THE ANATOMO-PHYSIOLOGICAL PECULIARITIES OF IMMUNE SYSTEM IN CHILDREN. THE LYMPHATIC GANGLIONAL SYSTEM. THE SEMIOLOGY OF IMMUNE SYSTEM AFFECTIONS IN CHILDREN. THE SEMIOLOGY OF LYMPH NODES AND PRINCIPAL TYPES OF LYMPHADENOPATHY. THE PRIMARY AND SECONDARY IMMUNODEFICIENCIES IN CHILDREN.
**Immune system**

reunites the organs, tissues and cells, which ensure the defense of human organism against the genetically strange substances (antigens) by exogenous and endogenous origin.

The function of IS consists in the Ag identifying and generation of specific response –

- synthesis of antibodies,
- accumulation of sensibilized lymphocytes, which will neutralized, destroyed and eliminated the Ag from organism.

1. Lymphoid organs:
   a) Central
   b) Peripheral

2. Humoral components
   a) Nonspecific
   b) Specific

3. Cellular components
   a) Nonspecific
   b) Specific

**Thymus**

The thymus is sitting retrosternally.

From the anatomic point of view, the thymus is formed from two lobes connected by isthmus.

Each lobe is formed from lobules delimited by conjunctive septa which proceed from the capsula covering the entire organ.

Two zones are described in the thymic lobule: cortical and medullar.

The thymic cells are lymphocytes, epithelial and non-epithelial cells.

The process of differentiation is developing under the influence of local hormones (thymosine, thymopoietine, thymuline) secreted especially by subcapsular and subtrabecular epithelium.

**Peripheral lymphoid organs**

Peripheral (secondary) lymphoid organs are represented by:

- Spleen
- Lymph nodes
- Lymphoid tissue from mucosae

**Lymph nodes**

- The forming of LN begins in the 2-nd month of intrauterine development and is finishing in the postnatal period.
- In new-born the LN capsula is very thin and fine, the trabeculae are weakly differentiated, and their palpation is difficult. LN are soft and they are included in good developed adipose tissue at this age.

- At 1 year age the LN can be palpated at the majority of children.
Parallel with their growing their differentiation has place.

In the 3 yrs age the capsula is good formed.

At 7-8 yrs the forming of trabeculae in the interior of LN begins.

At 12-13 yrs the structure of LN is definitized, being good differentiated all their structures: capsula, trabeculae, follicles, sinuses.

In the puberty period the LN growing is finishing, and sometime even partially regresses.

The maximal number of LN is achieved around 10 years age.

The mature has approximately 460 LN, having total mass by 1% from corporal mass (500 – 1000g).

Each lymph node (LN) is covered at surface with conjunctive tissue capsule, and in interior contains lymphoid tissue.

The lymphoid tissue of LN is separated in two layers: cortical and medullar.

Cortical layer is formed from follicles–conglomerates of B lymphocytes.

In paracortical layer the T-lymphocytes are placed

In medullar layer the plasmocytes, secreting immunoglobulins are placed.

The semiology of LN affection

Complaints.
In the case of LN marked enlargement, the child or the parents can remark this modification and can present the respective complaints.
In the case of lymphadenitis the child can accuse pain, tumefaction and hyperemia at the level of affected LN.

Semiology of LN affection

Inspection.
Only LN which are placed superficially and are very enlarged in volume (lymphogranulomatosis, infectious mononucleosis) can be observed.
In lymphadenitis the hyperemia of teguments covering the involved LN, which usually is tumefied and painful at palpation can be observed.

Palpation. At palpation the LN the following Characteristics are appreciated:

Dimension – usually the LN have a diameter around 0.3-0.5 cm (pea seed).
The dimension of LN is gradated as the following:
I degree – dimension of millet seed
II grad – dimension of lentil seed
III grad – dimension of pea seed
IV grad – dimension of horse bean
V grad – dimension of peanut
VI grad – dimension of pigeon egg.
Increasing of LN dimension poate can be isolated or in group, symmetrical or unilateral.

