THE THORAX, MEDIASTINUM

I. Lymphatic System
   A. Lymphatic vessels are found on the surface around the lungs and beneath the visceral pleura
      1. found in dense connective tissue -
      2. primary function is to remove excess fluid from tissue -
   B. Lymphatic vessels arise from loose space of the interstitium
      1. vessels follow bronchial airways, arteries, and veins to hilum
      2. unicuspid, funnel shaped valves direct fluid toward hilum
      3. large lymph channels have smooth muscle bands that actively produce peristaltic movement regulated by the autonomic nervous system
      4. vessels end in pulmonary and bronchopulmonary lymph nodes -
   C. Lymph nodes are located along lymph vessels
      1. produce lymphocytes and monocytes
      2. act as filters -

II. Neural Control
   A. Autonomic nervous system helps to balance the tone of bronchial and arteriolar muscles of the lung
      1. regulates involuntary vital functions -
      2. contain two divisions
         a. sympathetic nervous system
         b. parasympathetic nervous system
   B. Sympathetic nervous system -
      1. stimulation can cause epinephrine or norepinephrine to be released
         a. stimulates the beta2 (B2) receptors -
      2. alpha stimulation produces pulmonary vascular constriction
   C. Parasympathetic nervous system -
      1. releases acetylcholine -
      2. inactivity of one system allow the other system to dominate the bronchial smooth muscles

III. Lungs/Mediastinum
   A. Morphology of the lungs
      1. pointed upper portion forms the APEX -
      2. BASES are broad and concave
         a. anterior -
         b. posterior -
      3. mediastinal border of each lung is concave -
         a. hilum is located at center of mediastinal border
      4. right lung is larger and heavier than left
         a. three lobes are located on the right, lobes are divided by oblique and horizontal fissure
         b. two lobe are located on left side and are divided by the oblique fissure
   B. Mediastinum
      1. cavity contains organs of the thorax between the right and left lung -
      2. bordered anteriorly by sternum and posteriorly by vertebrae
3. changes in shape of the mediastinum can compromise the cardiopulmonary system
4. arteries
   a. aortic arch and branches
   b. subclavian (r. and l.), left common carotid
   c. thoracic aorta -
5. veins
   a. brachiocephalic (r. and l.)
   b. superior vena cava
   c. azygous v.
   d. hemiazygous v.
6. nerves
   a. vagus n.
   b. recurrent laryngeal n.
   c. phrenic (C3-C5)
7. thoracic duct -

C. Plural membranes
1. visceral pleura attaches to outer surface -
2. parietal pleura lines the inside of the thoracic wall -
3. thin serous fluid holds the two surfaces together
   a. surfaces glide over each other during respiratory maneuvers
   b. inspiration -
4. subatmospheric pressure is created between two pleura -
   a. lungs tend to collapse
   b. thorax tends to expand
5. if air is allowed to enter thorax between pleurae, lungs will collapse - pneumothorax

IV. Thorax
A. Bones of the thorax
1. 12 thoracic vertebrae
2. 12 pair of ribs
   a. pairs 1-7 are true ribs, vertebral sternal ribs
   b. pairs 8-12 are false ribs, vertebral costal ribs
   c. pairs 11-12 are floating ribs
3. sternum
   a. manubrium steni -
   b. sternum or body -
   c. xiphoid process
   d. sternal angle (angle of Louis) is the junction between the manubrium and sternum

B. Boundaries of thorax
1. suprasternal angle or jugular notch T2-T3
2. sternal angle T4-T5
3. subcostal or infrasternal angle T9
4. costal margins, ribs 7-10 T8-L2
5. scapula
   a. superior angle T2
   b. spine T3
   c. inferior angle T7
6. nipple, male or immature female 4th ICS

C. Muscles of inspiration (See Muscles of Respiration, page 4)
1. diaphragm - major muscle of respiration (inspiration)
   a. dome shaped musculofibrous partition located between thoracic cavity and abdominal cavity
   b. composed of two hemidiaphragms -
c. contraction or movement is downward -

