should tolerate

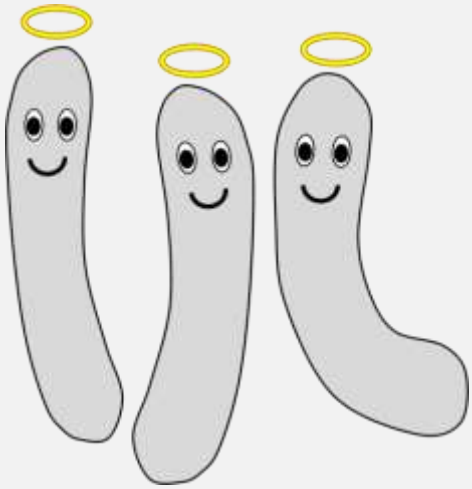
In the previous books we learned how our immunocytes protect us from cancer and from dangerous germs such as the Mycos, the fungus Candida, the worm Ascaris and the lethal Pneumococcus.

Our immune system works like a powerful army able to attack foreign substances that try to harm us. However, there are many substances that, despite being foreign, are beneficial or innocuous for our body, so they should be "tolerated" by our immune system. For instance:

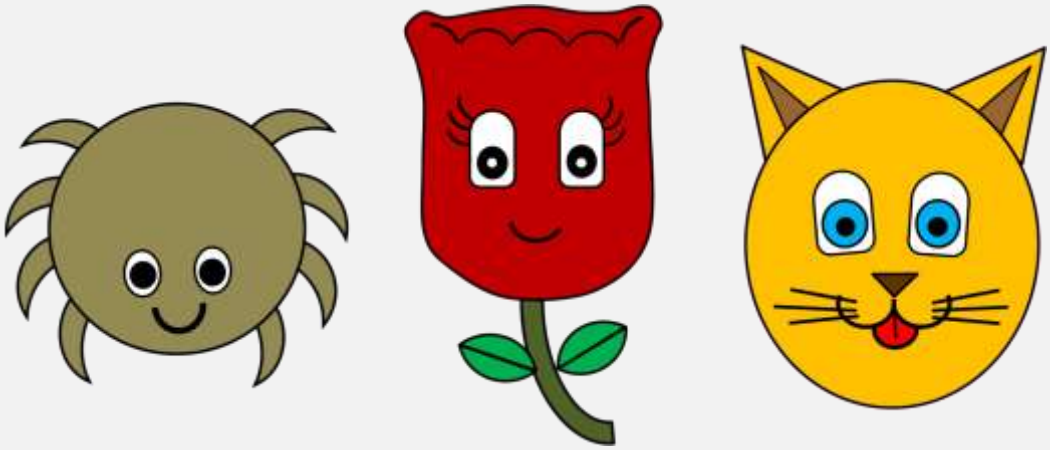
- Food.



- Medicines.
- "Good bacteria" that live in our body (commensal bacteria).



- Harmless environmental substances such as house dust mites, plant pollen or pet dander.



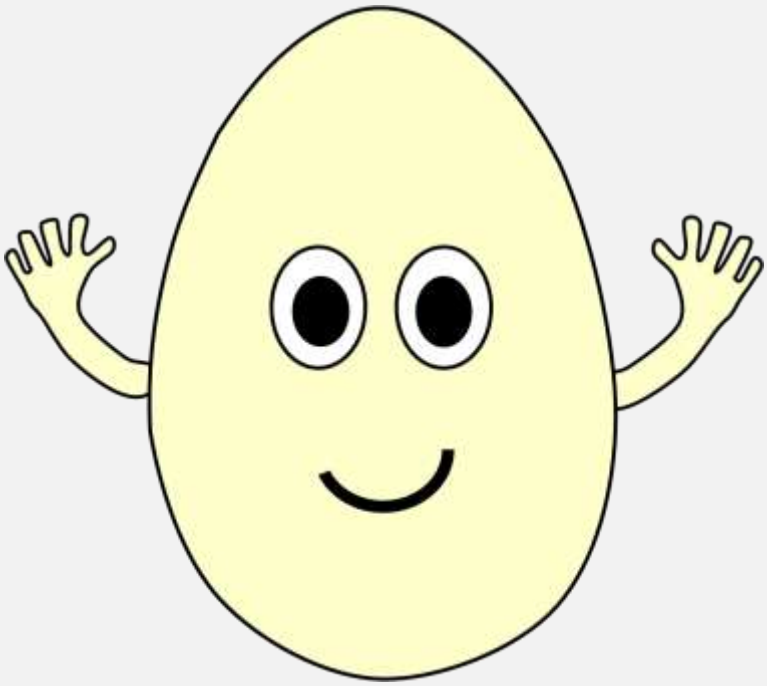
In the next chapters we will see how our immunocytes learn to tolerate the molecules of a very nutritious food: the chicken egg.

