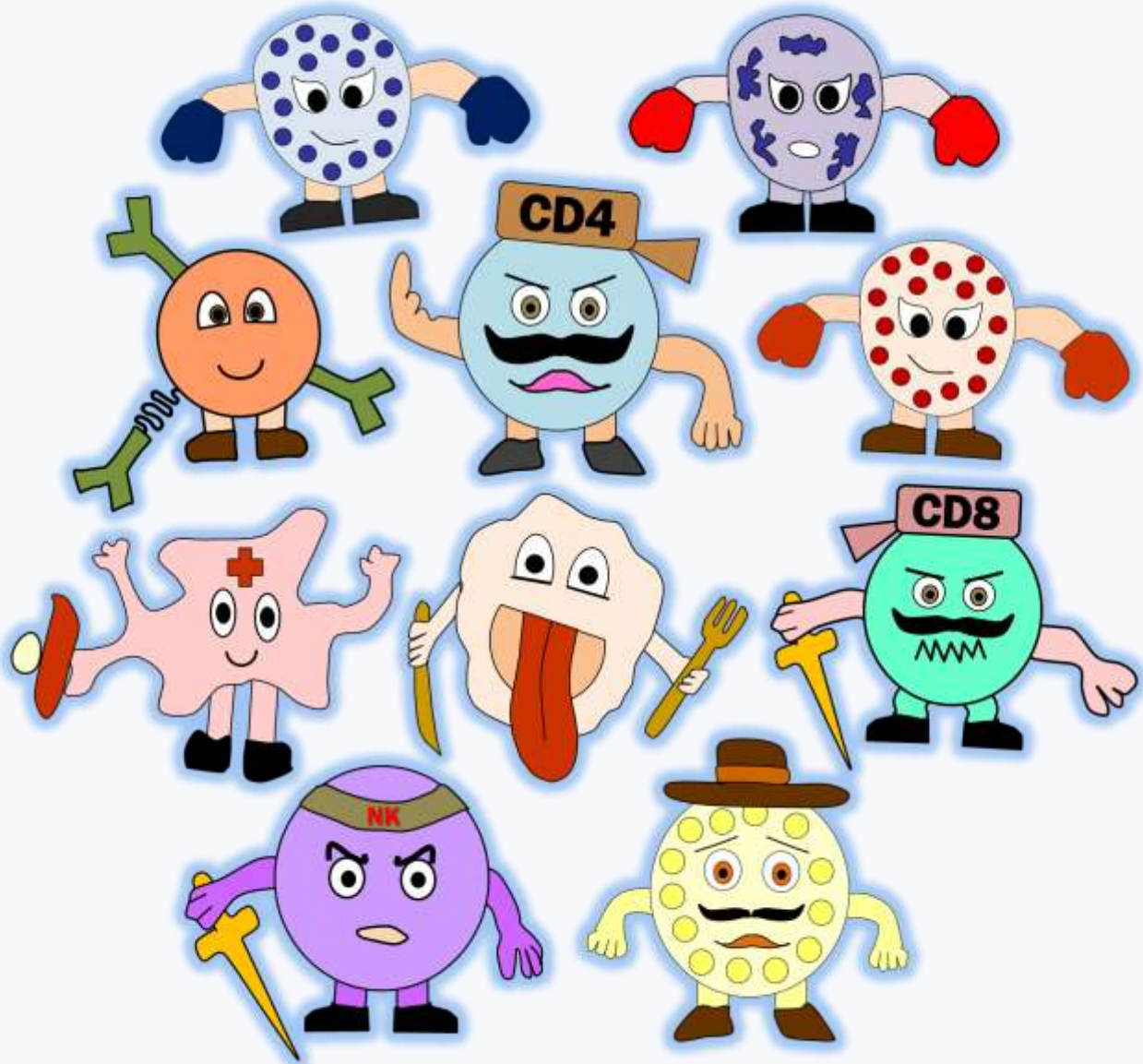


# **When the Immunocytes go crazy...**

**Allergies and autoimmune diseases**



**Juan Carlos Aldave, MD**  
**Allergy and Clinical Immunology**

# **When the Immunocytes go crazy**

## **Allergies and autoimmune diseases**

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

The immunocytes are very strong and powerful to attack dangerous bugs. However, they must learn to tolerate some molecules such as food and self proteins.

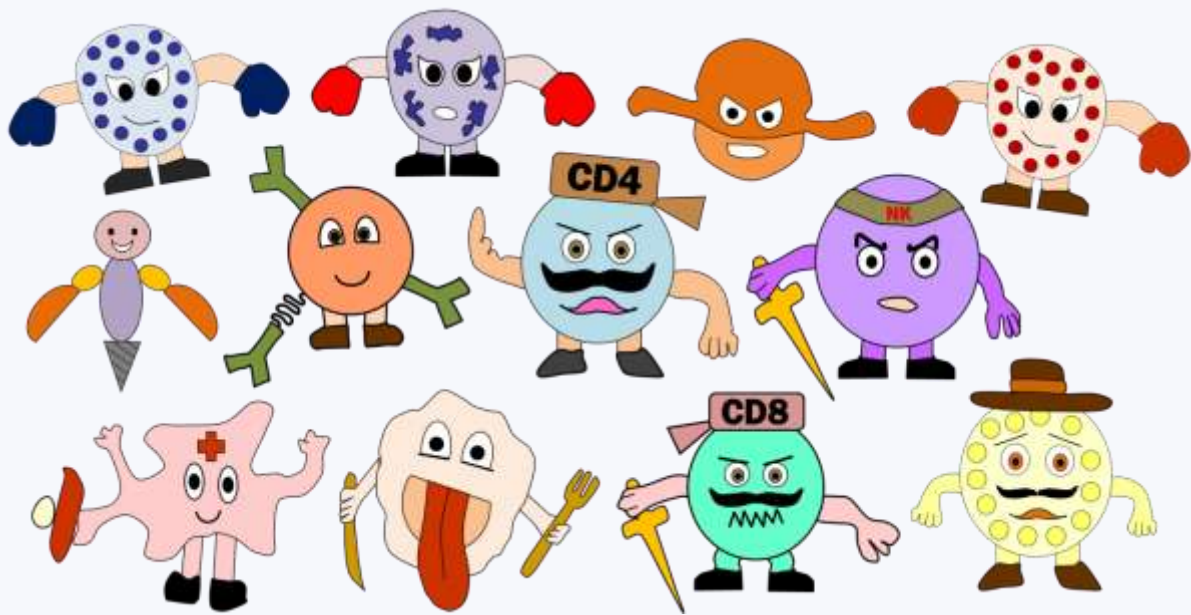
In this little book I will show the danger we face when our immunocytes go crazy and attack molecules that should be tolerated.

