

V. N. Karazin Kharkiv National University
School of Medicine

SYNDROME OF PLEURAL EFFUSION. DIFFERENTIAL APPROACH



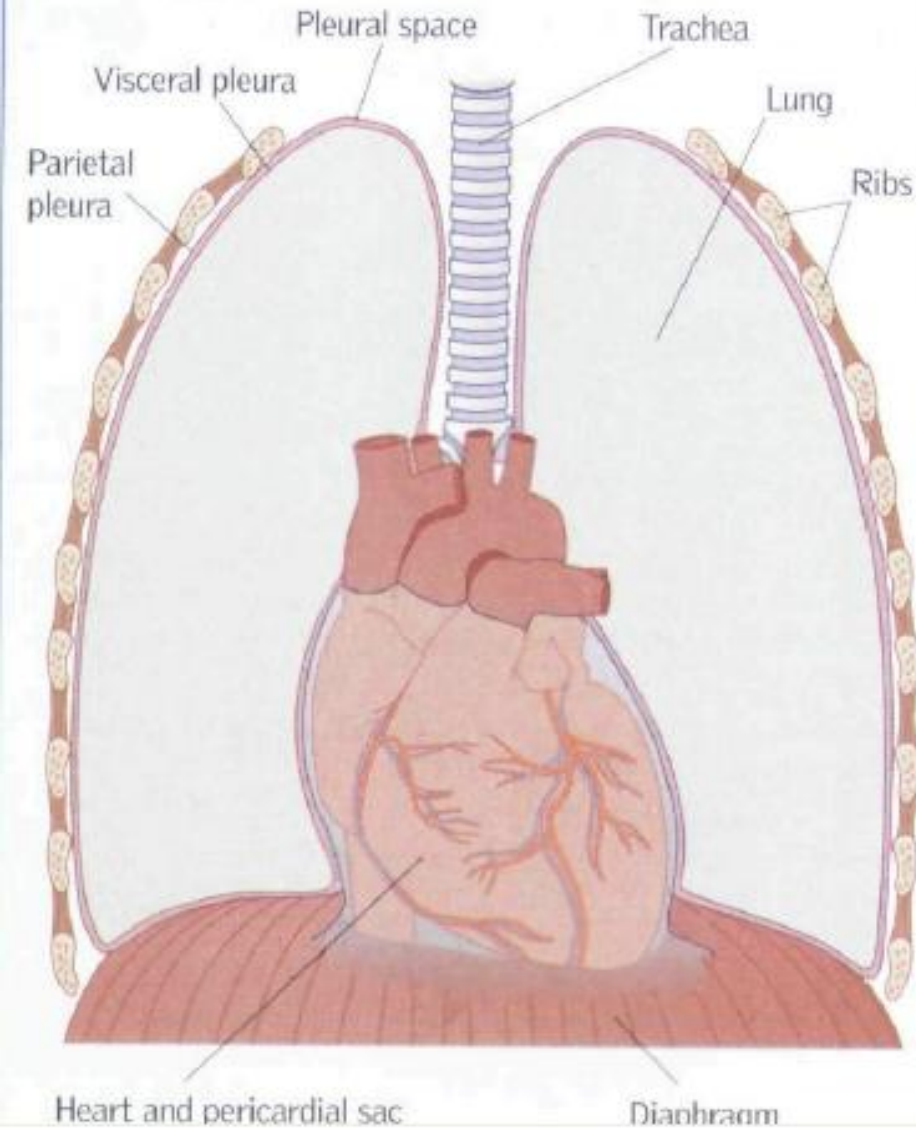
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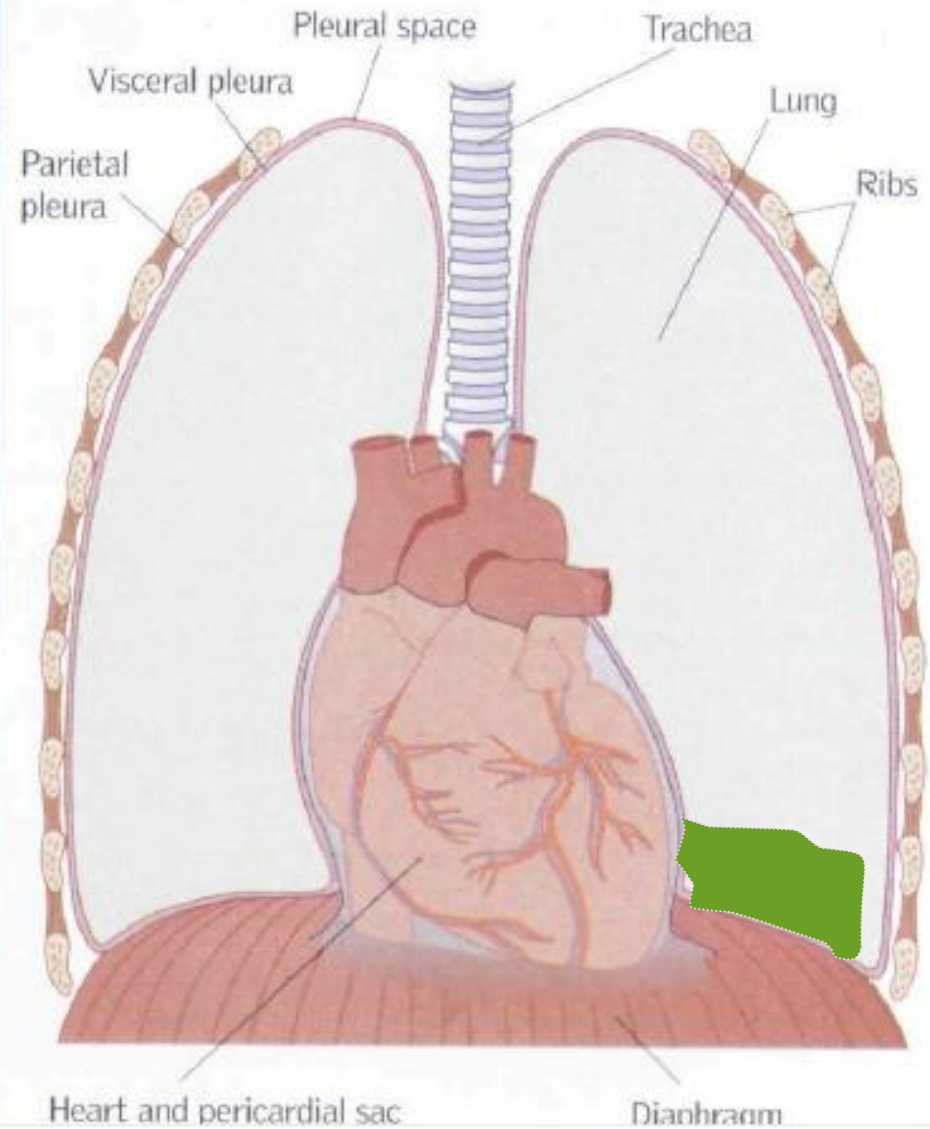
Normal lung