Please answer the following question:

1. Which substances should be tolerated by our defense system?

_____

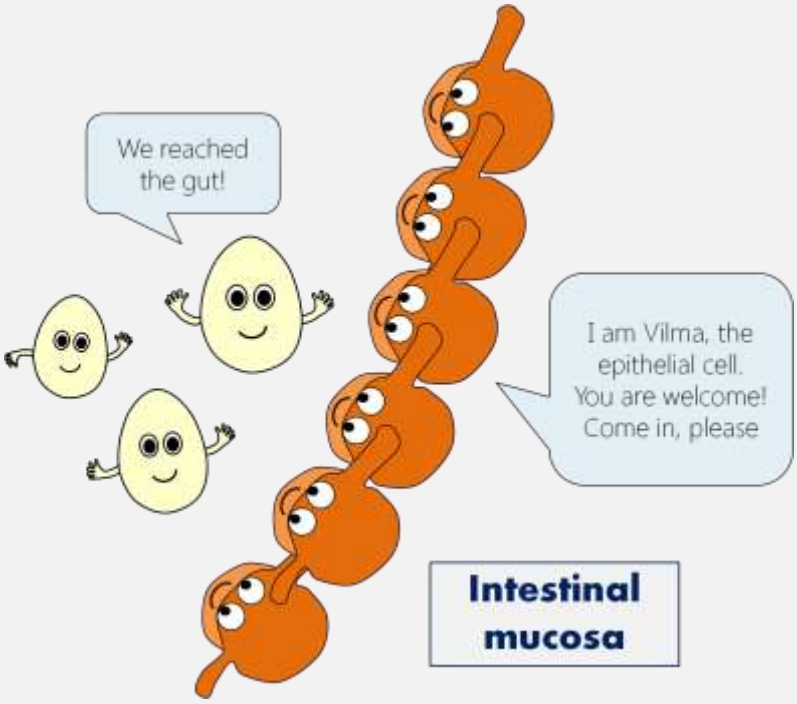
Chapter 2: Eating chicken egg for the first time



The chicken egg contains proteins that are not characteristic of human beings, that is, these proteins are strange molecules to our body. For example, ovomucoid, ovalbumin, ovotransferrin and egg lysozyme.

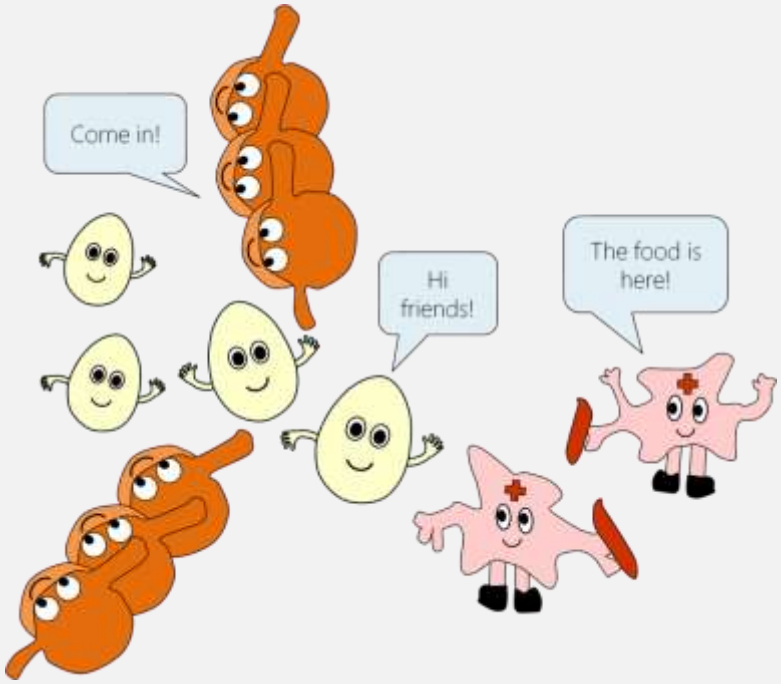
However, these molecules are food for us, so our immune system must tolerate them. This phenomenon is called "immune tolerance".

When we are babies and eat chicken egg for the first time, the egg molecules reach our gut, where they meet the epithelial cells lining the intestinal mucosa. We will name Vilma to one of our epithelial cells.

