Chemokine-guided Immune Cell Migration in Lymph Nodes

The principal function of secondary lymphoid organs, such as the lymph nodes, is to bring antigen-presenting cells and antigen-specific B and T cells into close physical contact with each other. This complex cellular interaction is critical for mounting an effective immune response. Cells, clonally related, differentiate to match their specialized organs and mediate precise moves to different regions within them, guided only by a complicated set of highly redundant, homed chemokines.

- Chemokines, along with adhesion molecules, significantly contribute to the massive extravasation of lymphocytes into lymph nodes via high endothelial venules.
- Once lymphocytes have exited the vascular compartment, they differentially migrate to B and T cell areas in the cortex and paracortex, respectively, under the influence of chemokines involved in lymph node structure, and follicular and interdigitating dendritic cells (DCs).
- Guided by chemokines, immature DCs in the peri-follicular sanctuary antigens, begin their maturation program, and migrate via the lymphatics to the node. DCs that matured en route present antigen to T cells and present to naive T cells. It may also be taken up and presented by naïve B cells. The now activated T cells interact with antigen-presented cells and direct the generation of memory and plasma B cells.
- Antibody-antigen complexes bind Fc receptors on the surface of follicular DCs. Antigen on the surface of DCs stimulates nearby naïve B cells. Activated B and T cells migrate towards the marginal zone and enter to encourage self-differentiation into memory and plasma B cells.

The Human Chemokine System

The picture on the right represents various chemokine interactions and pathways involved in immune cell migration. It highlights the role of chemokine receptors in guiding immune cells to specific locations within lymph nodes.