

NAME _____ LAB TIME/DATE _____

REVIEW SHEET
exercise

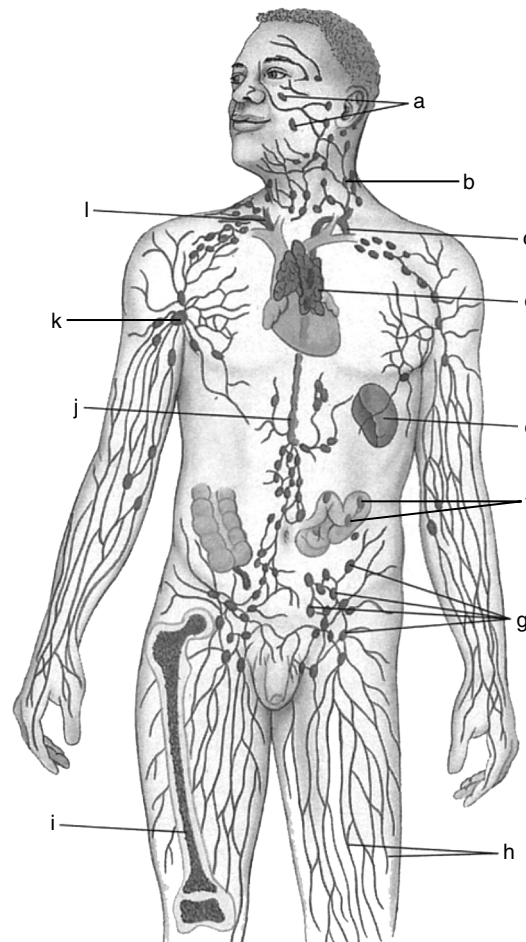
The Lymphatic System and Immune Response

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The Lymphatic System

1. Match the terms below with the correct letters on the diagram.

- k _____ 1. axillary lymph nodes
- i _____ 2. bone marrow
- b _____ 3. cervical lymph nodes
- j _____ 4. cisterna chyli
- g _____ 5. inguinal lymph nodes
- h _____ 6. lymphatic vessels
- f _____ 7. Peyer's patches (in intestine)
- l _____ 8. right lymphatic duct
- e _____ 9. spleen
- c _____ 10. thoracic duct
- d _____ 11. thymus gland
- a _____ 12. tonsils



2. Explain why the lymphatic system is a one-way system, whereas the blood vascular system is a two-way system.

Blood vessels form a complete circuit from and to the heart. The lymphatic system lacks arteries and begins with blind-ended lymph capillaries. Thus, it is a "return" system only.

3. How do lymphatic vessels resemble veins? They are thin walled and have valves.

How do lymphatic capillaries differ from blood capillaries? *Lymph capillaries are more permeable and are blind ended; they have no "feeder" arterioles.*

4. What is the function of the lymphatic vessels? *To pick up and return excess tissue fluid (and leaked proteins) to the blood vascular system.*

5. What is lymph? *Leaked plasma (but contains fewer proteins).*

6. What factors are involved in the flow of lymphatic fluid? *"Milking" action of skeletal muscles; pressure changes in the thorax.*

7. What name is given to the terminal duct draining most of the body? *Thoracic duct.*

8. What is the cisterna chyli? *Enlarged terminus of the thoracic duct, which receives lymph from the digestive viscera.*

How does the composition of lymph in the cisterna chyli differ from that in the general lymphatic stream?
Same, except that the lymph in the cisterna chyli is very fat-rich.

9. Which portion of the body is drained by the right lymphatic duct? *Right half of upper torso and head; right arm.*

10. Note three areas where lymph nodes are densely clustered: *axillary region*,
cervical region, and *groin*

11. What are the two major functions of the lymph nodes? *To remove debris from the lymph and to provide a site for cloning and multiplication of lymphocytes.*

12. The radical mastectomy is an operation in which a cancerous breast, surrounding tissues, and the underlying muscles of the anterior thoracic wall, plus the axillary lymph nodes, are removed. After such an operation, the arm usually swells, or becomes edematous, and is very uncomfortable—sometimes for months. Why?

The lymphatic fluid is not being drained from the area.

The Immune Response

13. What is the function of B cells in the immune response? *Upon antigen challenge, they clone to produce daughter cells, most of which are plasma cells that release antibodies to the blood. (Humoral response.)*

14. What is the role of T cells? *Mount cell-mediated immunity. Attack virus-infected cells, tumor cells, bacteria, etc. Also activate B cells and enhance the migration of other WBCs into the area to help destroy antigens.*

15. Define the following terms related to the operation of the immune system.

immunological memory: Response that recognizes and mounts an attack on antigens previously encountered

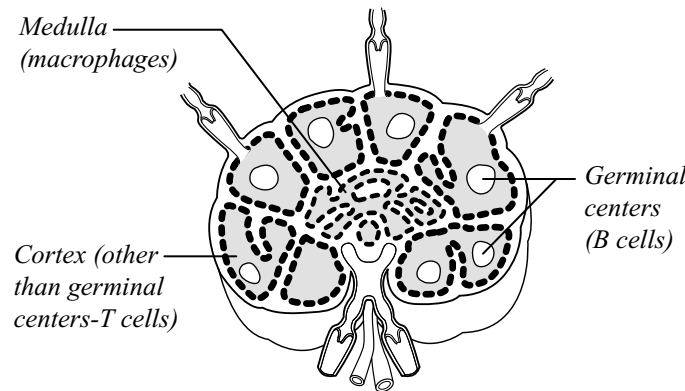
specificity: Ability to distinguish between closely related antigens.

recognition of self from nonself: Ability to recognize proteins on own tissue cells as "self" and not attack them.

autoimmune disease: An inability of the immune system to recognize self, resulting in attack of self cells by the immune system.