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# Chapter 1: The powerful army of immunocytes



The main function of our immunocytes is to protect us from millions of dangerous microbes that endanger life.

Immune cells cluster in battalions to fight against so many microbes. For example, our TH17 battalion kills the fungus *Candida*, the TH1 battalion destroys the lethal *Mycobacterium tuberculosis*, and the TH2 crowd kills the worm *Ascaris*.





Our immunocyte army is very powerful. It activates rapidly after detecting bugs or hazardous substances in our body to destroy them and thus preserve life.



However, there are several external substances that, despite being foreign, are beneficial or harmless to us. Therefore, these substances must be tolerated by the defense system. Own body molecules must be tolerated by immune cells too. The immunocyte that directs the processes of immune tolerance is Feliquito, our T regulatory cell.

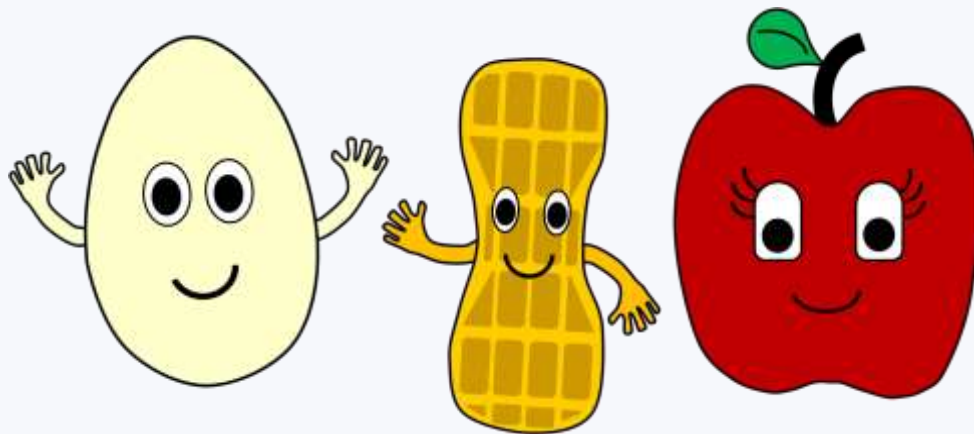




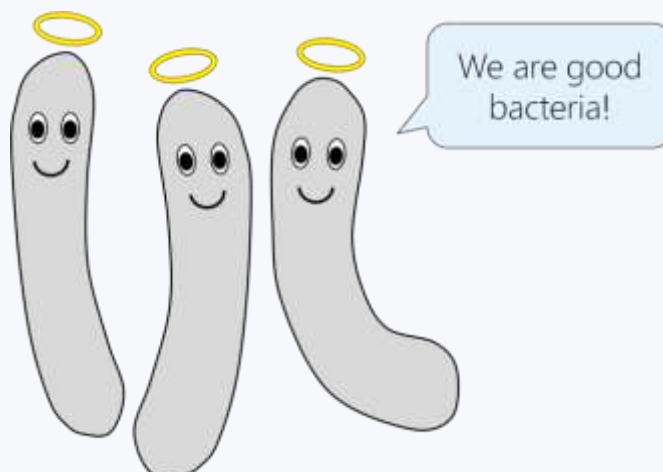
## Chapter 2: The foreign substances that we should tolerate

Our defense system must learn to tolerate some foreign substances that are beneficial or innocuous to us. For example:

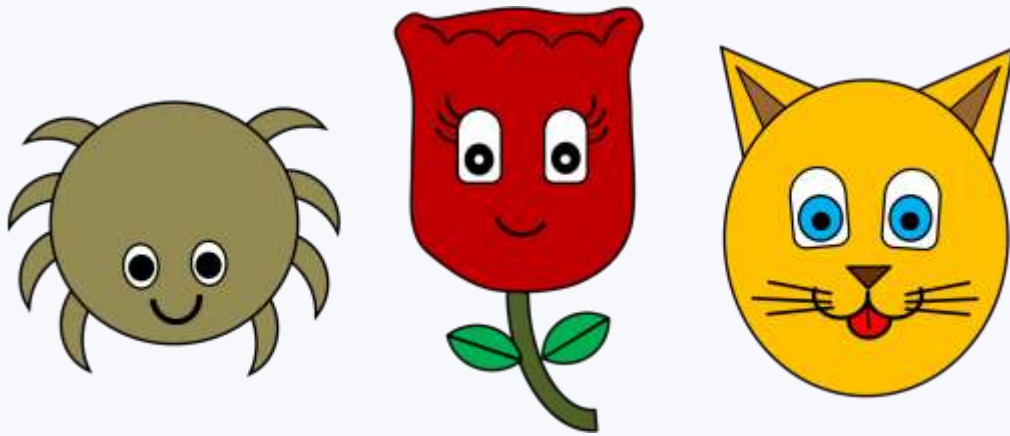
- Food that provides energy to our cells, such as egg, fish, peanuts, fruits, etc.



