Introduction

A basic feature of M-cells is the mucus sampling function, which is realized by micro pinocytosis and macropinocytosis. Both mechanisms are receptor mediated and energy dependent.

Concept of Panautoprotection

In 1988 Karchev formulated the concept of panautoprotection. Tonsillar and adenoid M-cells are considered to be specialized receptors of the immune system, cooperating with the autonomous nervous system, while antigens are discussed as mediators of bio integration.

Role of M-cells

M-cells are constantly intaking different foreign antigens (macromolecules, viruses and bacteria) from the tonsillar surface. They are actively transported through the cytoplasm of the M-cells in numerous vesicles as a result of the micropinocytosis and in tubules if the antigens are actively transported through the cytoplasm of the M-cells in the intraepithelial / intercellular passages. The latter are a legitimate element of the inner environment of the organism. The basolateral surface membrane of the M-cell is specifically invaginated and forms intraepithelial passages, marked with P on Fig. 1. They allow the immuno-competent cells such as lymphocytes, macrophages etc. to quickly get acquainted with the foreign antigens released by the M-cells. This way their processing starts in the intraepithelial passages. A very special feature of these antigens is that their processing ends with the production of a considerable number of B-lymphocytes in the tonsillar lymphoid follicles that are capable of fast transformation into plasmatic cells upon a second encounter with the antigen and start the secretion of IgA antibodies. Since the latter can be actively transported through the epithelium into the covering mucus, the protection against these antigens takes place at the level of the mucus. This is the most physiologic protection, which is not accompanied by pathological alterations and symptoms

Para-M-cellular foreign antigen penetration

However, all antigens penetrating the internal medium of the organism para-M-cellularly are processed in the lymph nodes, but the resulting B-cells upon the second encounter with the antigen transform into plasmatic cells secreting mostly IgA. In other words, the protection against those antigens will be most efficient when they reach blood circulation, but it is the case when pathological symptoms may occur.

M-cells – IgA B-cells

We assume that when the foreign antigen passes through the cytoplasm of the M-cells, it gets attached to a mucus, synthesized within the M-cell, that later switches on the production of IgA – antibodies by the B-cells, produced in the MALT - follicles.

M-cells and vaccination

What we discussed by now is of great importance for vaccination. We can postulate that vaccination would be most effective if the artificially introduced antigens had passed through the M-cell system. The end of injected vaccinations is approaching.

Antigen transport through the M-cells

The mechanisms for endo- and trans- cytosis of foreign antigens by M-cells are largely unknown. However, it is proven that the movement of the vehicles and the tubes containing foreign antigens through the cytoplasm is mediated by actin molecules.

M-cells and oral tolerance

M-cells in tonsillar epithelium are the beginning of the adaptive immune processes and mechanisms, representing what is called immunogenesis in the infant organism; these cells are closely involved in the mechanism of oral tolerance. Oral tolerance is the active non-response to antigens given to the host via the oral route. The oral tolerance is a way to treat autoimmune or chronic inflammatory diseases in human subjects. Generally, the mucosal immune system is characterized by a fine balance between responses to foreign antigens and immune suppression.

M-cells and tonsillectomy

We can assume that in a genetically susceptible host the tonsillar flora triggers and drives an aberrant immune response resulting in chronic inflammation of the tonsils. Furthermore, confused and burdened by the maladaptive response towards the constantly changing environmental conditions, the normal M-cellar mechanisms for antigen recognition and antigen delivery react pathologically by auto aggression, allergy or reduced resistance. These are the cases, along with those of pathological tonsillar hyperthrophy, when tonsilectomy is indicated. Clearly in the near future tests will be developed to objectively pathological M-cell function, necessitating tonsilectomy.

M-cells’ IgA – receptor

In addition, it has been established that M-cells possess a unique type of IgA membrane associated receptor (W. Paul, 2003). This supports the hypothesis we suggested some 10 years ago about the importance of the couple: M-cell – IgA in panautoprotection, similarly to the couple: mucous – cilia in mucus clearance.

Conclusion

• Finally, M-cells on the surface of MALT represent permanently open bridges between the Homoeothermic body and environment. Entering constantly by these bridges, the foreign antigens play their major role as mediators of biointegration.

• Something more, the environmental antigens and their respective receptors – the M-cells, modulate the content of the organisms as a mirror image in harmony with the surrounding milieu.

References

1. Hadjiyankov CV Theory of Immunological Circuits Microenvironmental Recognition and the Universal Intercellular Communication Crose-talk (in print), St John’s NF 450 pp, 2006