Pleural effusion

The thorax, lungs and pleura

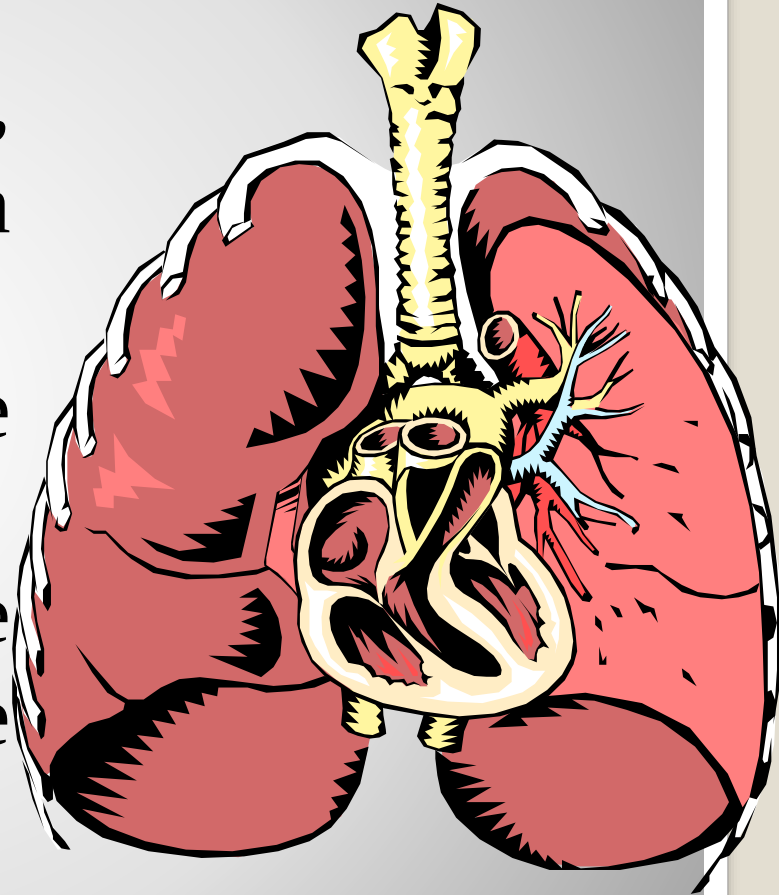


The thorax, lungs and pleura



Physiology of the normal lung

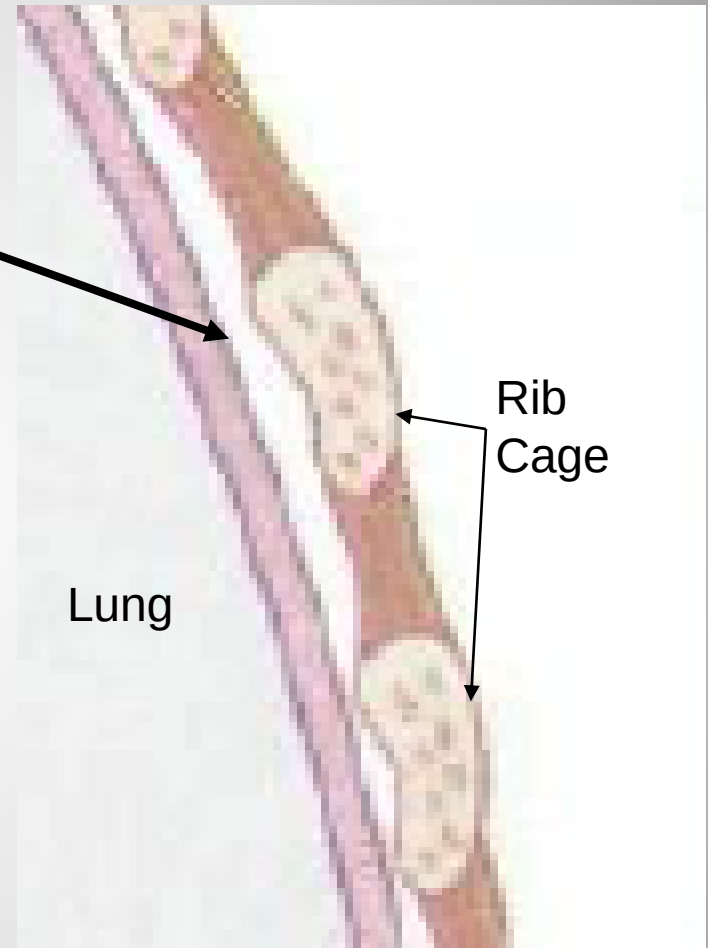
- The lungs are soft, spongy, cone-shaped organs located in the chest cavity.
- They are separated by the mediastinum and the heart.
- There are 3 lobes on the right lung and 2 lobes on the left lung.



