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DEPARTMENT OF BIOTECHNOLOGY
FACULTY OFENGINEERING & TECHNOLOGY

LT.4. Lymphocyte Trafficking

Content Outline

1. Lymphocyte Trafficking
2. Mechanism of trafficking
3. Test your understanding
4. References & Further reading

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LT 4. Lymphocyte Trafficking

•**Lymphocytes** are migratory cells, **trafficking** from their sites of origin in the bone marrow and thymus and homing to and recirculating through specialized lymphoid and extra lymphoid tissues in the periphery. Like all leukocytes, **lymphocytes** develop with characteristic **trafficking** properties.

•Lymphocytes are the cornerstone of the adaptive immune response and the basis of immunological memory. In order to protect the body, lymphocytes must be able to access the many sites where pathogens may appear. Toward this end they continually travel through the body by way of the circulatory and lymphatic systems.

•The circulatory system provides rapid access to bodily tissues, but is more than a mere highway along which lymphocytes travel. The lymphatic system, which ultimately channels lymph back into the circulation via the thoracic duct, provides a route for lymphocytes that have exited the bloodstream to return and circulate anew.

•The homeostasis of the immune system is maintained by the recirculation of naive lymphocytes through the secondary lymphoid tissues, such as the lymph nodes, Peyer's patches and spleen. Upon antigen encounter in the secondary lymphoid tissues, lymphocytes become activated and undergo a reprogramming of their trafficking properties.

•Lymphocyte migration through various tissues is not random. It has been demonstrated unequivocally in sheep that there are differences in the migratory properties of lymphocytes that have been collected from separate anatomical sites and returned intravenously to the donor. Lymphocytes obtained from intestinal lymph recirculate preferentially through the gut, whereas those obtained from efferent lymph of a peripheral lymph node tended to avoid the gut and recirculate through peripheral lymph nodes. Similar observations have been reported in rodents, and it is now clear that lymphocyte trafficking occurs in a non-random manner, which is subjected to tightly controlled mechanisms.