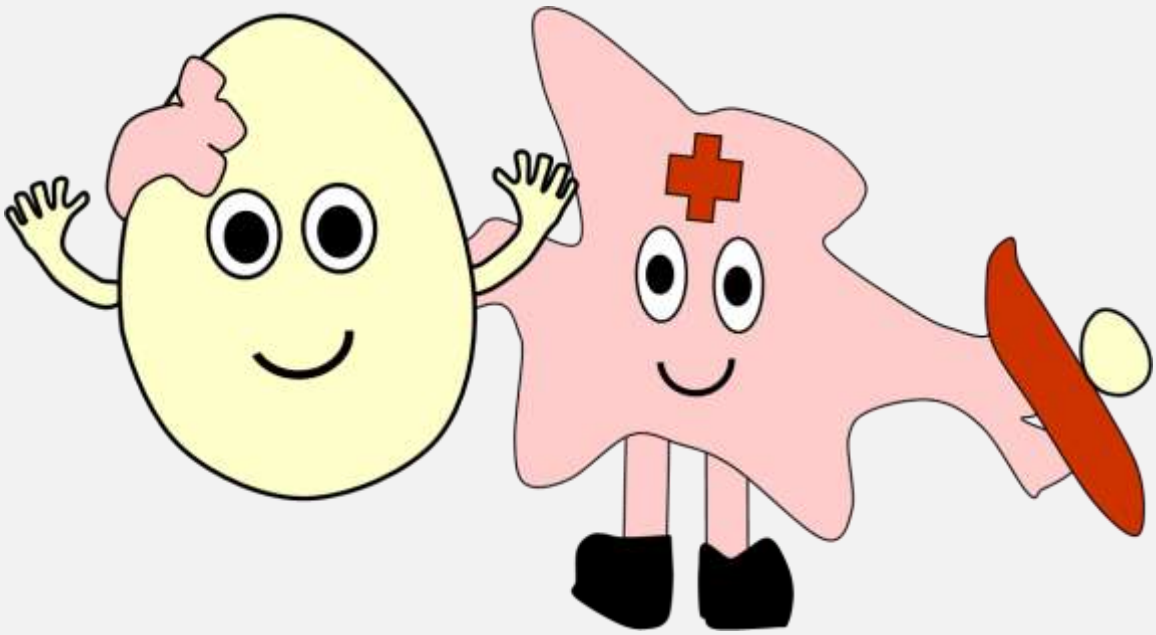


Vilma and her friends let egg molecules to pass through the epitelial lining and enter our intestinal mucosa to serve us as food.

Upon entering the intestinal tissue, egg molecules are recognized and trapped by a group of immunocytes capable of detecting foreign substances: dendritic cells. In the next chapter we will see how our dendritic cells react.



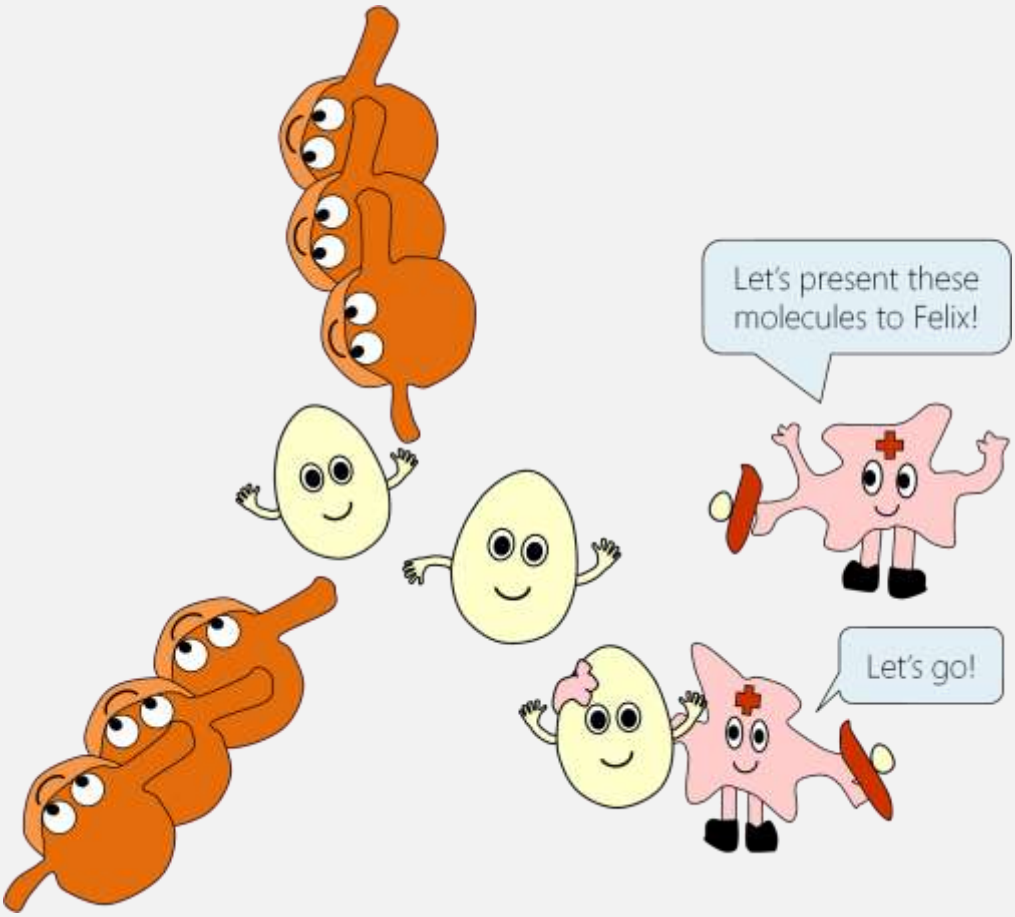
Chapter 3: Bertha finds egg molecules



Do you remember Bertha, our dendritic cell? She lives below the epithelial cells to keep an eye on the appearance of hazards or foreign substances.

