Mucosal immune system (MALT)

MALT (Mucous Associated Lymphoid Tissue)

- GALT (Gut Associated Lymphod tissue)
- BALT (Bronchi Associated Lymphoid Tissue)
- Immune tissues of the urinary tract, genital tract, conjunctiva, middle ear…
- Includes also brest gland!

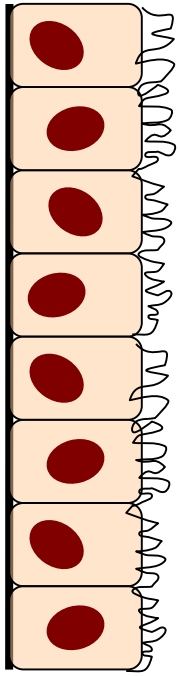
Anatomy of MALT

- Diffuse tissue containing lymphocytes and other cells of the immune system in submucosa.
- Specialized organs:
  - Waldeyer´s ring
  - Payer´s patches
  - Appnedix

Epitelial cells are intergal part of the immune system of mucous membranes

EXPRESION

- **enzymes**
- **HLA antigens**
- **adhesion molecules**
- **receptorsyfor:**
  - **mikrobes**
  - **cytokines**
  - **polymeric Ig**



PRODUCTION

- **cytokines**
  - **pro-inflammatory**
  - **growth factors**
  - **chemotactic**
- **antibiotic peptides**
- **various other mediators**

INTERACTION WITH SPECIFIC IMMUNE SYSTEM

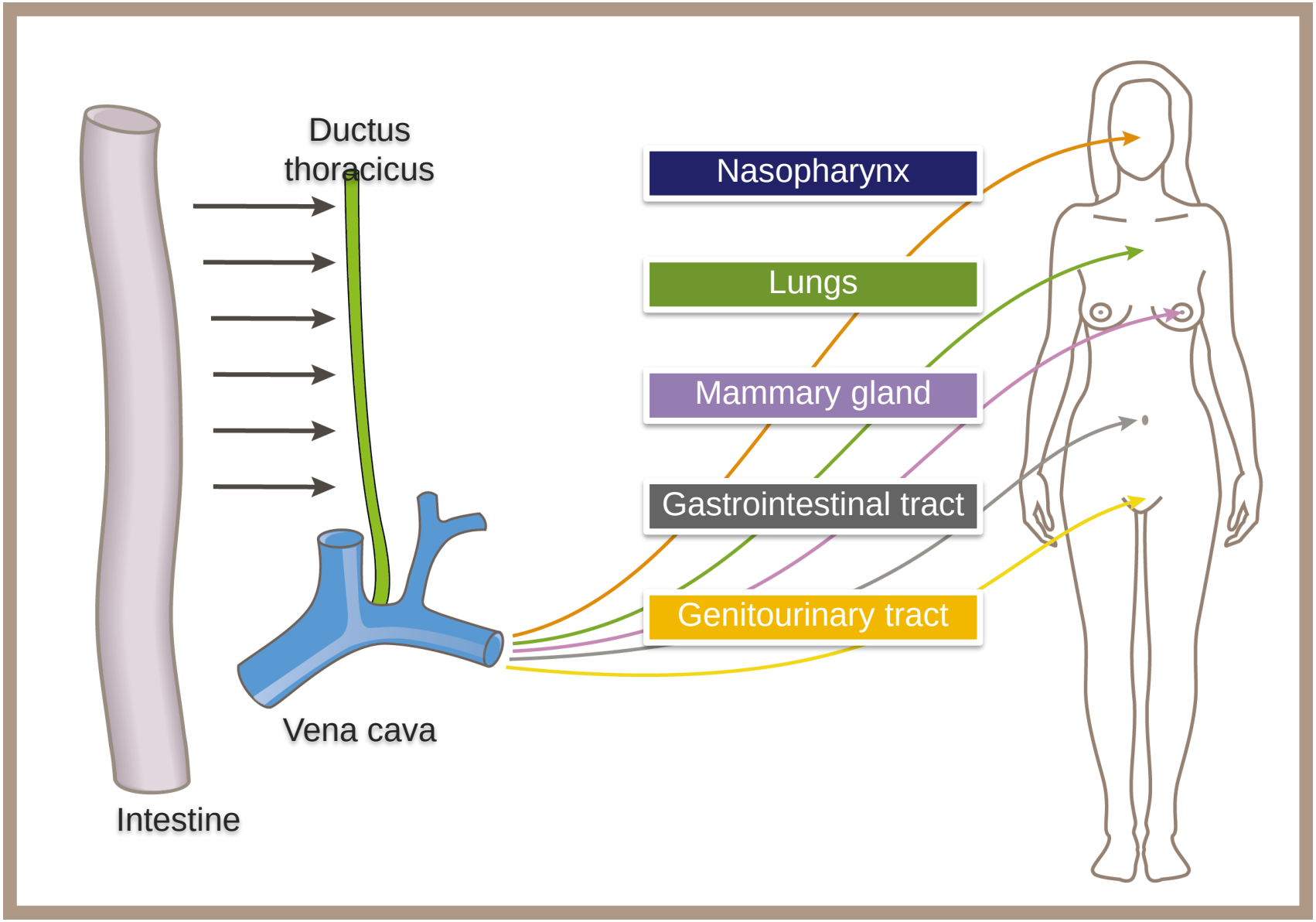
Antimicrobial nechanisms on mucous membranes

