“FATE” OF NANOPARTICLES AFTER MACROPHAGES

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Introduction. Over the last decade nanoparticles (NPs) have been used in numerous fields of biomedicine. An urgent problem is the study of the mechanisms of NPs interaction with cells, the understanding of which is necessary for the development of drugs with targeted delivery to the cell level, as well as to assess the possible negative effects of NPs on the body. Cells of the immune system are the first at the border of NPs penetration into the tissues and cells.

Aim. It is essential to investigate the interaction of NPs with phagocytic cells, mechanisms of intracellular penetration and the response of immune cells to NPs penetration. **Materials and methods**. Data analysis of literature and Internet sources.

Results and discussion. A number of researchers suggest preferred macrophage response to corpuscular antigens as opposed to soluble ones. Application of NPs in medical practice requires monitoring of the absence of lipopolysaccharides on their surface. Penetration of gold NPs into dendritic cells results in an increase in the level of gamma-interferon and an activation of specific immune response by cytotoxic T-cells. Furthermore, there is evidence that gold nanorods and nanorods coated with SiO_2 penetrated into macrophages cause a release of inflammatory mediators (cytokines, prostaglandins) and activate immune response genes. Internalization of gold NPs conjugated with antigen into dendritic cells conditions an increase in immune response as compared with the native antigen, which is manifested in enhanced lymphocyte proliferation and extended expression of immunostimulatory CD86 molecules. Macrophages, endothelial and immature dendritic cells were found to possess the highest capacity for the absorption of gold NPs. One of the effects of gold NPs penetration into the immune system cells is the production of pro-inflammatory cytokines and inhibition of macrophage proliferation, which is indicative of their direct immunostimulatory effects. Activation of immune cells by gold NPs can serve as a basis for the development of new vaccine adjuvants. Aerosol application of metal and carbon NPs on primary cultures of alveolar macrophages was found to influence macrophage function: the production of active oxygen species, the activity of enzymes involved in the “oxidative burst”, the ability of monocytes to differentiate into mature macrophages and the level of synthesis of proinflammatory cytokines.

Conclusions. Thus, further development of nanotechnologies requires a clear understanding of both the properties of nanomaterials and the mechanisms of their interaction with biological objects.