Bertha is able to recognize the chicken egg molecules that crossed the intestinal epithelium. After detecting and trapping egg molecules, Bertha should convince the other immunocytes to tolerate them. In other words, Bertha should promote immune tolerance to egg proteins.

To accomplish this, Bertha travels in silence carrying egg molecules from the intestinal mucosa to the lymph nodes, where she will meet Felix, our CD4 T lymphocyte. Lymph nodes are bean-shaped organs that serve as headquarters of the immunocytes.



The encounter between Bertha and Felix is essential for the normal function of our immune system. In the next chapter we will see what happens after this encounter.

Let's help Bertha to solve the following questions:

1. What is the name of our danger-sensing cell?

   _____

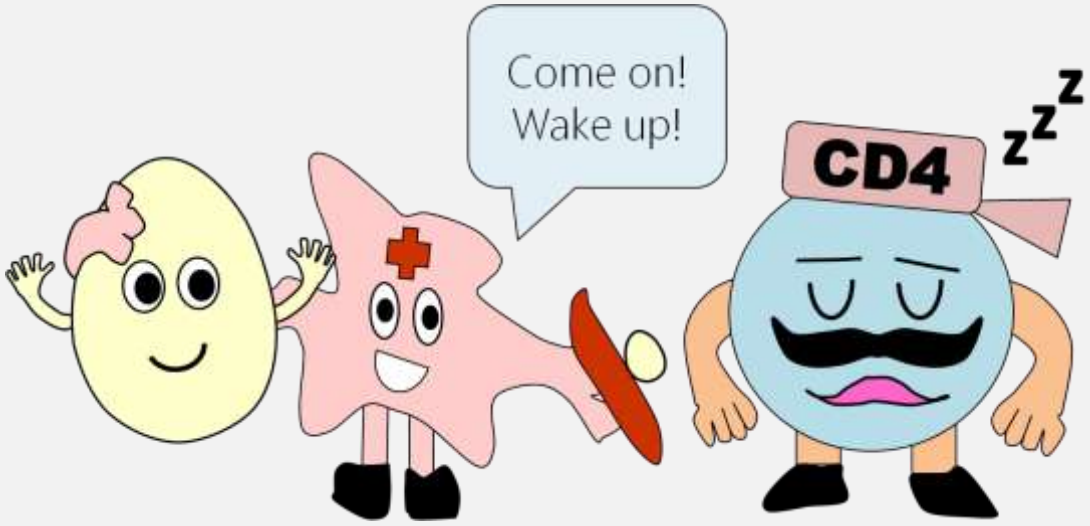
2. How does Bertha react when she finds egg molecules?

   _____

3. What are the lymph nodes?

   _____

Chapter 4: Waking up T regulatory cells

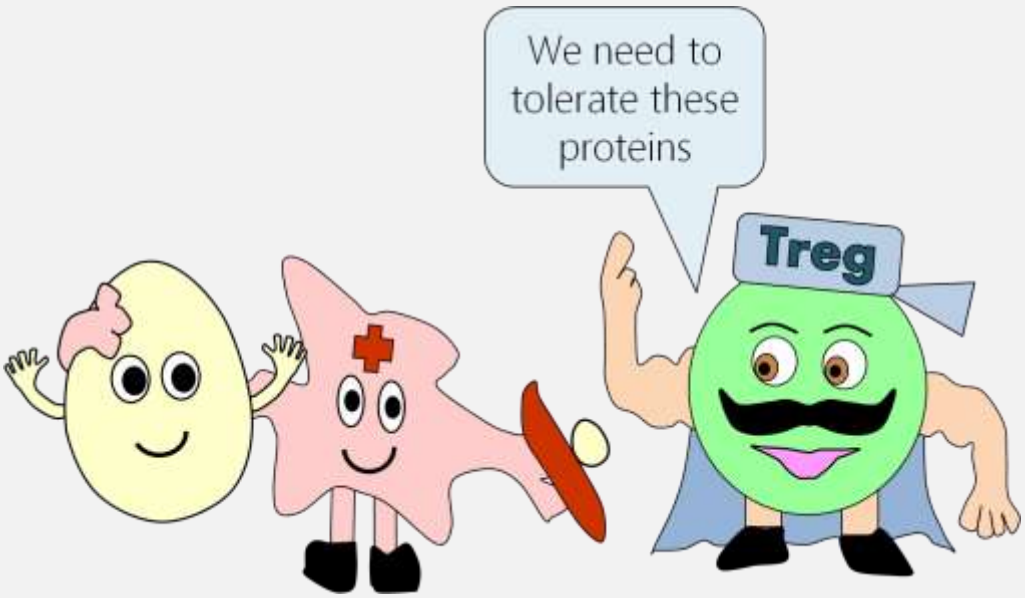


Felix is our T CD4 lymphocyte, also known as T 'helper' cell. His main role is to activate or enhance the actions of other immunocytes. In the first books of our series we learned that Felix can convert into:

- Superfelix, the TH17 lymphocyte, who heads the TH17 battalion against the fungus Candida.
- Felicon, the TH1 lymphocyte, commander of the army that attacks the Mycobacteria.
- Feliciano, the TH2 lymphocyte, who leads the battalion that destroys the worm Ascaris.