Layers of the lung

Parietal Pleura

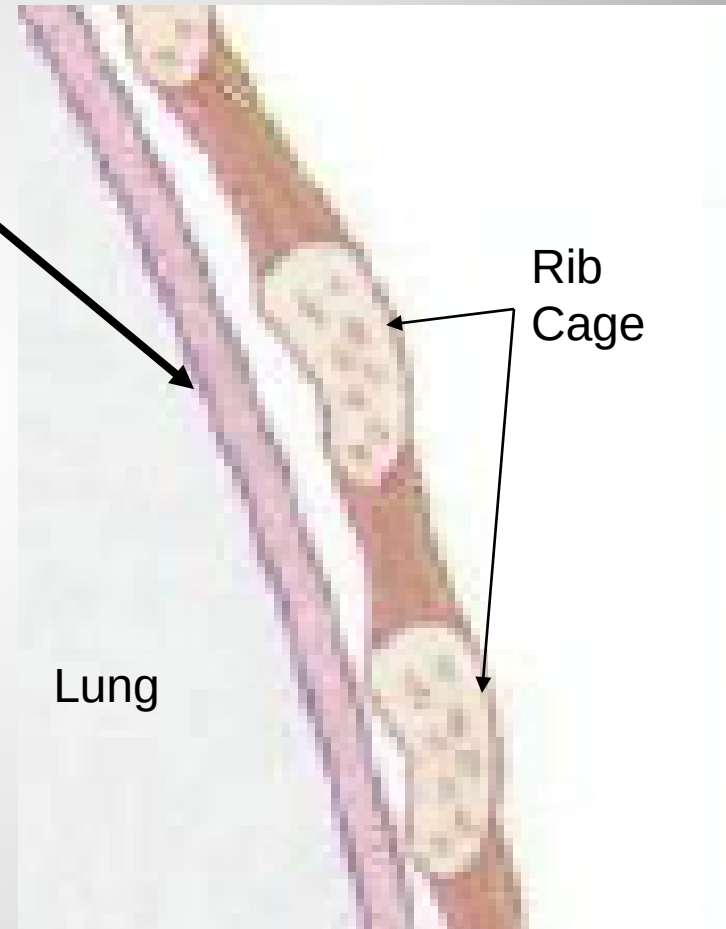
- Lines the thoracic cavity, including the thoracic cage, mediastinum, and diaphragm
- Contains sensory nerve endings that can detect pain



Layers of the lung

Visceral Pleura

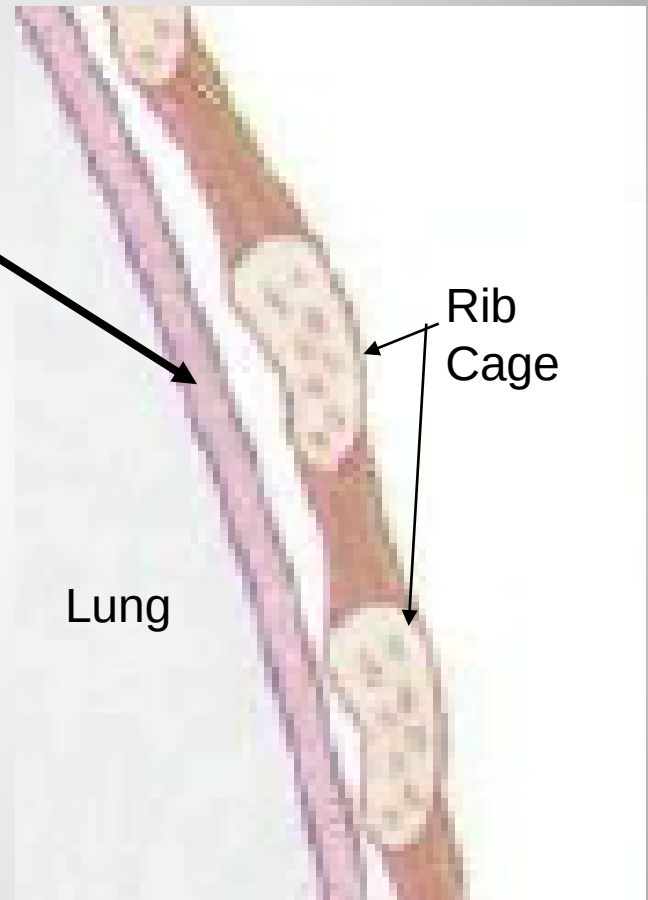
- Lines the entire surface of the lung
- Contains NO sensory nerve endings that detect pain



Layers of the lung

Pleural Space

- thin, transparent, serous membrane which lines the thoracic cavity
- a potential space between the parietal pleura and visceral pleura



Pleural fluid

- serous fluid that allows for the parietal pleura and visceral pleura to glide over each other without separation
- contains about 5-15ml of fluid at one time
- Pleural fluid is produced by the parietal pleura and absorbed by the visceral pleura as a continuous process.
- about 100-200ml of fluid circulates though the pleural space within a 24-hour period
- has an alkaline pH of about 7.64



Review question:

Pleuritic chest pain indicates inflammation or irritation of the parietal pleura or visceral pleura?