**IS. Nonspecific immunity**
The factors of nonspecific protection have a large spectrum of action, that is possess a high specificity.
The nonspecific forces of protection are sufficient for to combat the majority of pathogen agents.
Nonspecific reactions are at the basis of natural immunity and offer to organism the immunity even against the pathogen agents which the organism didn’t anteriorly met.
These factors being phylogenetically older have a decisive role in the protection of neoobs until the maturation of specific immune mechanisms.

**Cellular immunity**
The immune response is ensured by T-lymphocytes (thymodependent) and B-lymphocytes (bursodependent).
The both cellular lines have a common predecessor – stem cell, which migrates from bone marrow in thymus and in analog of Fabricius burse, when the differentiation and their maturation have place.
Then these cells populate the T și B zones of LN. Here, at the first meeting with Ag their sensibilization and ulterior differentiation in another 2 subpopulations have place:
- effector cells and
- memory cells.
Effector cells – participate directly in the „liquidation” of antigenic aggressor. In the cell immunity there are cytotoxic T-lymphocytes (T-killer). They neutralize the antigen directly or through some special biologic active substances – lymphokines.

**Humoral immunity**
The humoral immunity is ensured by B-lymphocytes.
Initially the T-lymphocytes are stimulated, And they will be transforming in T-helpers.
These through interleukins will stimulating the transforming of B-lymphocytes in plasmocytes, which will synthesize the specific antibodies.
So, the effector cells of humoral immunity are plasmocytes.
B-lymphocytes receive also information about the nature of Ag and from macrophages which captivate these antigens and remake them primarily.

**IS. Specific immunity**

In this way for good functioning of IS an harmonious collaboration between these three types of immunocompetent cells is necessary:

- T-, B-lymphocytes and macrophages.
- In the same time during antigenic stimulation the T-suppressors are forming. They block T-helperis, in this way blocking the Ab synthesis by B-lymphocytes.
- This capacity of the organism is the basis of immunotolerance.

**Semioiology of IS affections**

Three types of this system functions affection are possible:

- Defect of one link of IS (primary and secondary immunodefficiencies)
- Autoaggression against the normal structures of human organism (autoimmune diseases and diseases due to immunocomplexes)
- Dysfunctions when some functions of IS are exagerrated in the detriment of another (lymphoproliferative syndromes)

The states of immunodeficiency appear as a result of one or more links of IS function abolition.

The states of immunodeficiency are:

- primary (inborn) and
- secondary (acquired).

The states of primary immunodeficiency are determined by:

- primary affection of T-lymphocytes;
- primary affection of B-lymphocytes;
- combined affection of T- and B-lymphocytes;

the summary incidence of primary immunodeficiency states is by 2:1000,

- 50-70% being primary defects of B-lymphocytar system, and
- 5-10% of T-lymphocytar system.

**Suggestive signs for a primary immunodeficiency are:**

- The child supports frequently infectious recurrent diseases especially of respiratory pathways, digestive tube, reno-urinary system, teguments, frequently complicated with otitis, purulent sinusitis and septicemia.
- They manifest unusual reactions at banal infections (ex. pneumonia at varicella).
- The suffering is determined by unusual causal agents (ex. Pneumocystus Carinii)
- Presence of some systemic reactions after vaccination with live viral attenuated vaccines or BCG.
Bizarre hematologic deficit
(anemia, thrombocytopenia, leucopenia)
Disorder of digestion with the development of malabsorption syndrome.

Secondary immunodeficiencies
Secondary immunodeficiencies are determined by a lot of pathological states which lead to the involution of lymphoid tissue, lymphopenia, hipogammaglobulinemia. They are the following:
- pathologic states associated with loss of proteins:
  nephrotic syndrome, combustions, exsudative enteropathy
- dystrophias, avitaminoses
- Viral (flu), bacterial (holera), micotic (candidosis) infections, helminthiases
- Massive surgical interventions and/or postoperative yatrogenic complications (irradiation, imunosuppressives: GCS, CS)
- Lymphoreticular tumors(lymphogranulomatosis,etc.)

Bibliography: