The Lymphatic System and Lymphoid Organs and Tissues

2 Lymphatic System
• Consists of three parts
  1. A network of ________ ________(lymphatics)
  2. ________
  3. lymphatic ________ and ________

3 Lymphatic System: Functions
• Returns ________ ________ and leaked ________ ________ back to the ________
• Once interstitial fluid enters ________, it is called________
• Together with ________ ________ and ________, provide the structural basis of the ________ system

4. Figure # 20.1

5 Lymphatic________
• ________ system, lymph flows toward the ________
• Lymph vessels ________ include:
  • Lymphatic________
  • Lymphatic_______ ________
  • Lymphatic_______
  • Lymphatic_______

6 Lymphatic Capillaries
• Similar to________________, except
  • Very ________ (take up cell debris, pathogens, and cancer cells)
  • ________ cells ________ to form ________ ________, and are ________ by ________ filaments, preventing ________ of capillaries
7 Lymphatic Capillaries
• Absent from________, ________, bone ________, and the ________
• ________: specialized lymph capillaries present in ________, ________
• Absorb digested_______ and deliver fatty lymph (_______) to the ________
• Digestion – chapter 23

8 Figure # 20.1b

9 Lymphatic __________ Vessels
• Similar to ________, except
• Have ________ walls, with ________ ________ valves
• ________ more frequently
• Collecting vessels in the ________ travel with ________ ________
• ________ ________ travel with ________
• ________ are supplied from branching ________ ________

10 Lymphatic Trunks (9)
• Formed by the ________ of the largest ________ ducts
  • Paired ________
  • Paired __________
  • Paired ________
  • Paired ________ trunks
  • A single i________ trunk

11 Lymphatic Ducts
• ________ is ________ into one of ________ large ________
  • Right l________ ________ drains the right upper ________ and the right side of the ________ and ________
  • ________ duct arises from the ________ ________ and drains the ________ of the ________
  • Each empties lymph into ________ circulation at the junction of the ________ ________ and ________ veins on its own side of the body (left and right)

12. Figure # 20.2a pg: 755
13. Figure # 20.2b pg: 755

14 Lymph Transport
*Lymph is propelled by:*
1. Active ________ ________
2. _________ of nearby ________ - travel with arteries (veins and nerves)
3. Contraction of ________ ________ in the ________ of the lymphatics
4. _________ ________ of ________ dumped back into ________
   stream – same amount as lost as _________ ________

15 Lymphoid Cells
*________the main ________ of the ________ system*
• Two main varieties
  • T cells (___ ________)  
  • B cells (___ ________)

16 Lymphocytes
• ___ cells and ___ cells _______ against ________
• _______ the body perceives as ________
• _______ and their ________; ________
• Mismatched _______ or _______ cells

17 __________
• _______
  • Manage the _________ ________
  • Attack and destroy _________ cells – _________ T’s _________
  _________ antigens while _________ T’s _____ the _________
  _________ antigens
• _______
  • Produce _________ cells provide _________ _______, by
    producing _________ _________

18 Other Lymphoid Cells
• _________ _________ foreign substances and help _________ T cells
• _________ cells _________ antigens and deliver them to _________ nodes
• _________ cells produce _________ that _________ other cells in
  lymphoid _________
19. **Figure # 20.3**

20  Lymphoid Tissue
• Houses and provides a __________ site for lymphocytes
• Furnishes a __________ vantage point
• Two main types
  • __________ tissue
  • Lymphatic __________

21  Lymphoid Tissue
• ________ lymphatic tissue comprises _________ _________ tissue elements in _________ body _________
  • Larger collections in the _________ _________ of _________ membranes and lymphoid _________

22  Lymphoid Tissue
• Lymphatic________, (nodules) (not same as _________ - no _________) are solid, spherical _________ of tightly packed _________ elements and _________
  • _________ center composed of _________ and _________
  • May form part of larger lymphoid organs

23  Lymph Nodes
• _________ lymphoid organs of the body
• Embedded in_______ _________, in clusters along lymphatic _________
• Near the body surface in _________, _________, and _________ regions of the body
• _________ shaped w/ fibrous _________

24. Fig. 20.2a; pg. 755

25  Lymph Nodes
• Functions
  1. _________ lymph________ destroy __________ and _________
  2. _________ system________ are _________ and mount an attack against__________
26  Structure of a Lymph Node
• ________ ________
• External ________ ________
• ________ extend inward and ________ the ________ into ________
• Two histologically distinct regions
  • ________
  • ________

27  Structure of a Lymph Node
• Cortex contains follicles with germinal centers, heavy with dividing ________
• ________ cells nearly encapsulate the follicles (bring antigens into node)
• Deep cortex houses ________ in transit
• T cells_______ continuously among the_______, l___________, and ________ stream

28  Fig. 20.4 pg.757

29  Structure of a Lymph Node
• Medullary cords extend inward from the cortex and contain B cells, T cells, and plasma cells
• Lymph sinuses contain macrophages

30.  Fig. 20.4b; pg. 757

31  Circulation in the Lymph Nodes
Lymph
• ________ via________* lymphatic vessels
• Travels through large ________sinus and ________ sinuses
• ________the node at the ________ via ________**vessels
• Fewer ________** vessels, causing flow of lymph to________, allowing ________ and ________ time to carry out ________
  *carry to or towards
  ** carry away from
33 Spleen
- _______ lymphoid organ
- Served by _______ _______ and vein, which _______________ at the _______
- Functions
  - _______ lymphocyte_________ and immune _________ and _______
  - _______ the blood of _________ _________ and _______ and _______

34 Fig. 20.6c; pg.759

35 _______
- _______ _______ products of _________ (e.g., _________) for later _______
- _______ blood ___________
- Site of _______ erythrocyte _________ (normally ceases after birth)
- Has a _______ capsule and _______ Contains _______, ________, and huge numbers of _______

36 Structure of the Spleen
- Two distinct areas
  - _______ pulp
  - Mostly lymphocytes on reticular fibers and involved in immune functions
  - _______ pulp
    - Rich in macrophages for disposal of worn-out RBCs and bloodborne pathogens

37 Fig. 20.6 a&b;  pg. 759
38 Thymus
  • Size with age
    • In _______, it is found in the inferior _________ and extends into the _________, where it partially overlies the _________
    • Increases in _________ and is most active during _____________
    • _________ _________ during _____________ and then gradually__________

39 Thymus
  • Thymic lobes contain an outer _________ and inner _________
  • Cortex contains densely packed _________ and scattered _________
  • Medulla contains fewer lymphocytes and__________ (Hassall’s) _________ involved in _______________ development

40. Figure # 20.7

41 Thymus
  • Differs from other lymphoid organs in important ways
    • It functions strictly in _____________ maturation
    • It does not______________ antigens
    • The_______ of the thymus consists of _________-shaped _________ cells (not _________ fibers - CT)
    • These thymocytes provide the _________ in which _________ become ______________

42 _________
  • _________ lymphoid organs
  • Form a _________ of lymphatic tissue around the _________
    • _________ tonsils—at posterior end of the _________ cavity
    • _________ tonsils—grouped at the base of the _________
    • _________ tonsils (_______)—in posterior wall of the _________
    • _________ tonsils—surrounding the openings of the _________ into the _________
43 Tonsils
• Contain _______ with germinal centers
• Are not fully__________
• __________ overlying tonsil masses i __________, forming tonsillar __________
  __________ Crypts _________ and _________ _________ and particulate __________
• Antigens _________ in _________ or lymphatic _________/vessels

44 Fig. 20.8b pg. 760

45 _______ of Lymphoid Follicles
• _______ _________
• _______ of lymphoid follicles
• In the _______ of the distal portion of the_________ _________
• Similar structures are also found in the _________
• Peyer’s patches and the appendix
• _______ bacteria, preventing them from _________ the intestinal ______
• Generate _________ ”_________
• Antigens not in blood/lymph vessels

46 Fig. 20.8; pg. 761

47 MALT
• _______ _________ _________ _________, including
  • _______ patches, _______, and the_________ (digestive tract)
  • Lymphoid _______ in the walls of the_________ (respiratory tract)
• Protects the_______ and _________ systems from foreign matter