- Good bacteria that live in our body, also called 'commensal bacteria'. These bacteria produce vitamins, regulate the function of the immune system and prevent tissue invasion by bad bacteria.



- Harmless substances that live around us, such as house dust mites, pet dander, plant pollens and some environmental fungi.



- Medicines used to prevent and treat diseases, such as anti-inflammatory drugs, antibiotics and anesthetics.

All these substances must be accepted by our immune system through the phenomenon of 'immune tolerance', which is essential for our life.

In the next chapter we will learn how our immunocytes react after recognizing self molecules.

Please answer the following questions:

1. Which foreign substances must be accepted (tolerated) by our immune system?

---

2. Place true or false:

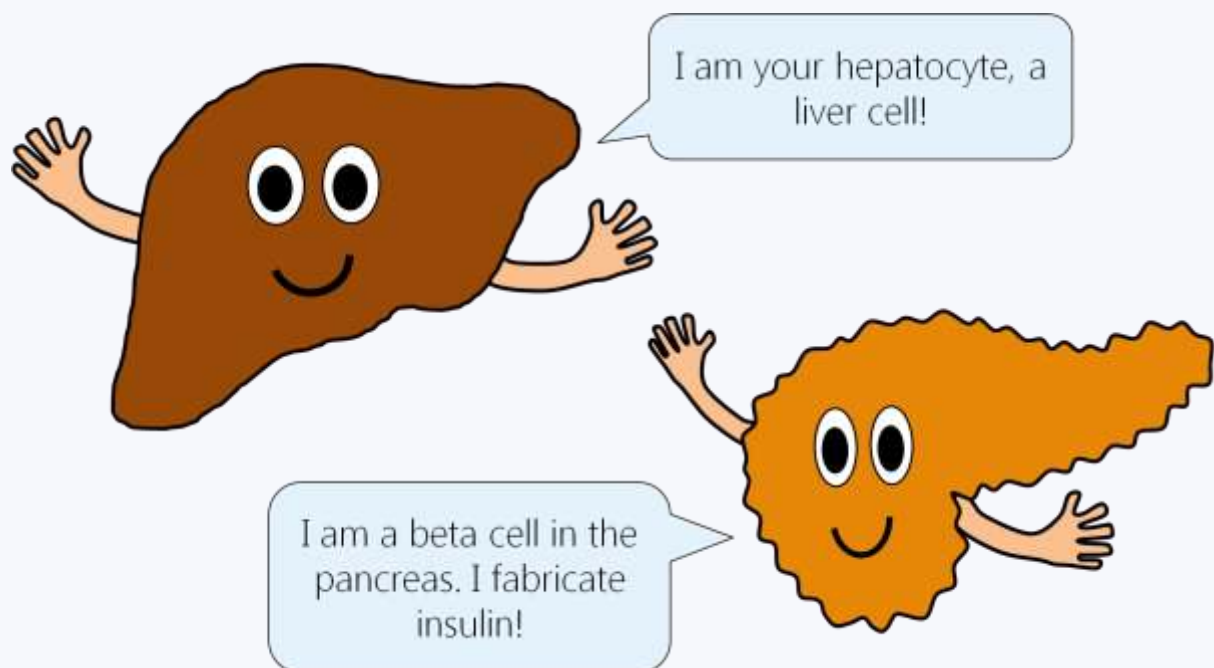
The phenomenon of immune tolerance is essential for our life

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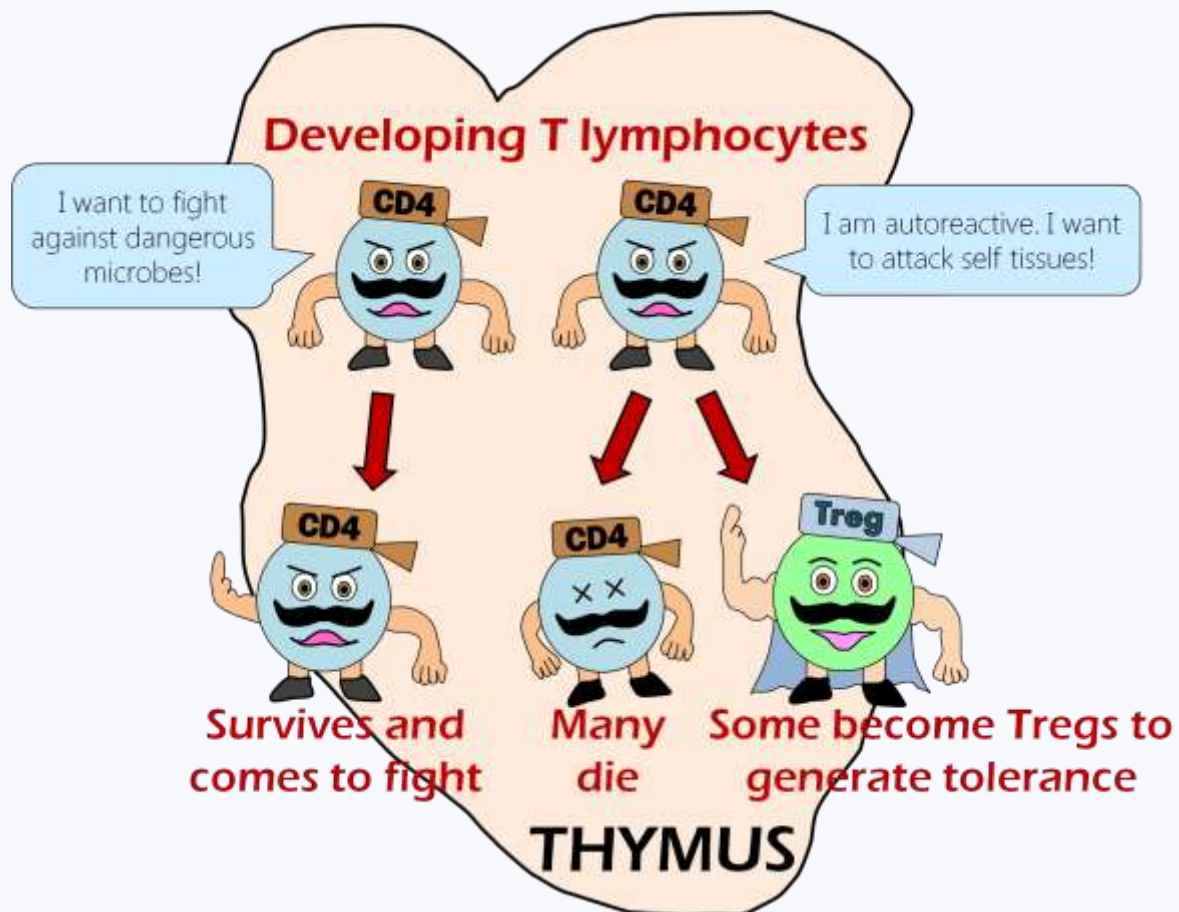