In this book we do not need a commander to direct an attack against egg molecules, but a commander to promote immune tolerance.

After eating some egg proteins, Bertha travels to the lymph nodes to meet Felix and show him these foreign molecules. When Felix recognizes egg molecules, he wakes up and converts into Feliquito, our T CD4 regulatory lymphocyte, the head of immune tolerance.



In the next chapter we will understand the actions of Feliquito. I invite you to solve the following questions:

1. What happens when Felix recognizes the chicken egg molecules?

   _____

2. What is the name of the head of immune tolerance?

   _____

3. Match the correct options using arrows:

Feliciano	commander of the anti-Candida army
Felicon	commander of the anti-Myco army
Feliquito	commander of the anti-Ascaris army
Superfelix	promoter of immune tolerance

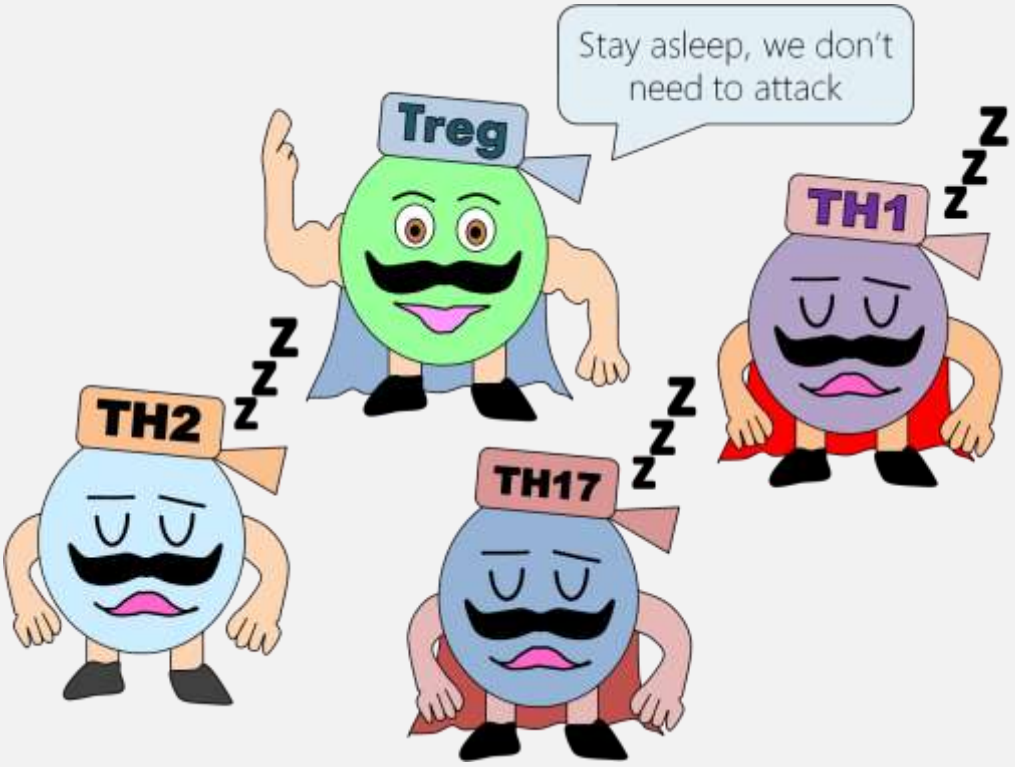
Chapter 5:
The work of Feliquito

Feliquito is our T CD4 regulatory lymphocyte, the main promoter of immune tolerance. His labor is very important for us to tolerate food molecules.