Factor	Mechanismus
Comensal bacteria	competition with pathogens production of antiinflammatory mediators
Tight epitelial junctions	protect from bacterial invasion into tissues
Cilia	bind and remove microbes
Mucin	bind microbes
Lysozyme	killing G+ bacteria
Laktoferin	iron binding (inhibition o microbial growth)
Antibiotic peptides (mainly β defensins)	killing microbes
Secretory Ig	Microbial adhesion blocade

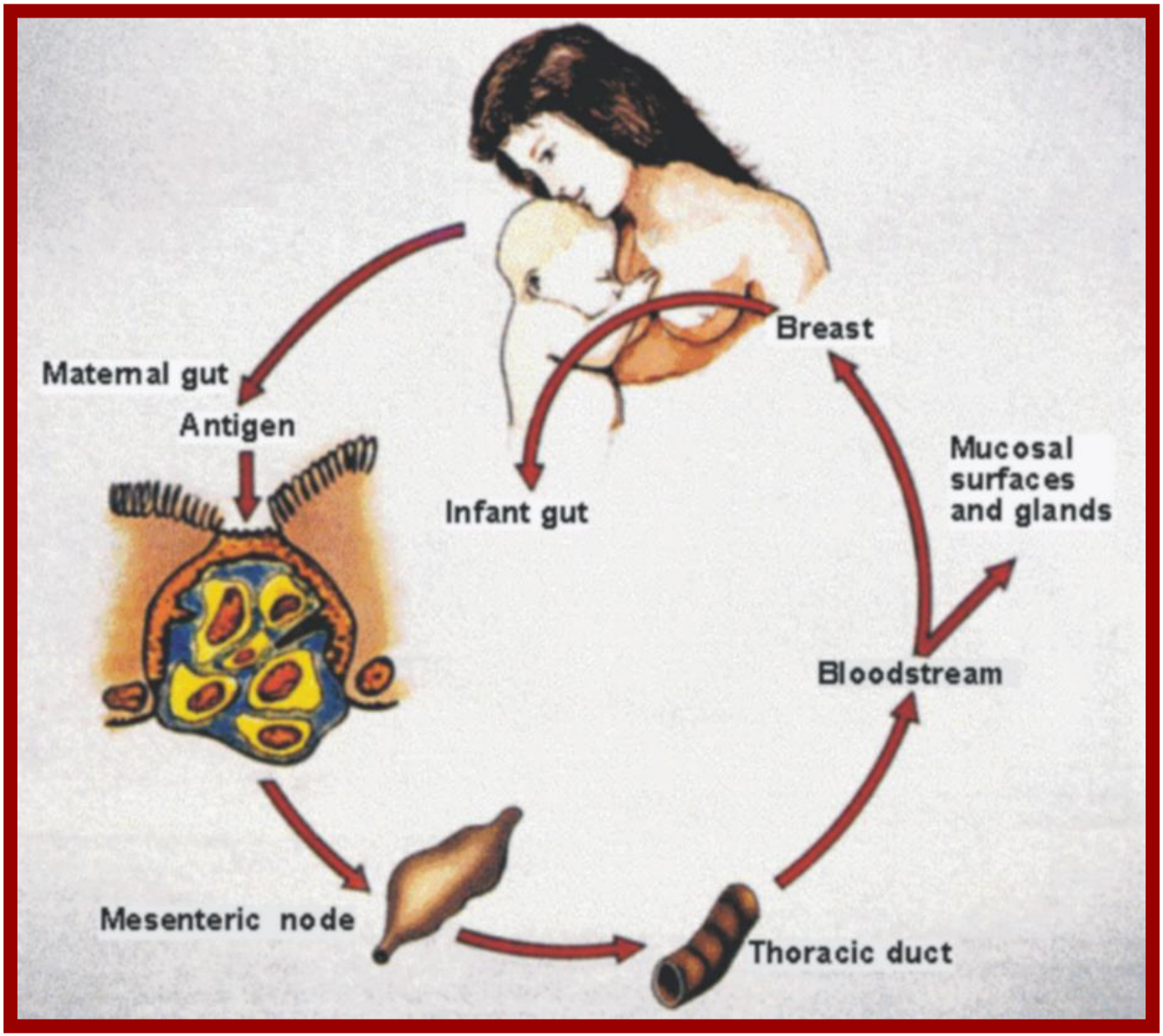
Mucosal immune system (MALT)