## Chapter 3: Induction of tolerance to self molecules

Our body contains thousands of proteins whose function is essential to keep us alive. Therefore we say that these molecules are 'self proteins'. For example, insulin that is produced by the beta cells of the pancreas, thyroid hormones produced by our thyroid gland, and myelin in the nervous system.



When T lymphocytes are developing in the thymus (a gland located near the heart), they must learn to tolerate self proteins. The majority of baby cells that want to attack self molecules ('autoreactive' T lymphocytes) are destroyed. Some others are converted into T regulatory cells, the directors of immune tolerance.



The same process goes for B lymphocytes when they develop in the bone marrow. Baby cells that attack self proteins ('autoreactive' B lymphocytes) are removed before they complete their maturation.

1. Mention a self protein and its location in the body:

Proteína

Lugar

\_\_\_\_\_

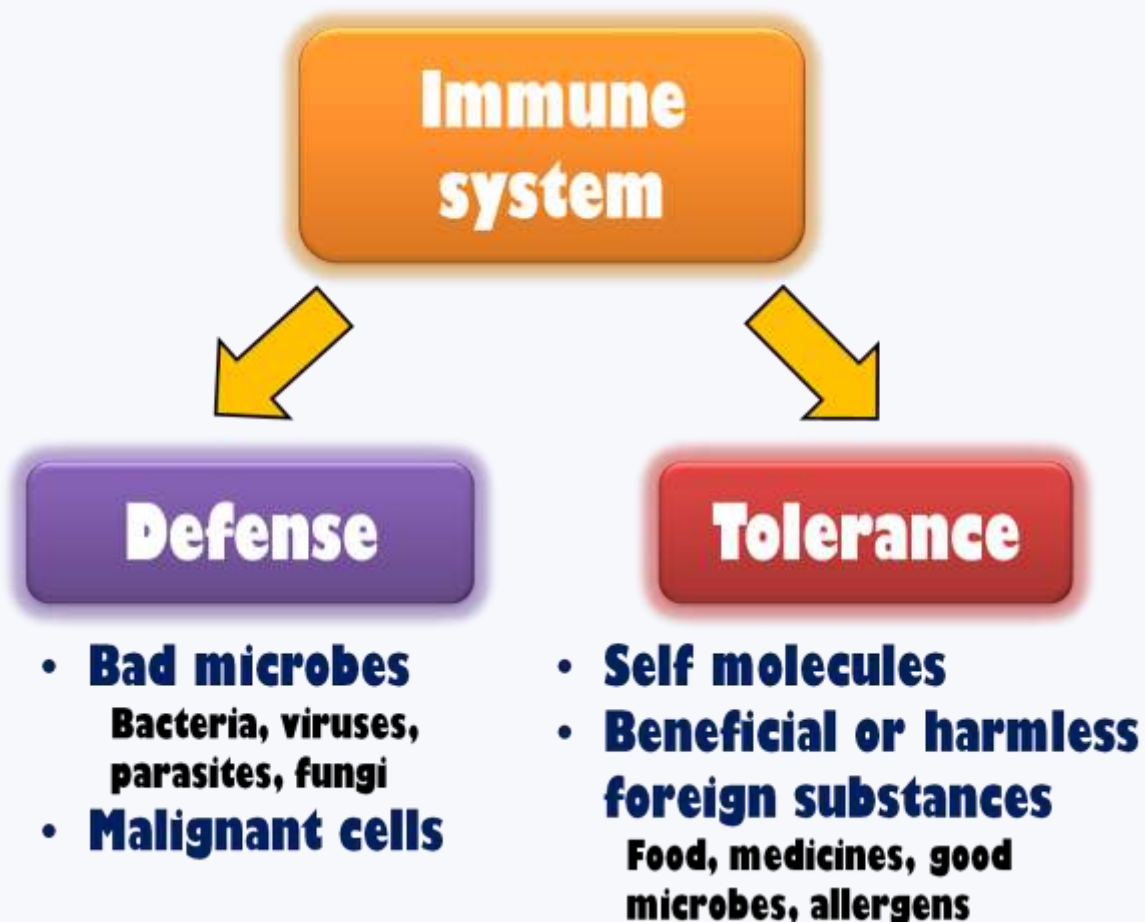
2. Where our T and B lymphocytes develop?