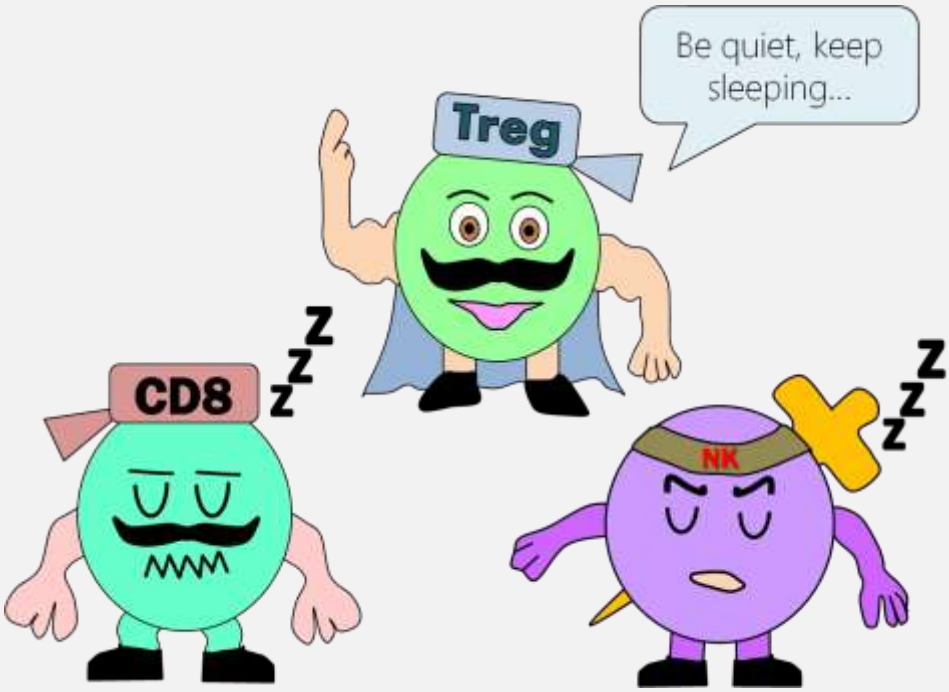
Feliquito develops in the lymph nodes after recognizing the chicken egg molecules presented by Bertha, our dendritic cell.

One of the actions of Feliquito is to help Moli, our B lymphocyte, to produce anti-inflammatory antibodies such as immunoglobulin A and immunoglobulin G4.

Another action of Feliquito is to make the warriors Feliciano, Superfelix and Felicon go to sleep.



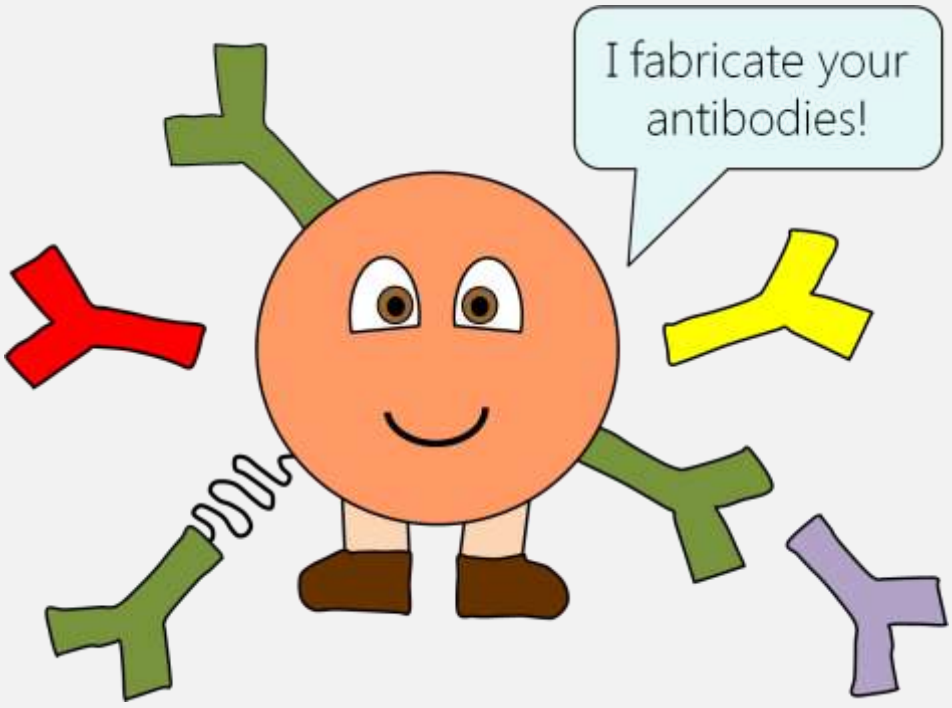
In addition, Feliquito can switch off the attack of Pacco, our T CD8 cell, and Paul, our NK lymphocyte (see the book: "The Immunocytes against cancer").