Think again!



The **visceral pleura** contains no nerve endings for detecting pain.

Correct!



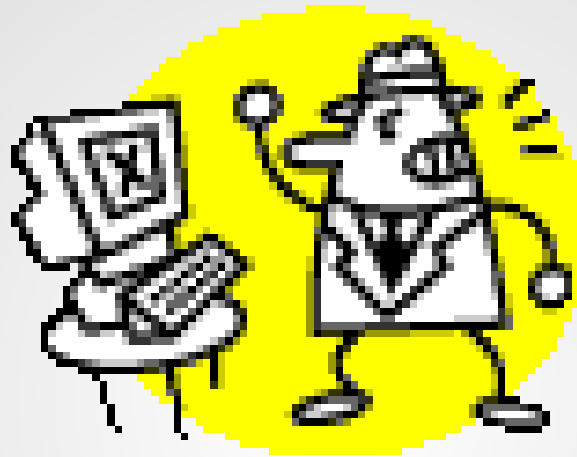
The **parietal pleura** contains sensory nerve endings that can detect pain.

Review question:

The pleural space typically contains how much fluid?

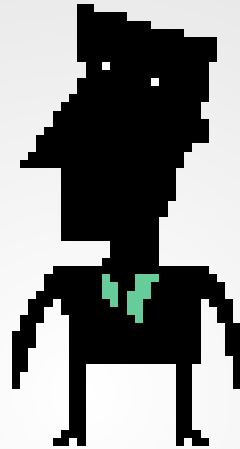
- 5-15ml
- 50-100ml
- 100-200ml

Think again!



About 100-200ml of fluid circulates though the pleural space within a 24-hour period

Correct!



- 5-15ml of fluid are present at one time
- The pleural space is a potential space between the parietal pleura and visceral pleura, allowing them to glide over each other without separation

Let's review

Fluid is absorbed by the:

- Parietal Pleura
- Pleural Space
- Visceral Pleura

Think Again - - -



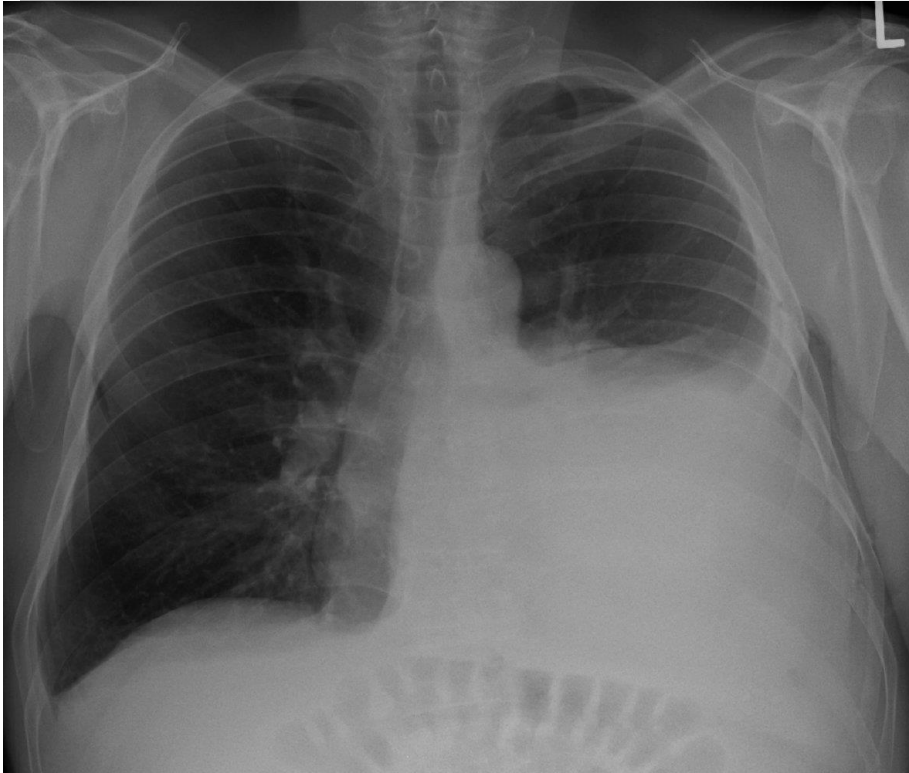
- Pleural fluid is produced by the parietal pleura
- The pleural space is a potential space between the parietal pleura and visceral pleura
- Negative pressure is created in the pleural space

Correct!!!