- Antigenic stimulation in one part of MALT leads to immune response also in other compartments of MALT.
- IgA is a predominant immunoglobulin secreted by the epitelial cells.
- Oral administration of antigens frequently leads to induction of immune tolerance.
- Intraepitelial lymphocytes - CD8+, restricted antigenic specificity.

Mucous- asccociated lymphoid tissue



Common immune system of mucous membranes



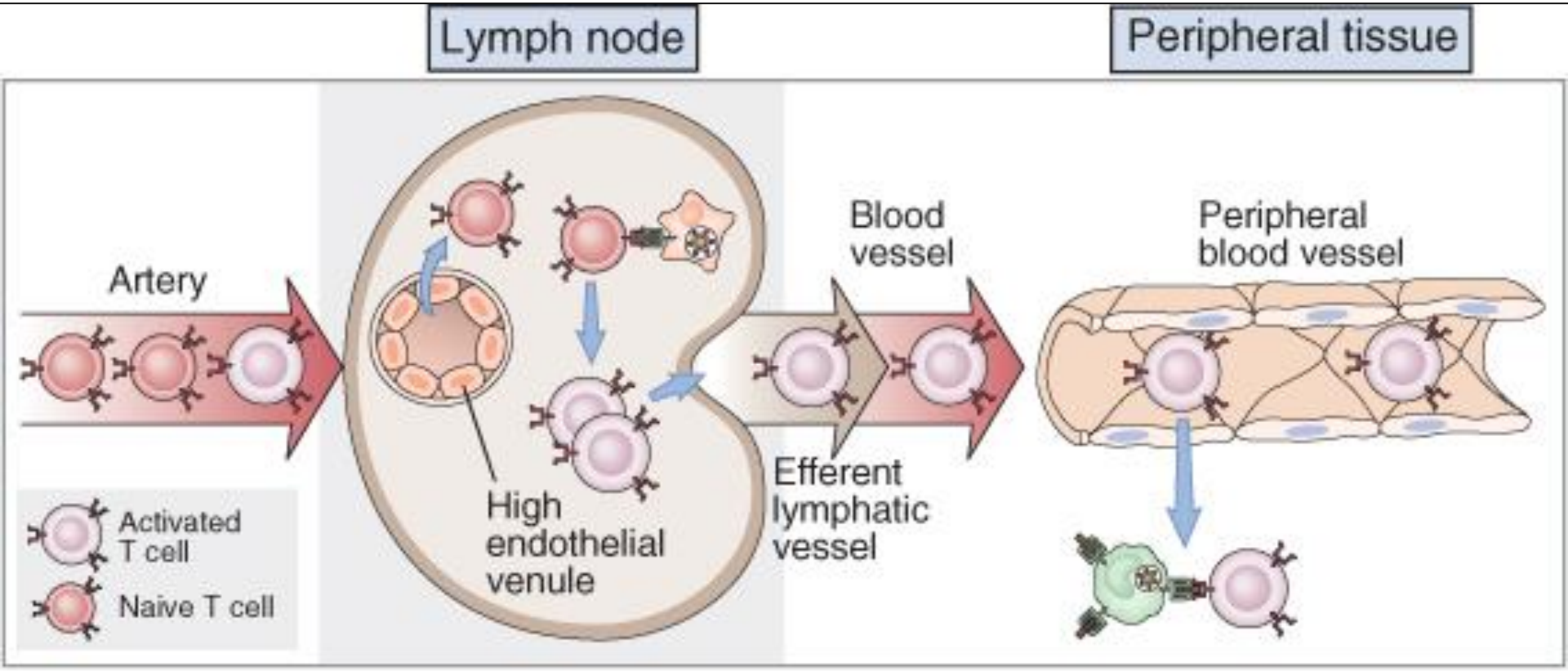
Homing of Lymphocytes

- The directed migration of subsets of circulating lymphocytes into particular tissue sites.
- Regulated by selective expression of adhesion molecules called **homing receptors** on lymphocytes.
- Tissue speciphic endothelial ligands are called **addressins.**