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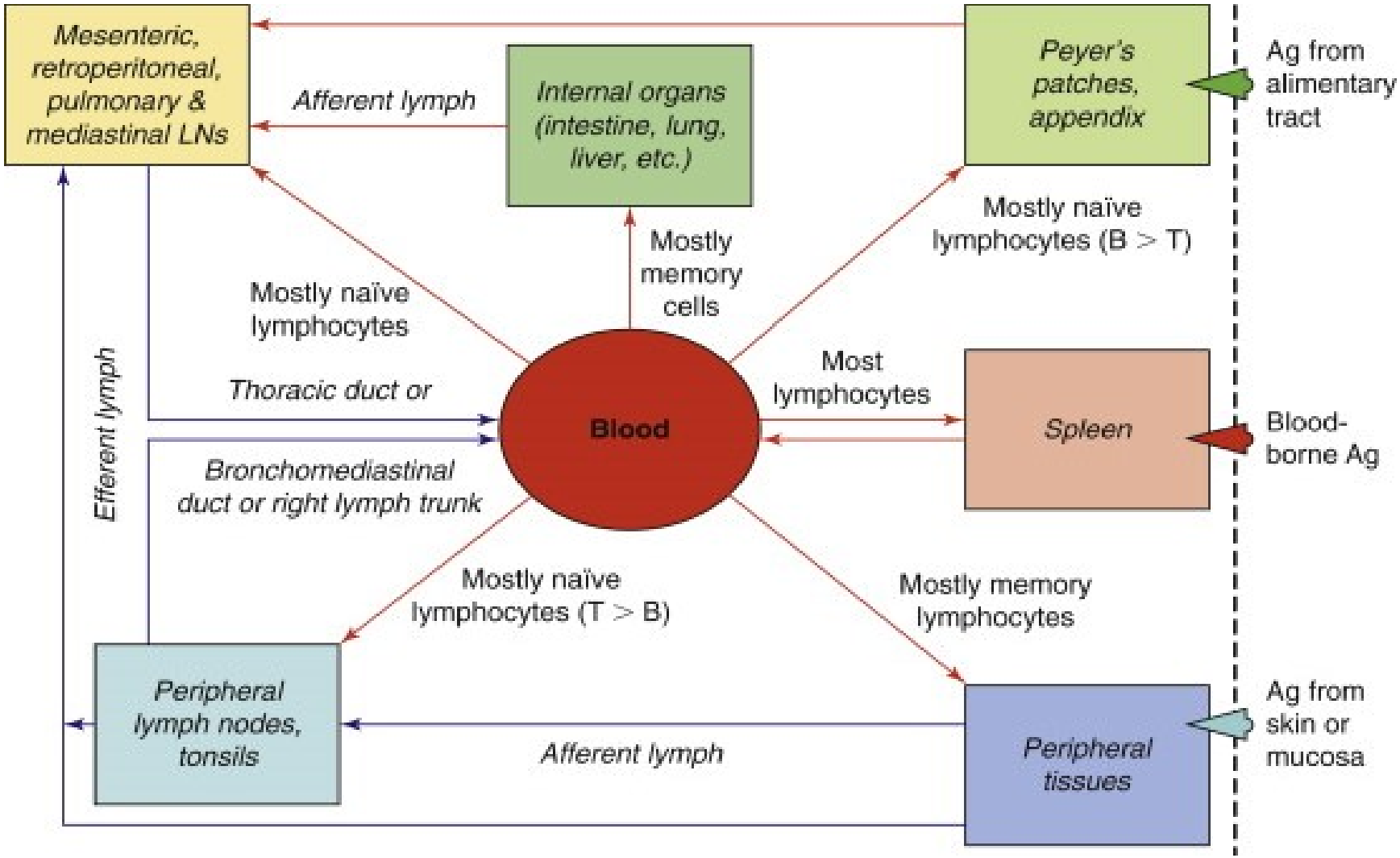
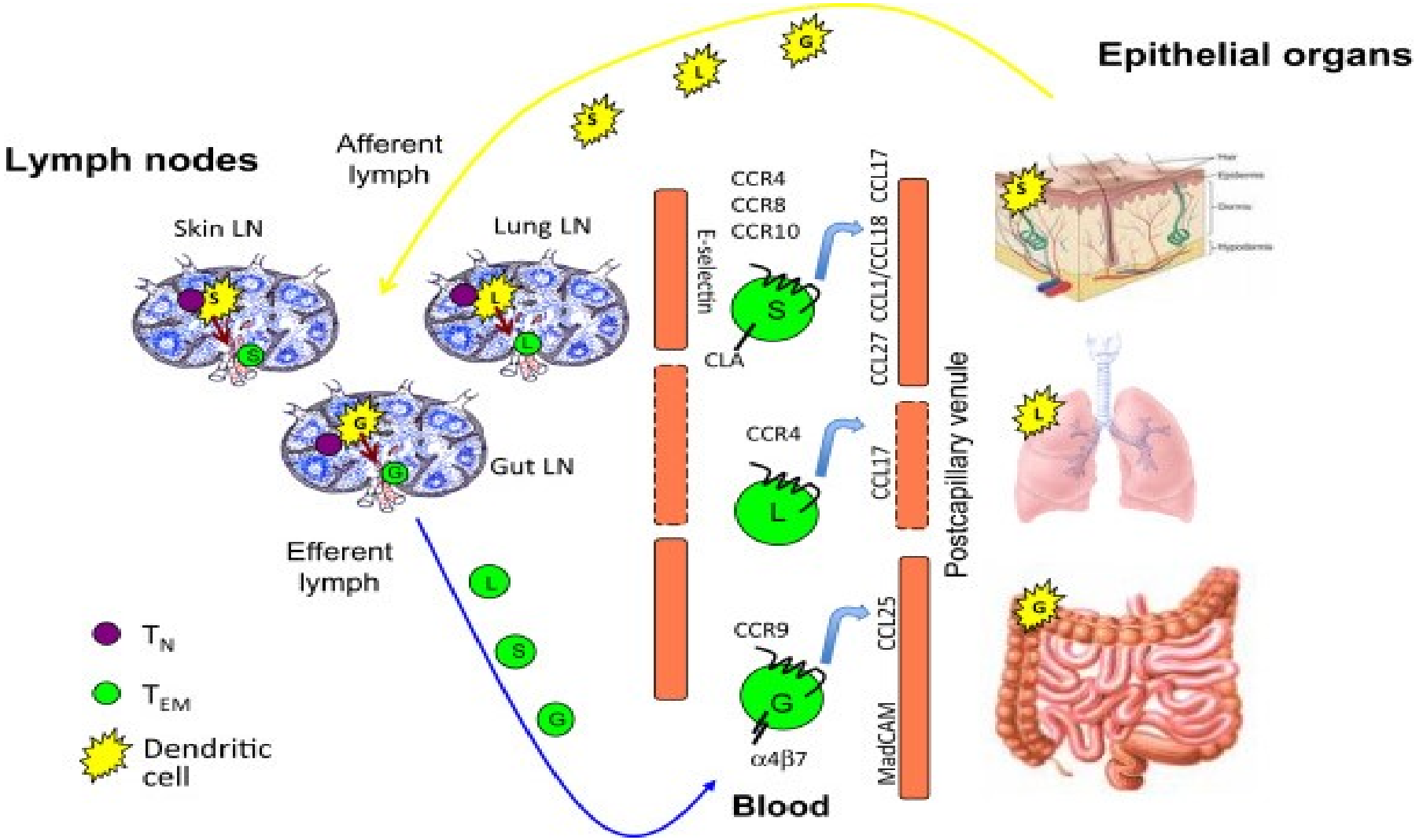
Mechanism: Lymphocyte Trafficking

In lymph nodes and Peyer's patches, the port of entry for naive T and B lymphocytes is the high endothelial venules (HEV), a specialized type of postcapillary venules. The endothelial cells of HEV are characterized by their distinct cuboidal morphology, discontinuous junctions between adjacent cells, and also by their luminal presentation of various adhesion molecules. Some of these molecules are at least in part responsible for the tissue-specific trafficking of lymphocytes by giving lymphocytes positional cues, and hence are called vascular addressins. The peripheral lymph node addressins include GlyCAM-1, CD34, podocalyxin, Sgp200, whereas mucosal or mesenteric addressin is thought to be MAdCAM-1. The complementary lymphocyte homing receptors for these vascular addressins are L-selectin for peripheral lymph node addressins, and a4b7 integrin for MAdCAM-1. In both peripheral and mesenteric recirculation compartments, however, gene disruption studies implicate that molecules other than those hitherto described are also involved, and multiple research groups are focusing their effort on the identification of these novel molecules. While L-selectin and their counter-receptors are primarily involved in lymphocyte rolling along the endothelial surface, LFA-1 and its counter-receptor ICAM1s are thought to be involved in firm adhesion of lymphocytes. During the course of rolling, lymphocytes are rapidly and transiently activated by chemokines secreted by HEV, which leads to rapid activation of LFA-1-mediated lymphocyte adhesiveness to HEV. How the subsequent transmigration of lymphocytes is controlled remain poorly characterized.



Trafficking Process



Lymphocyte trafficking to mucosal tissue

References & Further reading

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Further reading

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