T lymphocytes: \_\_\_\_\_ B lymphocytes: \_\_\_\_\_

3. What happens to 'autoreactive' T lymphocytes?

\_\_\_\_\_

## Chapter 4: The importance of 'immune tolerance'



'Immune tolerance' is a process by which our immune system learns to accept certain molecules without generating an attack.

In the previous chapters we learned that our immunocytes must tolerate:

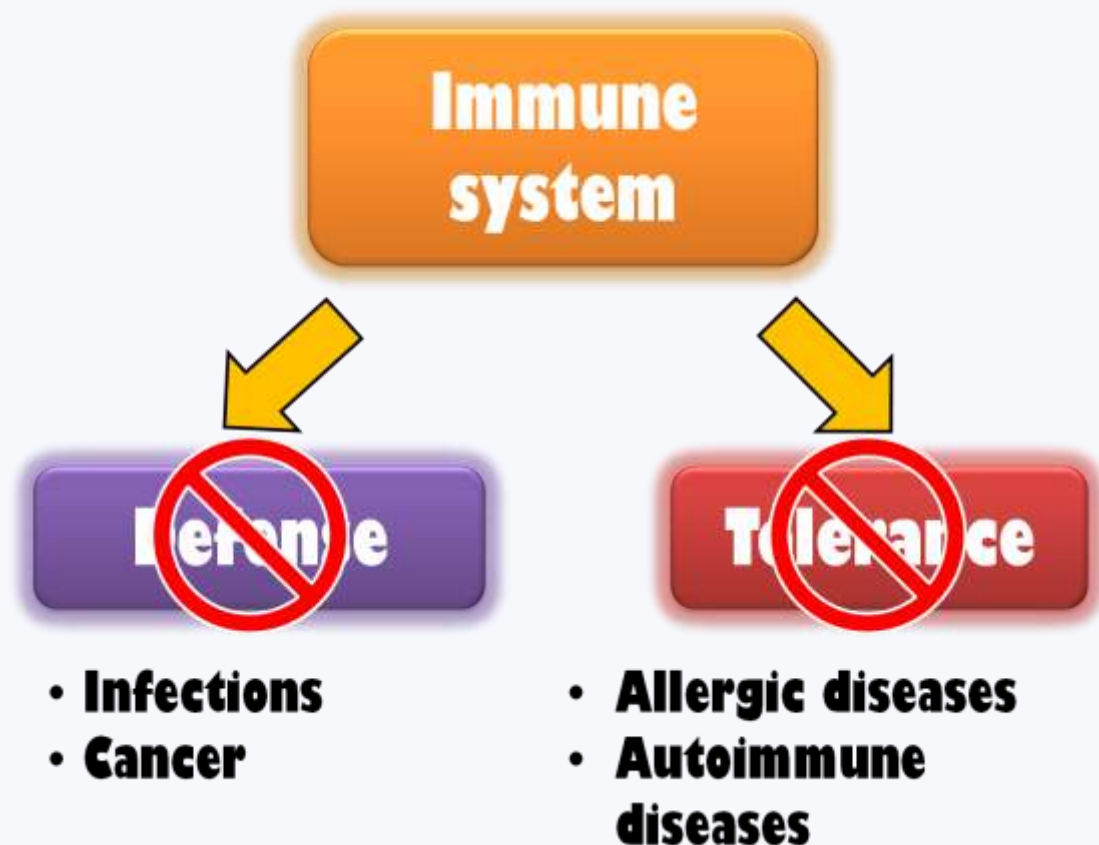
- Self molecules.
- Foreign molecules that benefit us such as food, medicines and good bacteria.

- Foreign molecules that do not harm us, such as house dust mites and pet dander.

In this manner we can feed without problems and self destruction is prevented.

If we lose immune tolerance against self molecules, autoimmune diseases develop.

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



1. What happens if we lose immune tolerance to ...  
... beneficial foreign molecules?

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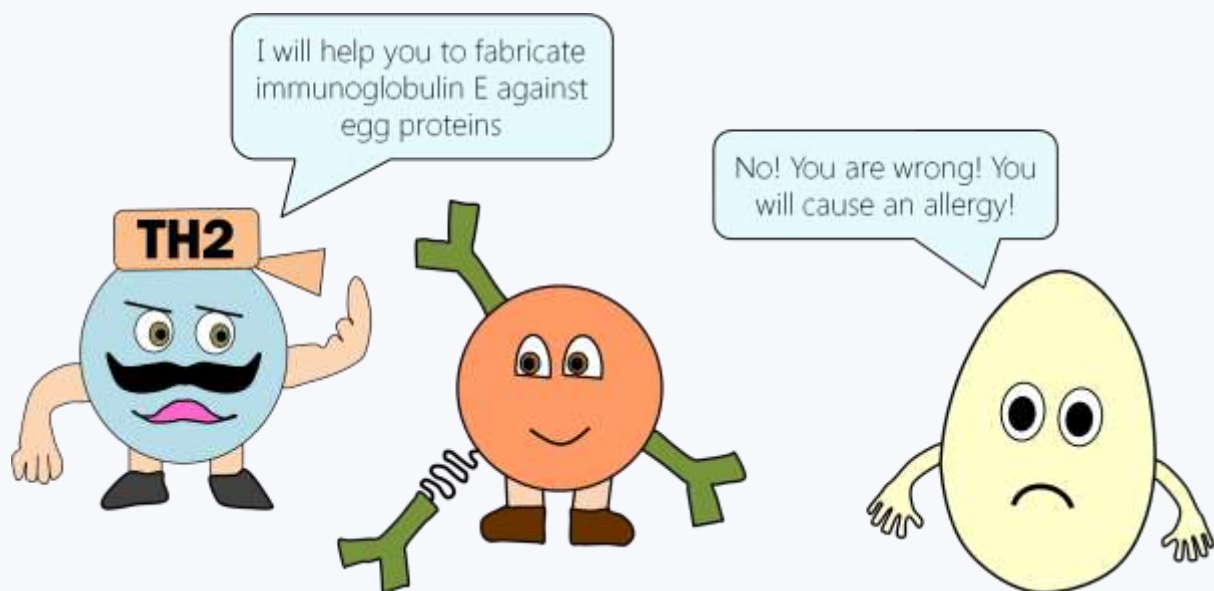
... self proteins?