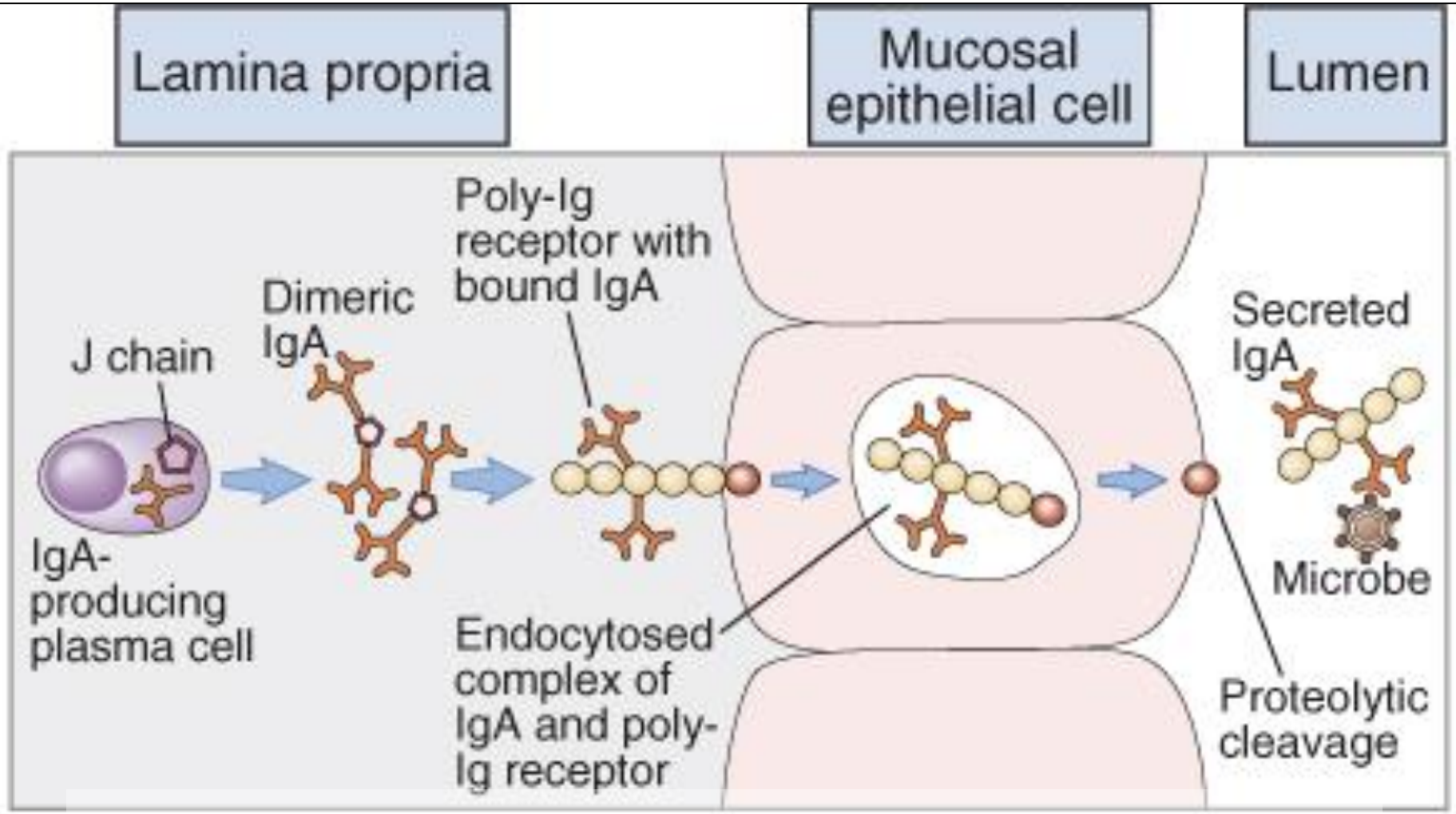
High Endotelial Venules

- Specialized venules. The site where lymphpocytes leave the blood stream and migrate into lymph nodes, spleen, organs of MALT.
- Adhesion molecules enable selective attachment of various types of lymphocytes.