2. accessory muscles of inspiration
   a. *scalene muscle (m.)* - flexes neck, elevates ribs 1-2, dec. intrapleural pressure
   b. *sternocleidomastoid m.* - with head and neck fixed it elevates sternum
   c. *pectoralis major m.* - increases anteroposterior diameter of chest
   d. *trapezius m.* - helps to elevate the thoracic cage
   e. *external intercostal m.* - pulls ribs upward and outward

3. accessory muscles of expiration - muscles recruited to help with exhalation
   a. *rectus abdominis m.* - compresses abdomen pushing diaphragm up
   b. *internal abdominis oblique m.* - compresses abdomen
   c. *transverse abdominis m.* - compresses abdomen
   d. *internal intercostal m.* - pulls ribs inward and downward

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**VOCABULARY**

1. costodiaphragmatic sinus -
2. costomediastinal sinus -
3. cupula -
4. epinephrine -
5. fossa -
6. insertion (muscle) -
7. hiatus -
8. intrapleural pressure -
9. jugular notch -
10. linea alba
11. lymphocytes -
12. monocytes -
13. norepinephrine
14. occipital bone -
15. origin (muscle) -
16. peristaltic -
17. phrenic nerve -
18. pneumothorax -
19. thoracic duct -
# MUSCLES OF RESPIRATION

## MUSCLES OF INSPIRATION

<table>
<thead>
<tr>
<th>MUSCLE</th>
<th>ORIGIN</th>
<th>INSERTION</th>
<th>ACTION</th>
<th>INNERVATION</th>
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</thead>
<tbody>
<tr>
<td>Diaphragm m.</td>
<td>sternum, costal cartilages, ribs 7-12</td>
<td>central tendon</td>
<td>contraction flattens diaphragm and enlarges thorax</td>
<td>Phrenic nerve</td>
</tr>
<tr>
<td>Scalenus medius m.</td>
<td>transverse process of C2-C7 cervical vertebrae 1-2,</td>
<td>1st rib</td>
<td>flexes and rotates head, elevates ribs flexes vert. column laterally</td>
<td>C3-C4</td>
</tr>
<tr>
<td>Sternocleidomastoid m.</td>
<td>head of sternum, head of clavicle</td>
<td>mastoid process nuchal line of occipital bone</td>
<td>rotates head, pulls head upward, elevates sternum</td>
<td>C1-C4</td>
</tr>
<tr>
<td>Pectoralis major m.</td>
<td>clavicle, sternum</td>
<td>crest of greater tubercle of humerus</td>
<td>draws ribs toward arms during forced inspiration</td>
<td>C5-C8,T1</td>
</tr>
<tr>
<td>Trapezius m.</td>
<td>occipital bone, ligamentum nuchae,</td>
<td>clavicle, scapula</td>
<td>raises shoulder, adducts scapula, elevates thoracic cage</td>
<td>C3-C4</td>
</tr>
<tr>
<td>External intercostal m.</td>
<td>11 on each side, inferior border of rib</td>
<td>superior border of rib below</td>
<td>pull ribs up and out</td>
<td>T1-T11</td>
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## MUSCLES OF EXPIRATION

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<tr>
<td>Rectus abdominis m.</td>
<td>crest of pubis, interpubic ligament</td>
<td>cartilages of ribs 5-7, xyphoid process</td>
<td>compresses abdomen, flexes spine</td>
<td>T6-T11</td>
</tr>
<tr>
<td>Internal abdominis oblique m.</td>
<td>inguinal ligament, iliac crest, lumbar aponeurosis</td>
<td>lower costal cartilages, linea alba</td>
<td>flexes and rotates vertebral column, compresses abdominal viscera</td>
<td>T4-T12</td>
</tr>
<tr>
<td>Transverse abdominis m.</td>
<td>1) inner surface of costal cartilages of lower 6 ribs, 2) middle layer of lumbar fascia, 3) anterior 2/3 of iliac crest, 4) lateral 1/3 of inguinal ligament</td>
<td>aponeurotic sheath to linea alba</td>
<td>compresses abdomen, depresses ribs</td>
<td>T7-T12</td>
</tr>
<tr>
<td>Internal intercostal m.</td>
<td>11 on each side, inferior border of rib and costal cartilage</td>
<td>superior border of rib and costal cartilage below</td>
<td>pull ribs down and in</td>
<td>T1-T11</td>
</tr>
</tbody>
</table>