---

## Chapter 5: Allergies

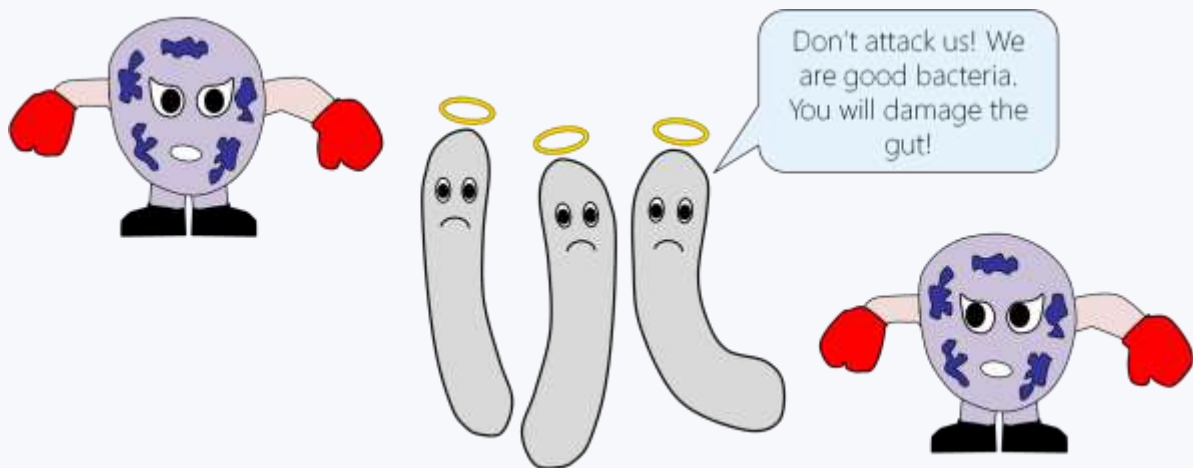
Allergic diseases develop when an individual loses immune tolerance to foreign molecules that should be accepted. For instance:

- If the TH2 battalion of a child (see the book "The Immunocytes against the Ascaron") reacts excessively to egg proteins, he will become allergic to egg. The kid may develop hives, chest tightness, diarrhea and low blood pressure after eating egg.

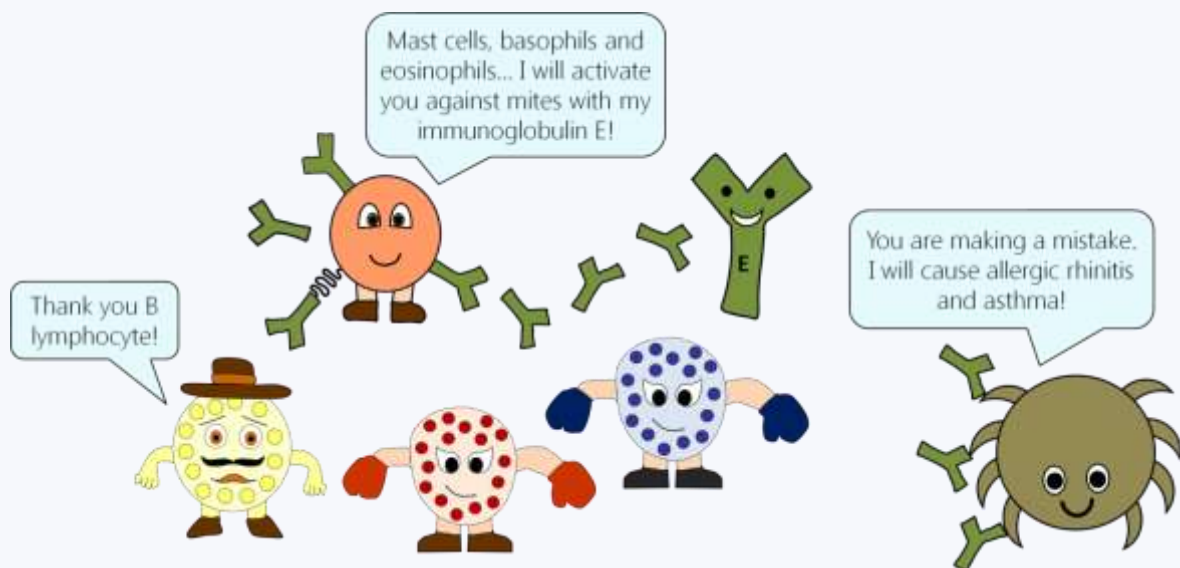


The same problem can occur with any food or medicine to which a patient is allergic. Severe allergic reactions to food and drugs can cause death.

- 'Inflammatory bowel disease' develops when the immune system attacks good bacteria in the gut. This disease is characterized by bloody diarrhea, intestinal pain and multiple ulcers in digestive organs.



- Allergic rhinitis and asthma are respiratory diseases that usually occur due to the production of IgE against proteins from house dust mites.



