LYMPHATIC SYSTEM

I. INTRODUCTION

The lymphatic system is named after the lymphocytes, which are the white blood cells that produce antibodies. In addition to immune defense, however, the lymphatic system also returns lymph to the blood. The clear-colored interstitial fluid that surrounds cells is called lymph once it is picked up by lymphatic vessels. The lymphatic vessels return the lymph to the blood.

II. LYMPHATIC ANATOMY

A. Lymphatic structures (Fig. 22.1 and 22.3 a, b, c) Study the torso models, except for the words marked with asterisks, which are on the illustrations only.

- Right lymphatic trunks* (Right jugular, right subclavian and right bronchomediastinal trunks)
- Thymus gland* 
- Axillary lymph nodes
- Cervical lymph nodes
- Thoracic duct (entrance into left subclavian vein)
- Thoracic duct*
- Spleen
- Inguinal lymph nodes

B. Veins which receive lymph from the right lymphatic trunks and the thoracic duct. (Fig. 22.3 a,b) Use the torso models.

- Right subclavian vein (receives lymph from right lymphatic trunks)
- Left subclavian vein (receives lymph from thoracic duct)

C. Tonsils (Fig. 22.5 and Fig. 23.2) The half-head models show these strategically located groups of lymph nodules.

- Palatine tonsils
- Pharyngeal tonsil (adenoids)
- Lingual tonsil
D. **Drainage of lymph** (Fig. 22.3) Note that the entire abdomen and everything inferior drains into the thoracic duct.

1. The upper right part of the body drains into the
   
   ________________________________ (lymph vessels).

   From there lymph from the upper right part of the body enters the
   
   ________________________________ (blood vessel).

2. The left part of the body, abdomen and lower limbs drain into the
   
   ________________________________ (lymph vessel). From there
   lymph from the left body, abdomen and lower limbs enters the
   
   ________________________________ (blood vessel).

**Optional notes on the lymphatic structures**

1. Ordinarily the **lymph nodes** are quite small and soft. They can be easily palpated (felt) if enlarged with infection.

2. The **palatine tonsils** and **pharyngeal tonsils** can be removed surgically if their enlargement obstructs the eustachian tubes or interfere with swallowing.

3. A ruptured **spleen** bleeds profusely and can be surgically removed to stop the bleeding. Why can you live without a spleen? What type of accident ruptures the spleen?

4. **Elephantiasis** is a tropical disease named for the huge swelling of the lower limbs. It is caused by a parasite that blocks the **lymphatic vessels**, preventing the return of lymph to the blood.

5. Because lymph capillaries are porous, cancer cells may enter them and be transported to other body areas, a process known as **metastasis**. The likely direction of metastasis can be predicted by the direction of lymph flow, the topic completed above. For example, is breast cancer likely to metastasize from one breast to the other, based on the direction of lymph flow?
BODY CAVITIES AND SEROUS MEMBRANES

I. BODY CAVITIES

A. Trunk cavities  Observe these on the torso models.

1. Thoracic cavity and subdivisions (Fig. 1.15; Fig. 1.17a,b)
   a. Right and left pleural cavities  (Contain lungs and pleural fluid)
   b. Pericardial cavity  (Contains heart and pericardial fluid)
   c. Mediastinum  (Fig. 1.15) Contains all organs between the lungs, including the heart within the pericardial cavity.

2. Abdominopelvic cavity and subdivisions 1.15)
   The diaphragm separates this cavity from the thoracic cavity.
   a. Abdominal cavity
   b. Pelvic cavity
      An imaginary plane from the sacral promontory to the superior surface of the pubic bones separates abdominal and pelvic cavities.
   c. The abdomen can be divided into 4 quadrants  (Fig. 1.12 a).
      Right upper quadrant
      Left upper quadrant
      Right lower quadrant
      Left lower quadrant
   d. The abdomen can also be subdivided into 9 regions  (Fig. 1.12 b).
      Right and left hypochondriac regions
      Right and left lumbar regions
      Right and left iliac regions
      Epigastric region
      Umbilical region
      Hypogastric region
II. SEROUS MEMBRANES

A. Introduction to serous membranes (See “Peritoneum, p. 873 [878-880])
Many organs of the trunk cavities and organs are covered with slick double
membranes, called **serous membranes**, or **serosa**, which lubricate their
movements. They are formed from simple squamous epithelial lining cells
over loose connective tissue. These double membranes—around the
heart, around the lungs, and around some abdominal organs—are actually
each formed from one closed sac. The small space between the inner and
outer layers is filled with a thin lubricating fluid. (Fig. 1.16). Your instructor
will use a closed **plastic bag** to help you visualize the serous membranes.
Either a **cadaver** or a **fetal pig** will be available to assist your
understanding.