Circulation of lymphocytes



Secretory IgA formation



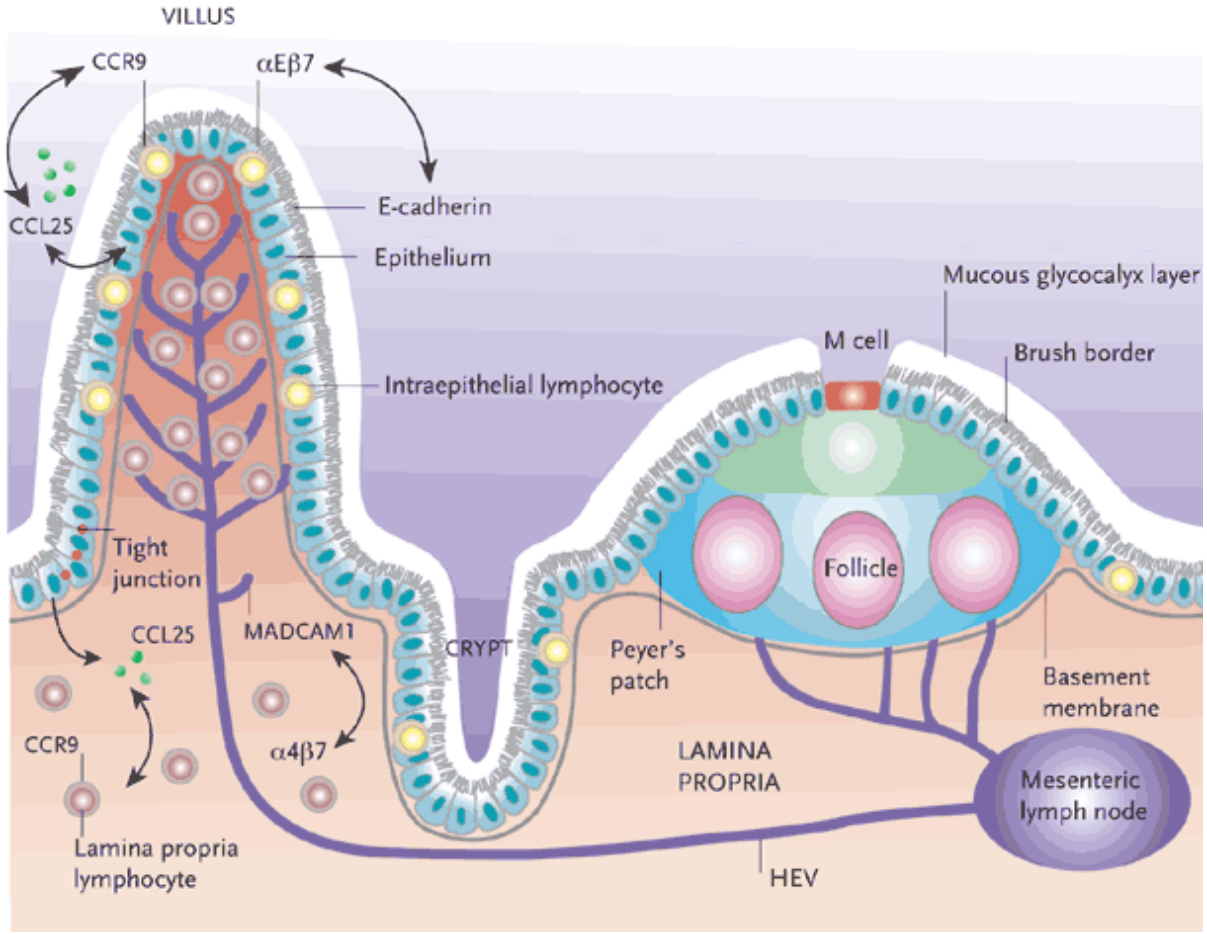
Intraepitelial T-lymphocytes

- TCR $\alpha\beta$ or $\gamma\delta$
- Extrathymic differentiation
- First line of specific immune response
- Predominantly CD8+
- Low antigenic specificity of TCR

M-cells

- Specialized enterocytes responsible for transport of antigens from the gut towards the immunocompetent cells inside the Payer´s patches.
- Transport in mediated by transcytosis.

Lymphocyte circulation in GALT



www.prn.org/.../hiv_1_gastrointestinal_galt_267

Oral tolerance

- Stimulation of the GALT frequently leads to induction of immune tolerance to the stimulating antigen.
- This occurs mainly if the gut is in „normal, non-inflammatory“ conditions.
- Induction of Th3 cell is the main mechanism.
- The tolerance is important to avoid unnecessary reactions to non-pathogenic antigens.

Comensal (normal) mikroflóra (of GIT)

- **~ 10^{14} microbial cells, ~ 1000 microbial species**
- **~ 50% non cultivated**
- **Complex ecosystem**
- **Included in innate immunity of GIT**
- **Mutual interactions of microorganisms: competition, symbiosis..**
- **Interaction with macroorganism: symbiosis, commensalism, important in metabolic processes (production of vitamins etc.)**
- **Immune system modulation**