Environmental and behavioral changes in modern society (air pollution, cigarette smoke, junk food, insufficient exercise, cesarean delivery, inappropriate use of antibiotics) have led to an increase in the prevalence of allergic diseases, which currently affect 40% of the population.

Allergic diseases cause great discomfort and reduce the quality of life of affected subjects. In severe cases they can even lead to permanent disability and death.



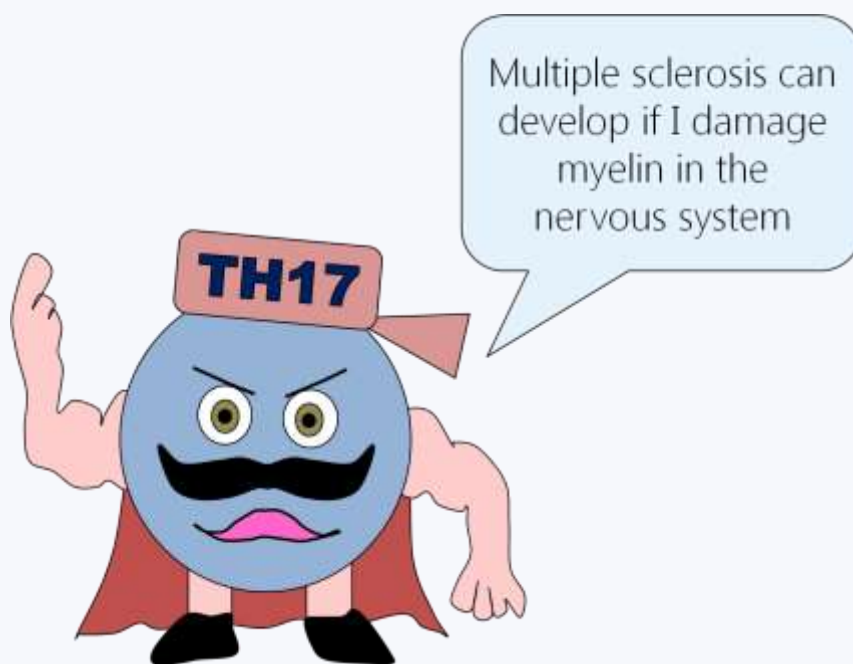
## Chapter 6:

# Autoimmune diseases

Autoimmune diseases occur when the immunocytes attack self molecules.

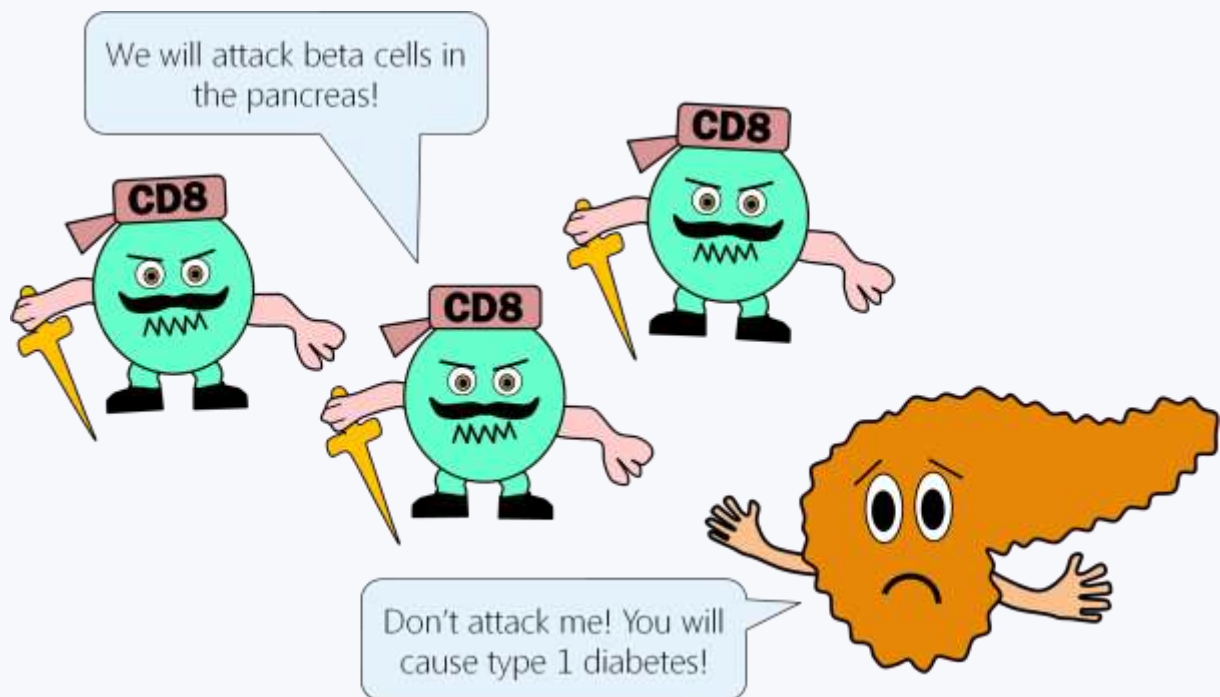
For example:

- Multiple sclerosis develops when the TH17 battalion (see the book "The Immunocytes against the Candida") attacks the protein myelin in the nervous system. Multiple sclerosis is a disabling disease characterized by neurological abnormalities such as weakness and loss of sensitivity.



A similar problem occurs in a joint disease called 'rheumatoid arthritis' (pain and inflammation in the finger joints, wrists, shoulders, etc.) and a skin condition known as 'psoriasis' (thick scales over the knees, elbows, behind the ears, etc.).

