Table of Contents

IMMUNE SYSTEM

THE BAD GUYS IN THE MOVIE ——————————————————————————————————————–

To clarify the concepts we will refer to microorganisms as criminals or criminals, whose function is to cause damage to our organism through different strategies. Some microorganisms will be located at the extracellular level (eg, like bacteria, fungi and extracellular parasites), violating the doors of our organism, robbing and abducting the honest inhabitants. Others. Like intracellular viruses and parasites, take helpless cells hostage, and finally, some criminals are cells of the community that corrupt themselves and become excessively enriched at the expense of the common good (ancestor cells).

1. ——————————-Now who can help us?

Our immune system has tools for immediate employment (non-specific or natural innate immunity) but others have to work them out (acquired, specific or adaptive immunity)

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INNATE IMMUNITY
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Imagine our body such as a country or a region. Natural immunity would be the system composed of the physical barriers that protect it and the local police that react to attacks on the integrity of the system. The border would be represented by the skin and mucous membranes, which function as a mechanical barrier that prevents entry of microorganisms (some microorganisms use the skin as a gateway,especially those that usually grow in it as Staphylococcus epidermidis). Skin secretions (sweat and sebum), by containing acids, determine an environment not favorable to the development of microorganisms; In the mucous membranes, the mucus next to the sweep, and bactericidal substances like the lysozyme, protect another door of entry of microorganisms to the system. For example, in the oral cavity the bactericidal substances (lysozyme, lactoferrin, Defensins and histatins) are found in saliva (this would partly explain the instinctive action of animals licking their wounds).

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PEACEFUL LIVING OF INHABITANTS
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Peaceful coexistence: many bacterial strains are adapted to life in different regions of the body, such as the skin, the oral and vaginal cavities, and the colon. In a great example of cooperativism. In exchange for a place to live in peace, these strains provide another line of defense against pathogenic microorganisms, by competing with them for binding sites and nutrients, or by making substances that inhibit their growth. The destruction of this saprophytic flora, for example by some antibiotics, violates a defense mechanism and favors colonization by dangerous germs.

PHAGOCYTES ——————– ——————————-

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Phagocytes (to serve and protect)
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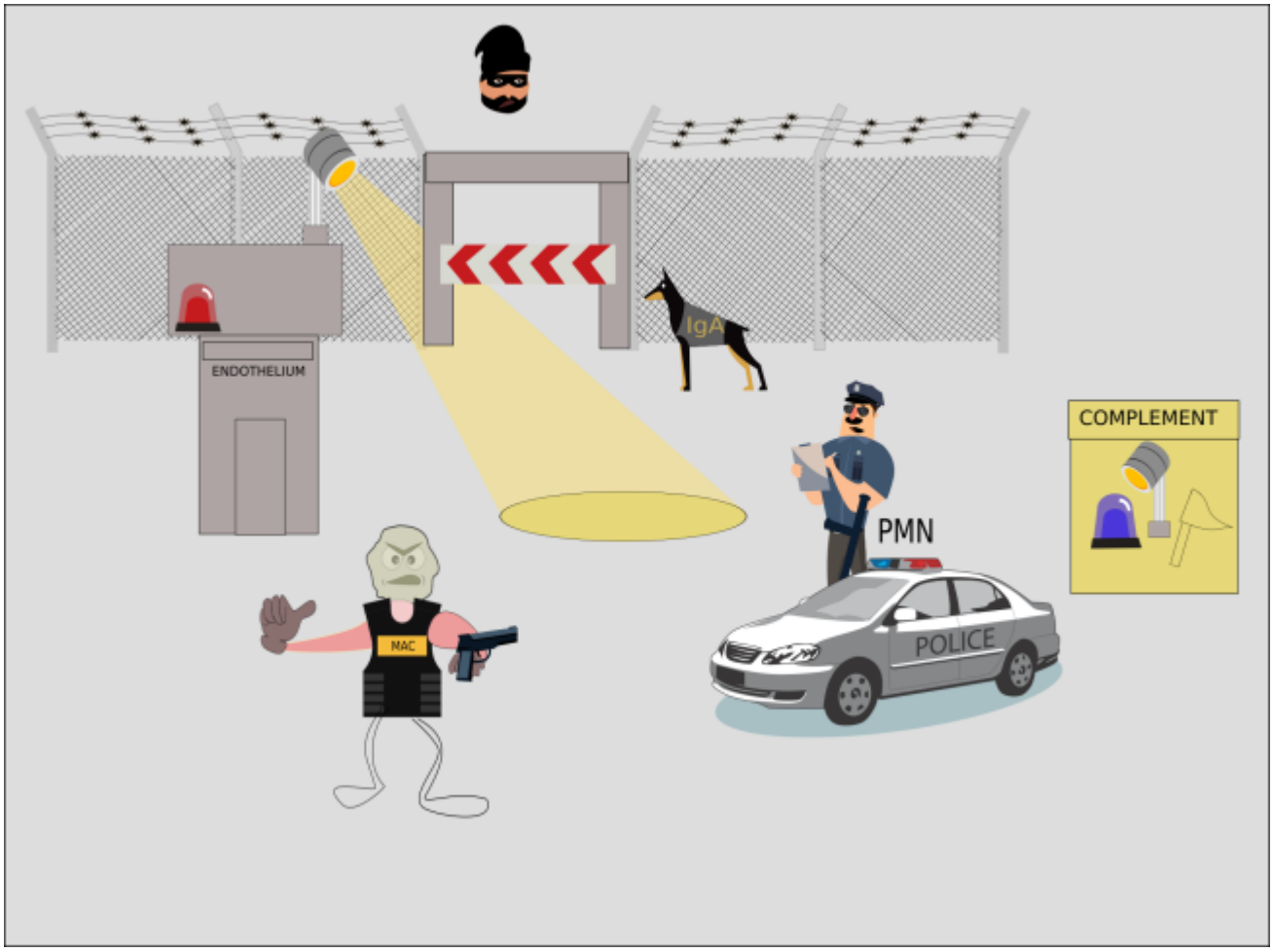
If the customs barriers (natural barriers) are violated, the system police are put into operation: phagocytes.