1. What are the functions of Feliquito?

_____

Chapter 6: Anti-inflammatory antibodies

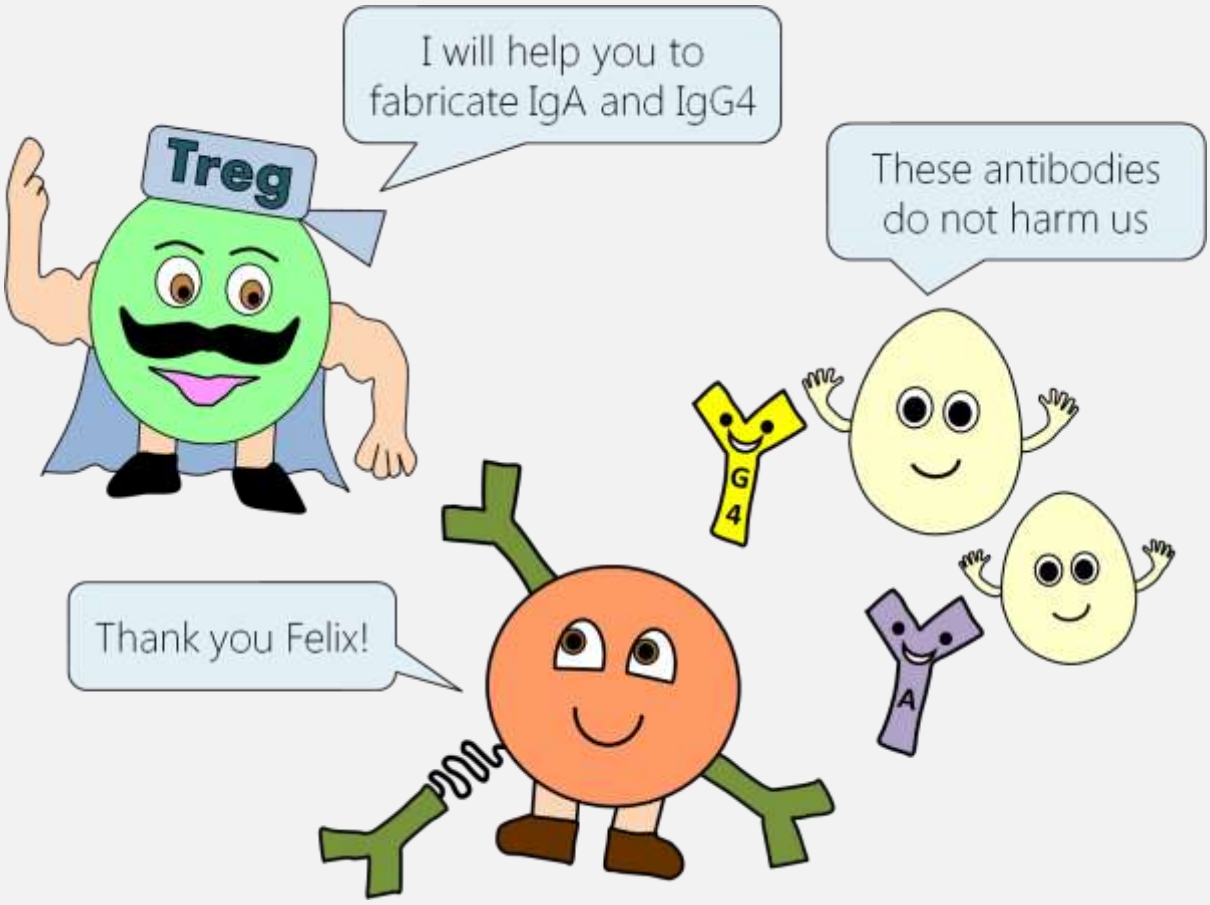


The main function of Moli, our B lymphocyte, is to synthesize antibodies, also called immunoglobulins. We have 5 classes of antibodies: IgG, IgA, IgM, IgD and IgE.

In the books "The Immunocytes against the Pneumococcus" and "The Immunocytes against the Ascaron" we learned that our antibodies are very important to defend us from dangerous microbes such as the Pneumococcus or the worm Ascaris.

However, in this book we need antibodies that favor the development and maintenance of immune tolerance to egg molecules.

That is how Moli, with the help of Feliquito, begins to produce anti-inflammatory antibodies such as immunoglobulin A and immunoglobulin G4. As a result, the molecules of chicken egg are accepted.



Help Moli to answer the following questions:

1. What is the main function of Moli?

   _____

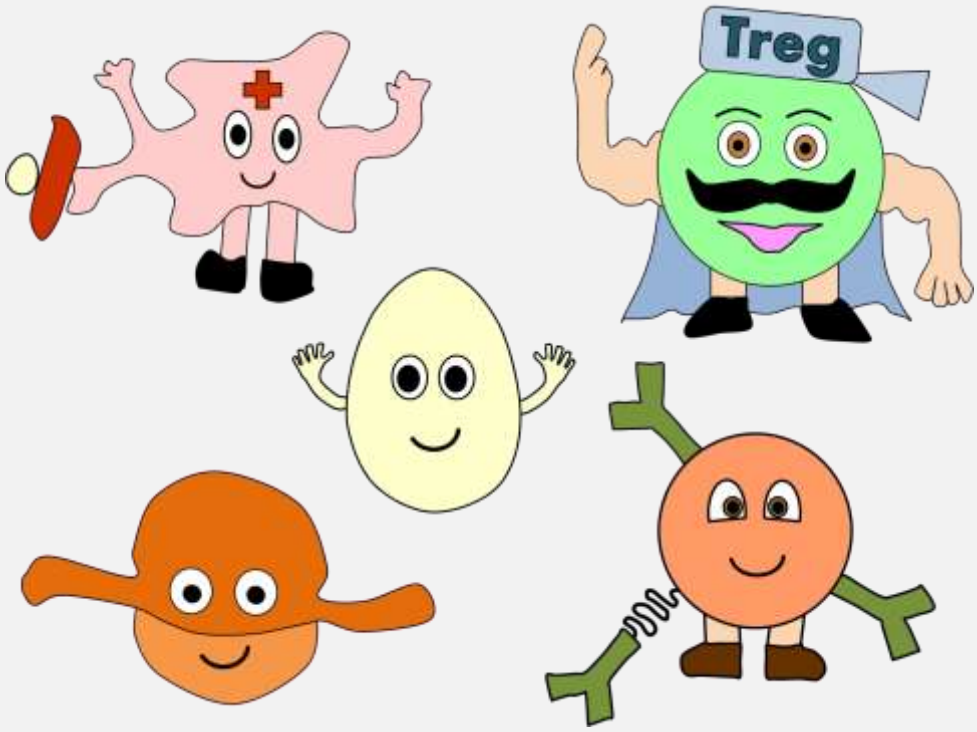
2. Which antibodies are produced against egg molecules?