- Type 1 diabetes occurs when the powerful T CD8 lymphocytes attack the beta cells of the pancreas. Children and adults with this disease need lifelong insulin injections to control levels of blood glucose.



- Other severe autoimmune diseases are systemic lupus erythematosus, myasthenia gravis, autoimmune thyroiditis, Graves' disease, autoimmune hemolytic anemia, and autoimmune thrombocytopenia.

Behavioral changes in modern society (little exercise, cigarette smoke, chemical products, junk food) have favored an increase of autoimmune diseases, which currently affect up to 20% of the population.

Autoimmune diseases destroy the body, reduce the quality of life and cause permanent disability or even death.

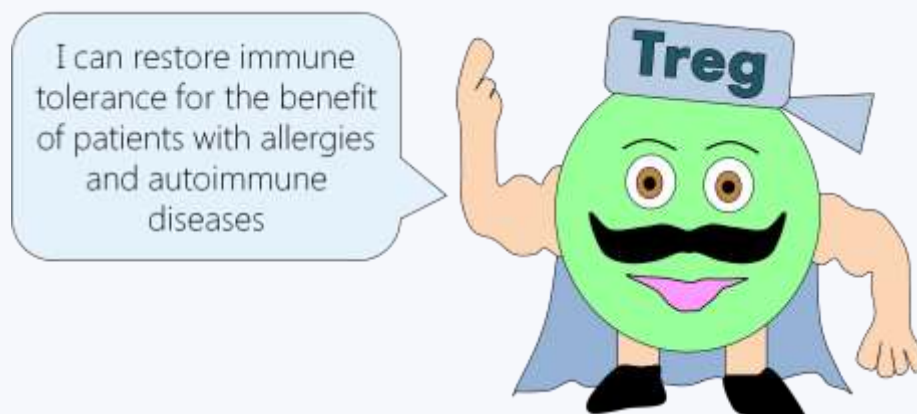
# Chapter 7: Restoring immune tolerance

Immune tolerance is essential to keep the body healthy. The immunocyte that directs immune tolerance is Feliquito, our T regulatory lymphocyte.

People with allergic diseases have lost immunological tolerance to certain foreign substances. People with autoimmune diseases have lost immune tolerance to self molecules.

**Is it possible to restore immune tolerance in people with allergies and autoimmune diseases?**

Theoretically yes, through a treatment modality called immunotherapy. The basis for immunotherapy is to generate specific regulatory T lymphocytes capable of recovering tolerance to the culprit molecules (allergens or self molecules).



In certain allergic diseases the efficacy of immunotherapy is well established (e.g. allergy to insect venom, allergic rhinitis, bronchial asthma).

In patients with autoimmune diseases the benefit of immunotherapy is still under investigation. If immunotherapy would work in these patients, we could cure autoimmunity.

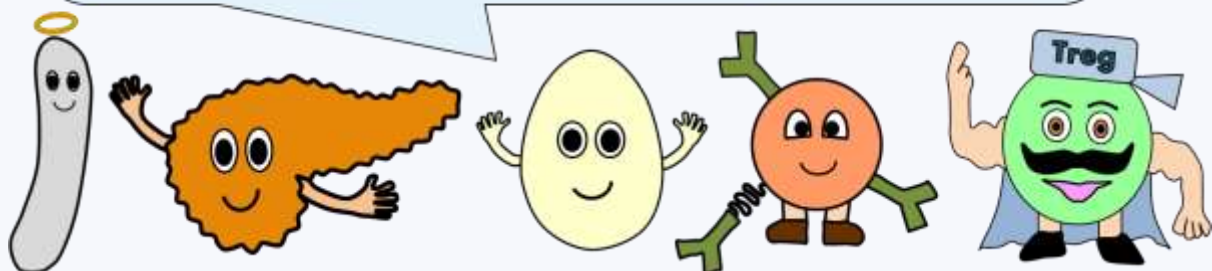
### Can we prevent the loss of immune tolerance?

There are no magical recommendations for this purpose; however, it is very important to keep a healthy lifestyle, which includes:

- A healthy diet (many fruits and vegetables, abundant water, low salt, low sugar, little animal fat).
- Frequent exercise.
- Living in a clean environment with good personal hygiene.
- Reducing familiar and work stress.
- Avoiding cigarette smoke and alcoholic beverages.

Therefore, it is important to understand the life and function of our immunocytes. If we improve our knowledge of allergies and autoimmune diseases, we will diagnose ill subjects promptly and give them an appropriate treatment.

It is important to understand the process of immune tolerance so we can improve diagnosis and treatment of patients with allergies and autoimmune diseases!



In this little book we learned what happens when our immunocytes loss control and attack certain molecules that should be tolerated, causing allergies and autoimmune diseases.

Do not miss the following book, where we will understand the reaction of our immunocytes after an organ or tissue transplantation.

Juan Carlos Aldave, MD

Allergy and Clinical Immunology

## Contributors:

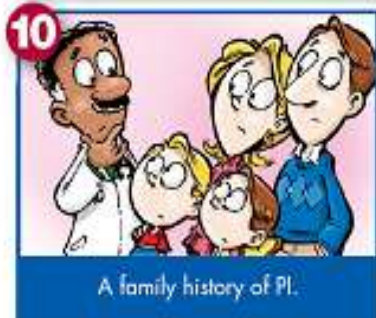
- Dr. Juan Félix Aldave Pita
- Bertha Alicia Becerra Sánchez

"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.**



"These warning signs were developed by the Jeffrey Modell Foundation Medical Advisory Board. Consultation with Primary Immunodeficiency experts is strongly suggested. ©2013 Jeffrey Modell Foundation"

[www.INFO4PI.org](http://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: 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 the Immunocyte Felix

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