



- Some points about the development of different types of lymphocytes:

• **T-lymphocytes:**

- ✓ They are produced in the bone marrow from lymphocyte precursors.
- ✓ Then, they will move to the thymus where they will mature and differentiate into:

- ❖ *Helper T-cells (CD4+)*: which enhance the differentiation of B-lymphocytes into plasma cells and the production of immunoglobulins.
- ❖ *Cytotoxic T-cells (CD8+)*: which are concerned with immunity against malignancy and viral infections.
- ❖ *Regulatory T-cells.*

Notice that Helper and cytotoxic T-cells will provide what is known as cellular immunity.

• **B-lymphocytes:**

- ✓ They are produced in the bone marrow and will get matured there.
- ✓ They differentiate into plasma cells which produce different types of immunoglobulins (IgG, IgA, IgM, IgD and IgE).
- ✓ Plasma cells provide what is known as humoral immunity.

- Defense mechanisms in digestive tract:

- Your gut is exposed to many foreign antigens encountered via digestion.
- The gut contains both types of lymphocytes (B and T lymphocytes). In addition, it contains myeloid cells (macrophages, neutrophils, eosinophils and mast cells). All of these together are known as Gut-Associated Lymphoid Tissue (GALT).

- Protection of intestinal mucosa:

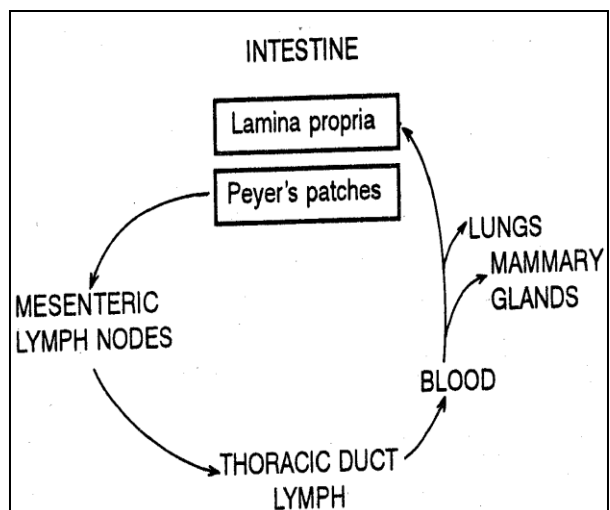
Non-immune protection	GALT (immune protection)
<ul style="list-style-type: none"> • Gastric acid. • Microflora (normal bacteria living in the gut). • Proteolytic enzymes. • Physical barrier. 	<ul style="list-style-type: none"> • Secretory antibody. • Cell-mediated immunity by T-cells and macrophages.

- The mucosal immune system is composed of:

- **Afferent limb:** which is represented by aggregated lymphoid tissue that gathers information about antigens. Examples are: GALT (tonsils, Peyer's patches and appendix) and BALT (bronchial patches).
- **Efferent limb:** which is represented by diffuse lymphoid tissue that provides a response specific for certain antigens.

- Process of lymphocyte proliferation in Peyer's patch:

- Peyer's patch contains an immature germinal center, T-cells and B-cells (which express IgM, IgG, IgA and IgE).
- Cells known as M-cells will transport antigens that are present in the gut lumen to Peyer's patch and this is going to induce lymphocyte differentiation into mature effector cells. The image show circulation of gut lymphocytes.
- Regulatory T-cells promote B-lymphocytes to switch their immunoglobulin isotype from IgM to IgA.





- IgA plasma cells will produce monomeric IgA and a J-chain which will lead to the formation of dimeric IgA when joined with another monomeric IgA.
- Intestinal epithelial cells will produce a glycopeptides known as the secretory piece which will function as a cellular receptor for the dimeric IgA. Therefore, secretory IgA will be produced.
- Secretory IgA neutralizes viruses, bacteria and toxins. IgA is the major mucosal immunoglobulin which prevents the adherence of pathogenic microorganisms to gut epithelium, sometimes referred to as “mucosal antiseptic paint”.

- **Clinical significance:**

- **Immune response by gut antigens:**

- ✓ **Tolerance:** is a systemic hyporesponsiveness to orally ingested antigens.
- ✓ **Systemic immunization** (see the image): large molecules will activate immediate hypersensitivity reaction mediated by IgE (type-I hypersensitivity) or delayed hypersensitivity reaction mediated by cellular reactivity (type-II hypersensitivity).