   _____

3. Who helps Moli to fabricate anti-inflammatory antibodies?

   _____

Chapter 7: The importance of 'immune tolerance'



The cooperative work of our epithelial cells (Vilma and her friends), our dendritic cells (Bertha), our T regulatory lymphocytes (Feliquito), and our B lymphocytes (Moli) allows us to develop the phenomenon of 'immune tolerance'.

The major task of this regulatory battalion is to promote immune tolerance to the following:

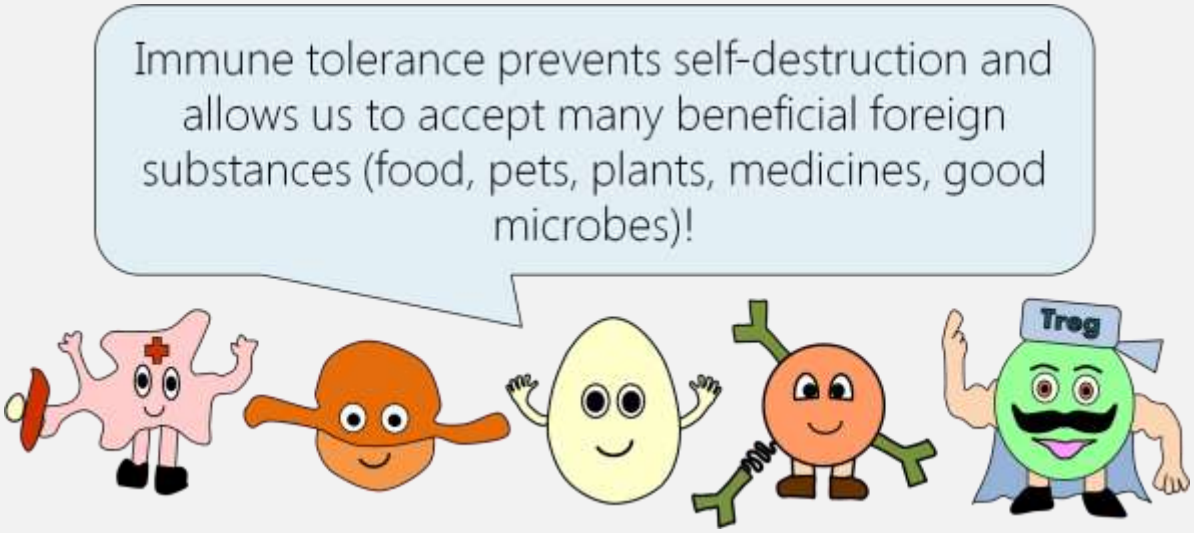
- Self molecules, that is, proteins of our own tissues.
- Foreign molecules that give benefit to us, such as food, medicines and "good microbes".

- Foreign molecules that are innocuous to us, such as house dust mites, plants and pet dander.

In this manner we can feed without problems and we prevent our destruction. Therefore, it is very important that our immune system functions properly.

When we lose immune tolerance against our own molecules, autoimmune diseases develop.

When we lose immune tolerance to beneficial or harmless foreign molecules, allergic diseases appear.



Let's complete this book with the following questions:

1. What can happen when we lose immune tolerance to self molecules?

   _____

2. What can happen when we lose immune tolerance to beneficial or harmless foreign molecules?

   _____

In this little book we learned how our immunocytes tolerate beneficial foreign molecules such as chicken egg, so that we can feed with no problem.

Do not miss the following book, where we will understand the danger we face when our immune cells stop functioning.

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Allergy and Clinical Immunology

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- Bertha Alicia Becerra Sánchez

"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.

"These warning signs were developed by the Jeffrey Modell Foundation Medical Advisory Board. Consultation with Primary Immunodeficiency experts is strongly suggested.

www.INFO4PI.org

Series: Funny Immunology to Save Lives

(Editions in English and Spanish)

Book 1: The Immunocytes
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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: T regs: controlling the immune army
Book 8: When the Immunocytes get sick...
Book 9: When the Immunocytes go crazy...
Book 10: The Immunocytes and transplantation
Book 11: The armor of Felix the Immunocyte

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