B. **Pericardial membranes** (Fig. 1.17a) Use the illustration, the **heart of the
torso models**, and the **cadaver** or **fetal pig**.

   - Parietal pericardium
   - Visceral pericardium
   - Pericardial cavity

C. **Pleural membranes** (Fig. 1.17 b) Use the **torso models**.

   - Parietal pleura
   - Visceral pleura
   - Pleural cavity

D. **Peritoneal membranes** and their folds (Fig. 24.5 a) Study the **torso
models**, the **illustration**, and the **cadaver** or **fetal pig**.

   - Parietal peritoneum
   - Visceral peritoneum
   - Greater omentum
   - Mesentery proper
   - Transverse mesocolon (suspends transverse colon)
   - Falciform ligament (Fig. 24.5 b) It is formed from a doubling of
   the visceral peritoneum. It suspends the liver from the diaphragm
   and abdominal wall.
   - **Peritoneal cavity** (Fig 24.5a) Note that this space is found
   throughout the abdomen, between visceral and parietal peritoneum.
1. What are the functions of the peritoneal membranes?

2. What happens if the peritoneal cavity is opened?

3. Are the following organs within the mesenteries or retroperitoneal (posterior to the mesenteries)? Are they covered by visceral peritoneum or parietal peritoneum? (See “Peritoneum, p 873 [878-880]) Use the torso models.

<table>
<thead>
<tr>
<th>Organ</th>
<th>Within mesenteries or retroperitoneal?</th>
<th>Covered with visceral or parietal peritoneum?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stomach</td>
<td>Within? Retro?</td>
<td>Visceral? Parietal?</td>
</tr>
<tr>
<td>Liver</td>
<td>Within? Retro?</td>
<td>Visceral? Parietal?</td>
</tr>
<tr>
<td>Gall bladder</td>
<td>Within? Retro?</td>
<td>Visceral? Parietal?</td>
</tr>
<tr>
<td>Duodenum</td>
<td>Within? Retro?</td>
<td>Visceral? Parietal?</td>
</tr>
<tr>
<td>Ileum</td>
<td>Within? Retro?</td>
<td>Visceral? Parietal?</td>
</tr>
<tr>
<td>Ascending colon</td>
<td>Within? Retro?</td>
<td>Visceral? Parietal?</td>
</tr>
<tr>
<td>Transverse colon</td>
<td>Within? Retro?</td>
<td>Visceral? Parietal?</td>
</tr>
<tr>
<td>Descending colon</td>
<td>Within? Retro?</td>
<td>Visceral? Parietal?</td>
</tr>
<tr>
<td>Appendix</td>
<td>Within? Retro?</td>
<td>Visceral? Parietal?</td>
</tr>
<tr>
<td>Urinary bladder</td>
<td>Within? Retro?</td>
<td>Visceral? Parietal?</td>
</tr>
</tbody>
</table>

E. Helpful tip for learning retroperitoneal organs

In the “200" torso models, the abdominal organs that are within the mesenteries are removable: stomach, liver, spleen, jejunum and ileum, and transverse colon. The models illustrate the retroperitoneal organs by showing them as a posterior group once the organs within the mesenteries are removed. The remaining organs--pancreas, duodenum, ascending, descending, sigmoid colon and rectum, kidneys and adrenal glands--are retroperitoneal. Exception: the vermiform appendix is within the mesenteries.
Optional notes on the body cavities and serous membranes

1. The plural of **pleura** is pleurae (plur-ee).

2. The heart is part of the **mediastinum**, which is within the **thoracic cavity**.

3. Until the advent of antibiotics, **peritonitis** was a deadly disease. The **peritoneal cavity** can be opened (and thereby infected) by an external injury to the abdomen, surgery such as Caesarian section, through rupture of the **vermiform appendix**, or even through severe stomach damage caused by a peptic ulcer. A burst appendix releases large amounts of bacteria from the intestines into the peritoneal cavity.

4. Surgery on the **kidneys** can be done through incisions in the back. Why might this be preferred to anterior incisions?

5. **Ascites** refers to accumulation of clear fluid in the **peritoneal cavity**. The swollen belly of a starved person is caused by ascites, but various disease states that cause edema may also cause ascites. “**Paracentesis**” is the name of the surgical procedure used to remove the excess fluid from the peritoneal cavity.