Studying the Microscopic Anatomy of a Lymph Node, the Spleen and a Tonsil

16. In the space below, make a rough drawing of the structure of a lymph node. Identify the cortex area, germinal centers, and medulla. For each identified area, note the cell type (T cell, B cell, or macrophage) most likely to be found there.



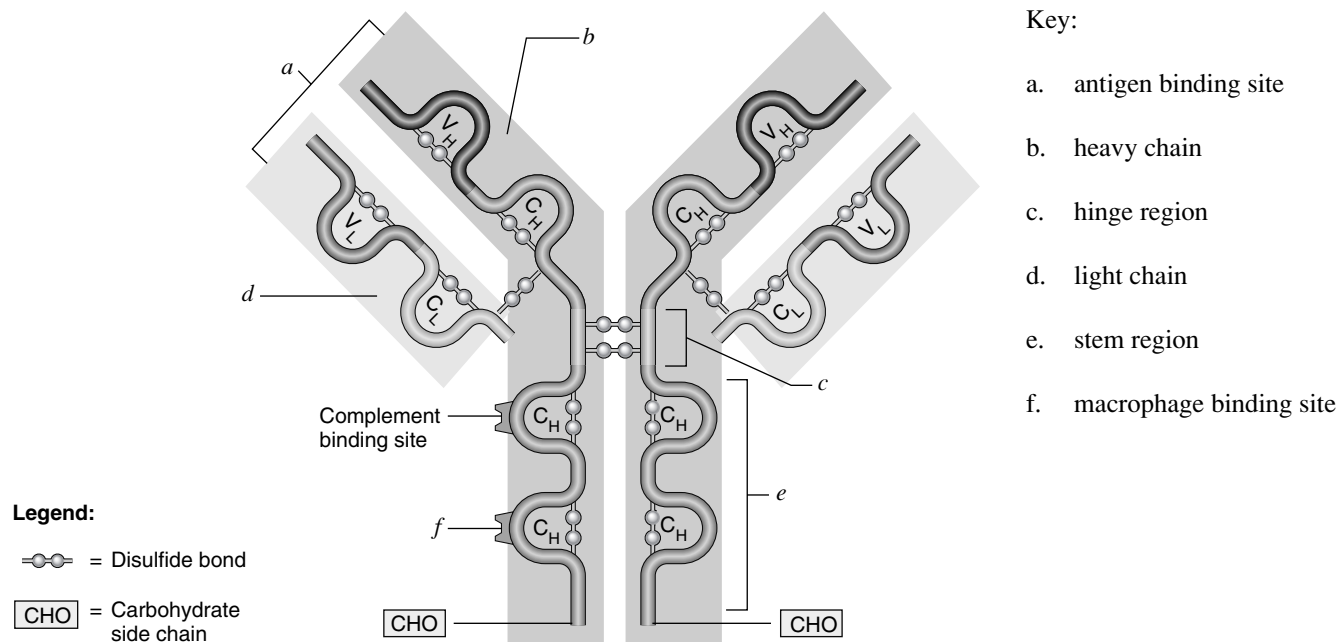
17. What structural characteristic ensures a *slow* flow of lymph through a lymph node? There are more afferent than efferent vessels.

Why is this desirable? Allows time for the macrophages in the node to remove antigens and other debris, and for activation of immune cells.

18. What similarities in structure and function are found in the lymph nodes, spleen, and tonsils? All are lymphoid tissue containing macrophages and lymphocytes. They are all areas where exposure to antigen causes lymphocytes to proliferate and form clones.

Antibodies and Tests for Their Presence

19. Distinguish between antigen and antibody. An antigen is a molecule capable of provoking an immune response. An antibody is a protein produced by plasma cells that interacts with a particular antigen to form a complex.
20. Describe the structure of the immunoglobulin monomer, and label the diagram with the choices given in the key. Four polypeptide chains, two "heavy" and two "light," held together by disulfide bonds to form a Y-shaped molecule. Each chain has constant (c) and variable (v) regions.



21. Are the genes coding for one antibody entirely different from those coding for a different antibody? No
- Explain. Only a few genes exist for coding antibody-constant regions; therefore many antibodies have identical c regions. The variable (antigen-binding) regions differ for each antibody responding to a different antigen.
22. In the Ouchterlony test, what happened when the antibody to horse serum albumin mixed with horse serum albumin?
A white precipitate formed (between wells 1 and 2).
23. If the unknown antigen contained bovine and swine serum albumin, what would you expect to happen in the Ouchterlony test and why? Antigen-antibody complexes would form a white precipitate between bovine serum albumin and the antibody to bovine serum albumin (between wells 1 and 3), and between swine serum albumin and antibody to swine serum albumin (between wells 1 and 4).