Nonspecific immunity

Nonspecific immune mechanisms (also **innate'**, **natural'**, **non-adaptive**) are innate. This means that all necessary information is invariably written in DNA and already present in the zygote. Nonspecific immunity responds after each encounter with an *antigen* by the same mechanisms, **has no memory'**.

It consists mainly of *complement components and phagocytes*. It is not aimed at the destruction of a specific antigen, but it is very *fast*. The cells are constantly present in the blood, so that activation is almost instantaneous (minutes to hours) when needed.

It is evolutionarily **older** (in all multicellular organisms to varying degrees) than specific immunity. It consists of *cellular and humoral components*.

This group also includes **barrier functions of the body'**, i.e. skin, mucous membranes, etc. (generally structures that prevent foreign particles from entering the body).

Aggregation of the components of natural immunity

Cellular components

- '**Phagocytes'**,
  - neutrophils (microphages) - short-lived, not APCs,
  - monocytes - their tissue form = macrophages - they live for a long time,
  - dendritic cells and other APCs,
  - eosinophils,
- '**mast cells'** (mast cells, heparinocytes),
- **basophily**,
- '**NK-cells'**,
- '**thrombocytes'**.

Humoral components

- '**Complement'** and '**acute phase proteins**,
- '**coagulation** and '**fibrinolytic system'**
- **interferons**.

Cellular component

These include mainly **granulocytes**, **macrophages** and some **lymphocytes**. Thrombocytes may also be included, but play a minor, but not unimportant, role.

Granulocytes and macrophages

The bulk of the cellular component of non-specific immunity is composed of cells arising from the **myeloid lineage**. This includes cells that exhibit high phagocytic capacity, i.e. **macrophages** and **neutrophil granulocytes**. Antigen-presenting cells, which include mainly **dendritic cells** (cooperating with T-ly) and **follicular cells** (presenting Ag to B-ly), cannot be overlooked. This group also includes **eosinophils'** and **basophils'**.

Lymphocytes

The next part is the cells of the **lymphoid line**. These include mainly cytotoxic NK cells (*natural killers*). Some immunologists also include some B-lymphocytes in this group due to their independence from T-lymphocytes and the possibility of partial change of their specificity during proliferation. These are B-cells that recognize carbohydrate antigens.

Humoral component

Acute phase proteins

This is a group of proteins whose levels rise significantly and relatively quickly after the immune system is activated. Complement components are also included here, but are separated for clarity.

🔎 *For more information see Acute Phase Proteins.*

Complement

Complement is a set of serum proteins capable of inducing **lysis** of certain cells when activated.

🔎 *For more information see Complement.*

Cytokines

Cytokines are a very diverse group of signal peptides, some of which have a hormonal function. Their production varies significantly with the degree of cell activation. **They mediate communication** between cells of specific and non-specific immunity. We divide them into several subgroups:

- interleukins,
- chemokines,
- interferons.

🔎 *For more information see Cytokines, Interleukins, Chemokines, Interferons.*

Principles of non-specific mechanisms

Identification of pathogenic patterns

Pathogens are identified by the presence of **PAMP** (Pathogen-Associated Molecular Pattern) - phylogenetically highly conserved structures. They are carried only by microorganisms and are essential for their survival. They include:

- **bacterial wall'** - peptidoglycan, lipoteichoic acid, lipopolysaccharide,
- **bacterial DNA'** - lots of cytosine and guanine, no methylation,
- '**dsRNA'** - viral.

These patterns are recognized by the **PPR** (Pathogen Pattern Receptor) = **PRR'** (Pattern Recognition Receptor). They are of the following types:

- **secernated'** - opsonins (e.g. MBL) of complement activation,
- **endocytic'** - on phagocytes, mediate phagocytosis (e.g. MMR (mannose macrophage receptor), MSR (macrophage scavenger receptor) - cleans up bacterial debris),
- **signalling'** - activate a signalling pathway leading to the production of cytokines (e.g. TLR (Toll-like receptor)).

Identification of endogenous patterns

In the context of apoptosis, **ACAMP** (Apoptotic Cell Associated Molecular Pattern) patterns are exhibited - e.g., phospholipids of the inner layer of the cell membrane. They are recognized by the **ACR** (Apoptotic Cell Receptor), rather anti-inflammatory cytokines are produced.

Antigen presentation

Antigen Presenting Cells (APCs) engulf antigens, process them in lysosomess and present them on **HLA class II** molecules. Thus processed, antigens (or antigenic epitopes) are presented together with costimulatory signals to T-lymphocytes.

Note: If any cell, not just the antigen presenting cell, is infected with an intracellular parasite, the antigen is presented on **HLA Class I**.

Links

Related articles

- Specific Immunity
- Immune system
- Macrophages
- Neutrophil granulocytes
- Compliment

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