Phagocytes include circulating neutrophils and tissue macrophages (which are derived from circulating monocytes). Neutrophils and monocytes, such as road police, patrol the vascular system and respond to the call of the endothelium in case of invasion or injury. The difference between

neutrophils and monocytes is that while both are displaced, the latter represent a SWAT team, which places checkpoints and detachments at strategic sites (tissue macrophages), allowing them to stop and destroy microorganisms.Pathogens within certain cells that have been taken hostage by them. This system, known as the monocyte-macrophage system (The old reticulo endothelial system), is present in the liver parenchyma (Kupfer cells), in the lung (alveolar macrophages), in the nervous system (microglia), in the lymph nodes, in the spleen and in the renal mesangium, Among other sites.within this SWAT team there is another specialized type of cell called the dendritic cell. These cells, located in strategic locations,act as a link between innate and acquired immunity (A kind of radiocommunication body); are one of the so-called professional antigen-presenting cells.



ACQUIRED OR ADAPTIVE IMMUNITY

Crime prevention (that is, the detention of criminals before they commit the crime) has given greater benefit than the representation This was demonstrated by the zero tolerance policy, set up by New York Mayor Rudolph Giulliani. In this sense, our system has developed a defensive structure that allows to develop intelligence tasks, to carry files of the best known criminals and to set up very effective operations, to hunt them down and destroy them before they can commit serious crimes, and keep them in memory in case they are seen second time. This type of operation can only be mounted by an immune system called Adaptive, acquired or specific (the federal police or FBI of the Americans) based mainly on two cellular types: T and B lymphocytes.

Both derive from the same academy (the bone marrow), but the T lymphocyte matures in another distribution (the thymus).Although they have different functions. there are common characteristics:

1.They can recirculate (i.e pass from the circulation to the tissues and return via a lymphocyte pathway, called the lymphatic pathway), unlike other leukocytes that only leave the bloodstream to

die on the battlefield of tissue.

2. They have receptors capable of recognizing the antigen (Specificity): the receptor B complex (BCR) and the T receptor complex (TCR), for the Lymphocytes B and T, respectively.

3. They present clonal proliferation when activated (clones of the activated cell are produced) (is that why federal agents are so similar?).

4. They present memory, which determines that the immune response is faster and of greater magnitude before the second entrance of the pathogen.

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ANTIGEN RECOGNITION
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Unlike phagocytes, they trigger their entire arsenal (place where weapons and military equipments are stored) indiscriminately and generate a major local conflict (inflammatory response) which usually collects victims in the civilian population (own cells that die in that response), the specific system generates specialized agents to each particular criminal type (lymphocytes).That is, that each type of activated lymphocyte is trained in recognizing the number of criminals through the antigenic pattern.

ANTIGENIC PATTERN —– Pattern recognition receptors (PRRs) play a crucial role in the proper function of the innate immune system. PRRs are germline-encoded host sensors, which detect molecules typical for the pathogens. They are proteins expressed by cells of the innate immune system, such as dendritic cells, macrophages, monocytes, neutrophils and epithelial cells, to identify two classes of molecules: pathogen-associated molecular patterns (PAMPs), which are associated with microbial pathogens, and damage-associated molecular patterns (DAMPs), which are associated with components of host's cells that are released during cell damage or death.

The microbe-specific molecules that are recognized by a given PRR are called pathogen-associated molecular patterns (PAMPs) and include bacterial carbohydrates (such as lipopolysaccharide or LPS, mannose), nucleic acids (such as bacterial or viral DNA or RNA), bacterial peptides (flagellin, microtubule elongation factors), peptidoglycans and lipoteichoic acids (from Gram-positive bacteria), N-formylmethionine, lipoproteins and fungal glucans and chitin.

Endogenous stress signals are called damage-associated molecular patterns (DAMPs) and include uric acid and extracellular ATP, among many other compounds.

What is an antigen? Antigen: for the specific immune system the antigens are the particular signs of the criminal that can identify. Recognition of this criminal (Sign/Character = antigen) can trigger a police response (immune system) or not. When it does, the antigen is called an immunogen

For example, the BCR is made up of antibody molecules (specific for the criminal) capable of recognizing as antigens almost all types of molecules (sugars, lipids, hormones, macromolecules, acids, nucleic acids and Proteins). In contrast, the TCR is more selective and is only able to recognize molecules of peptidic nature that are embedded on other special molecules called major histocompatibility complex (MHC) molecules.

In other words, if the police force T recognizes to a criminal as such, he must be in an environment (MHC molecule). These molecules of MHC are found in almost all cells of the organism; Therefore, all the cells in the organisms were likely to present to the Criminal (in the peptide format) to the T lymphocytes. Cells that have the ability to present an antigen are called antigen presenting cells (APCs); But some were trained for that function. This type of special antigen-presenting cells are called professional antigen presenting cells (police trained to present a particular criminal) and are

dendritic cells, B lymphocytes and macrophage).

Acquired or specific immunity is based on the recognition by lymphocytes of a specific signal from professional antigen presenting cells (macrophages, dendritic cells and B lymphocytes)

Division identifications: The professional APCs present to the lymphocytes a folder composed by the particular signs of the invaders.This information is authenticated by the data of the presenting APC (MHC molecules) from In this way, the lymphocyte will be able to read membrane of the APC the data of the evildoer. However, for lymphocytes to be activated, the APCs must provide a key of recognition which serves as a mechanism for that the attack lymphocyte system is not activated by mistake (a kind of key Secret that spies use to recognize themselves). The Are provided by costimulatory molecules (CD80 and CD86). In summary, the activation of a virgin lymphocyte or novice, requires a professional CpA on the surface of which are the MHC molecules, carriers of the peptides derived from the pathogen, and the costimulatory molecules. The first (MHC-peptide complex) is recognized by virgin T lymphocyte receptors and the costimulatory molecules interact with the present CD28 molecule On the same virgin lymphocyte. Just the presence Of these two signals (mediated by the TCR and by the CD28) allows the activation of the virgin lymphocyte and Gives rise to a complex web of events Worthy of the best thriller.

The two long arms of the law: the cellular response and the humoral Response

Cellular response

It is mediated by the T lymphocytes that patrol the body, ask documents to the cells and detect illegal aliens, seditious and social misfits identified and sought, Destroys them or denounces them to humoral immunity, for them to take care of them. In general the cell response is performed against tumor cells, fungi or cells taken as hostages by virus and parasite.

Unlike the non-specific immunity system(INNATE IMMUNITY) Specifically, the specific is based on the exact identification of the villain. Therefore the first step in activating this system is the identification.

Identification section: presentation of antigens. As we said, host cells process the pathogen antigen and express it in their own membranes, associated with a molecule of the MHC and a costimulator. New-born lymphocytes just emerging from the academy (thymus), also called native or virgin lymphocytes, interact with presenting cells in the lymph nodes. There they complete a course on the specific pathogen and, after a few days of training they leave the lymph nodes, armed and with a photo of the suspect.For each trait presented (fingerprint, photo, description) Designate a new specific police officer.From this It follows that every evildoer can be sought by several agents that are based on the identification of different types (eg, some will look for traces and others the face of the same criminal).

