

NK cells

NK cells (natural killer cells) make the third main subpopulation of the lymphocytes (15–20 % of the lymphocytes),

- stem cell (CD34) → lymphoid progenitor cell → NK cell (**CD56, CD16**),
- developmentally more related to T-lymphocytes than to B-lymphocytes,
- able to kill some tumor cells and virus-infected cells quickly,
- big granular lymphocytes,
- don't have specific antigen receptors,
- NK recognize cells that have an abnormally low number of MHC molecules of the I class,
- cancer cells and others prevent the attacks of the T cytotoxic lymphocytes by suppressing the MHC I molecules surface expression,
- rather a part of the non-antigen specific defence mechanisms, although they're similar to the lymphocytes,
- NK activities are complementary to activities of the T cytotoxic lymphocytes.



NK cell



NK cells are differentiated from the lymphoid progenitor cell.

NK cells belong to the agranulocytes because their granules are much less numerous than in granulocytes.

The function of the NK cells

Their basic function is a **defence** against viral, bacterial and parasitic infections. NK cells are not destined only to kill but also have an important **regulatory** function – they provide signals in the adaptive immunity, where they influence primarily the T lymphocytes and the dendritic cells. A function disorder of the NK cells can be associated with the increased autoimmune disposition and the occurrence of autoimmune diseases.

NK cells have a remarkable role in **pregnancy**. In the early beginning of the physiological pregnancy NK cells of the uterus (uNK) significantly proliferate due to the effect of the IL-15 and prolactin. They make the most numerous leukocyte population during the period of implantation, which is essential for the continuation of pregnancy, because NK cells produce the cytokines necessary for angiogenesis, facilitate the remodelling of spiral and uteroplacental arteries and promote trophoblast and placental growth, as well as deciduous vascularization. NK have a local immunosuppressive effect in the maternal-fetal area. If there is no predominant cytokine environment mediated by TH2 lymphocytes and the TH1 cytokine network predominates, conventional NK cells can pass from the peripheral blood to the uterus and then enforce their cytotoxic nature.

It was confirmed that a high concentration of the conventional NK cells (CD 56+16) was present in the uterus and placental biopsies of women, whose pregnancies ended in miscarriage. Also, increased cytotoxicity is expected on the implant side.

Receptors of the NK cells

Types:

- **positive** (stimulatory)
- **negative** (inhibitory)

The resulting reaction of NK cells with other cells depends on the predominance of the stimulatory or inhibitory signal.

- if the cell has a normal amount of MHC I molecules with normal peptides, negative signals will predominate and the NK cell will not activate;
- if there are few MHC I molecules on the surface, some isotype is missing or the molecules are changed, then stimulatory signals will predominate → the target cell will be cytotoxically destroyed by the NK cell.

Stimulatory receptors

Adhesion molecules (for example lectins): signals from these receptors activate the NK cells → cytotoxic mechanisms are applied. Stimulatory receptors are for example Fc receptor CD16.

NK cell meets the cell opsonized by the antibodies of IgG class → connects to Fc parts through the CD16 → receptors aggregate → cytotoxic mechanisms activate → ADCC – antibody-dependent cell-mediated cytotoxicity.

Inhibitory receptors

Recognize **MHC I**; signals from these receptors inhibit the cytotoxic mechanisms.

2 groups:

- **immunoglobulin** (KIR, killer inhibitor receptors)

KIR: their inhibitory activity is based on the association with cytoplasmic phosphatases, which cancel the signal pathways induced by the positive receptors associated with protein kinases; only in human NK cells.

- **C-type lectin receptors** (CD94/NKG2)

CD94/NKG2: in human NK cells; some also in mice.

Cytotoxic mechanisms and NK cell secretion products

- The main tools of the NK cell are cytotoxic granules containing perforin and granzymes,
- NK cells activators - interferons- α and β produced by different cells in viral infections,
- NK cells have an important regulatory function: they are a source of cytokines IFN- γ , IL-3, M-CSF and others,
- NK affect the differentiation of effector T-helper cells and hematopoiesis.

Links

Related articles

- Interferons
- Cells of the immune system
- Nonspecific immunity
- Complement system

External links

- NK cell

Bibliography

- HOŘEJŠÍ, Václav – BARTŮŇKOVÁ, Jiřina. *Základy imunologie*. 3. edition. Praha : Triton, 2008. 280 pp. ISBN 80-7254-686-4.
- PERRICONE,., et al. NK cells in autoimmunity: A two-edg'd weapon of the immune system. *Autoimmunity Reviews* [online]. 2008, y. 7, vol. 5, p. 384-390, Available from <<https://linkinghub.elsevier.com/retrieve/pii/S156899720800027X>>. ISSN 1568-9972. DOI: 10.1016/j.autrev.2008.03.002 (<http://dx.doi.org/10.1016%2Fj.autrev.2008.03.002>).