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 Once activated, the lymphocyte must proliferate; Interleukin 2 and its
receptor are responsible for the proliferation and differentiation that
converts naive or novate cells into effector cells armed. Apparently the
function of the coreceptor of the antigen-presenting cells would be to
promote the synthesis of IL-2.
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Immigration Division. ' NK cells (killer by nature)

NK cells (belonging to the group of innate lymphoid cells) are defined as large granular lymphocytes (LGL) and constitute the third kind of cells differentiated from the common lymphoid progenitor-generating B and T lymphocytes.These cells, derived from a lymphoid progenitor, destroy virus-

infected cells in other intracellular microorganisms. An antitumor activity is also disclosed.Its activation (which is the result of the balance between inhibitory signals and inhibitors) may result in the lysis of the undocumented cell by perforins, or induce the synthesis and release of large amounts of IFNγ, which activates the macrophages to ultimately destroy the microorganisms.

One of the inhibitory signals for the activation of NK comes from the molecules of the MHC class I, present in the majority Of the cells of the organism. The presence of these molecules functions as the identity card that normal cells present to this rude agent Of the order, which inhibits its tendency to the easy trigger. If, on the other hand, the cell does not exhibit this document (eg, by alteration or absence of CMH I expression, as in some viral infections), NKs are activated and kill undocumented cells (infected or corrupted cells). Certain Cells, as the erythrocytes do not possess these documents (MHC class I molecules) in their membrane and yet they are not attacked by the NK. This is due to the fact that the erythrocytes present in the oligosaccharide and inhibit the action of the NK. NK cells would act as a first line of defense until other lymphocytes come to the rescue.

HUMOURAL IMMUNITY - ANTIBODIES

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                                                    Humoral immunity is
mediated by antibodies
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These glycoprotein molecules are manufactured By B lymphocytes when activated by Identification of foreign molecules. Depending on the type Of antigen, the B lymphocyte can produce antibodies In two different ways In one case the lymphocyte B will need T lymphocyte help in another way Is independent of the T-cell and is triggered Direct from lymphocyte B.

We know that the specific system does not activate If there is no positive identification of the Suspect or part of division identification (APC), then with this data is assigned to a lymphocyte T newbie with the task of capturing it. If the lymphocyte T is a CD4 type H2, will activate the lymphocyte B to manufacture specific antibodies against the invader.

On the other hand, direct activation occurs in cases of antigens formed by a large molecule that has repeated recognition sites, and requires a cross-linking of the B lymphocyte (surface Ig) receptors. Imagine that lymphocyte B, being in turn an APC. He watches a van full of hooded men armed with machine guns. It is almost evident that they are assailants, so the B lymphocyte is not going to stop to ask the Identification of these subjects, as is done in the normal procedure through CPA - TH lymphocyte, but will proceed to set up an operation to stop them On its own, In this second case the humoral response will be quantitatively and qualitatively different (see primary and secondary response).

ANTIBODIES

they are the guarding dogs which recognize the criminals through smell and track them out by tagging them killing/injuring them instantly by making them bleed by biting them

4 legs and a single mouth

legs has nails which are variable regions right two legs and left two legs

heavy chains and light chains

light chain each one on right and left or these are the back legs heavy chains form the arms and the belly with tail..

back legs are the hands with nails for gripping front arms are the hands with nails for gripping

the criminal (antigen) acts as the epitope (or the stronger criminal) which runs away and the dog has a hand with nails which acts as the paratope

all the four legs and arms constitute the antigen binding fragment where as the the body which sits on Fc receptors to modulate its action

IgD - detection dog (dogs present with a companion of police for inspection called B cells -))) IgG - guard dogs /gun dogs (mediate type 2 hypersensitivity and type 3) IgA - sight dogs or assistance dogs – found in mucosal surfaces tears,breast milk and saliva IgM- mountain dog(mediate type 2 hypersensitivity) IgE - scent dogs — mediate type 1 hypersensitivity ... Allergy

Type 1 is AAA..

D with B,Go To two and 3 Mnemonic sentences .... Detected by B's,Go to two Assist surfaces Mount to eliminate ones.....

Immunoglobulins There are five classes of Immunoglobulins – IgG, IgA, IgM, IgE and IgD. D - GAME (the game)

- immunoglobulin G
- immunoglobulin A
- immunoglobulin M
- immunoglobulin E
- immunoglobulin D

Each has four polypeptide chains – two heavy and two light. These chains are held together by disulphide (S–S) bonds. Heavy chains are specific to each class of Ig. IgM is produced first in the immune response. IgG appears later as the IgM level falls. This secondary response of IgG is due to activation of long-lived B lymphocytes on repeated exposure to the antigen. The secondary response is quicker and greater. Remember:

IgM IMmediately produced IgG Greater response

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