- Pleural fluid is produced by the parietal pleura and absorbed by the visceral pleura as a continuous process.
- The visceral pleura absorbs fluid, which then drains into the lymphatic system and returns to the blood

Pleural effusion



Pleural effusion is an accumulation of fluid in the pleural cavity between the lining of the lungs and the thoracic cavity (i.e., the visceral and parietal pleurae).

TRANSUDATE

- The pleural fluid is called a transudate if it permeates (transudes) into the pleural cavity through the walls of intact pulmonary vessels.
- The accumulation of transudate is typically due to increased hydrostatic pressure (e.g., in congestive heart failure) and/or decreased oncotic pressure (e.g., in cirrhosis or nephrotic syndrome).
- Since transudate is a filtrate, it is typically a clear fluid with a low protein and cell content.
- **Common causes:** congestive heart failure; hepatic cirrhosis; nephrotic syndrome; protein-losing enteropathy; chronic kidney disease



Exudate

- It is called an exudate if it escapes (exudes) into the pleural cavity through lesions in blood and lymph vessels, e.g., as caused by inflammation and tumors.
- By contrast, the lesions responsible for the outflow of exudate allow larger molecules and even solid matter to pass into the pleural cavity.
- For this reason, exudate is a cloudy fluid with a high protein and cell content.
- Common causes: INFECTION (pneumonia; tuberculosis; pleural empyema); MALIGNANCIES (e.g., lung cancer, metastatic breast cancer, lymphoma, mesothelioma); PULMONARY EMBOLISM (In ~ 80% of pleural effusions associated with pulmonary embolisms, the fluid is an exudate (suggesting a pulmonary infarction). In ~ 20% of cases, the fluid is a transudate.); AUTOIMMUNE DISEASE (vasculitis; SLE; rheumatoid arthritis; sarcoidosis); PANCREATITIS; HEMOTHORAX; CHYLOTHORAX; PSEUDOCYLOTHORAX

A microscopic image showing a cross-section of tissue with a large accumulation of pus, which is a collection of dead white blood cells, bacteria, and other debris. The pus is a yellowish-white color and is surrounded by a layer of cells. The word "Empyema" is written in a large, bold, black serif font over the image.

Empyema

- Accumulation of pus in the pleural cavity.
- Most common: pneumonia → extension of bacterial infection into the pleural space
- Less common: infected hemothorax, ruptured lung abscess, esophageal tear, thoracic trauma

A microscopic image showing a dense collection of small, round, pale-staining cells, likely lymphocytes, within a fluid matrix, characteristic of chyle.

Chyle

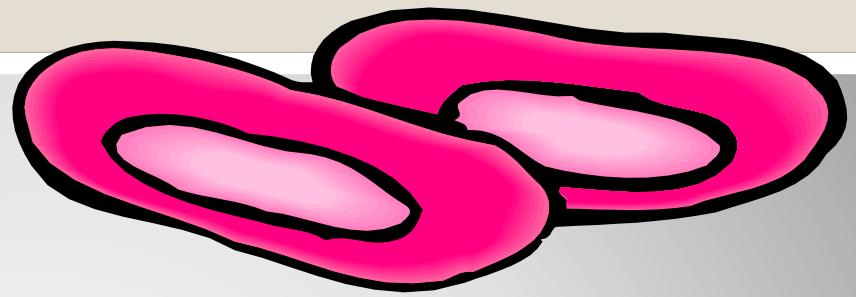
- Lymphatic fluid from the thoracic duct (chyle) accumulates in the pleural cavity
- Etiology: Trauma (including iatrogenic); Malignancy (e.g., lymphoma, bronchogenic carcinoma); Congenital lymphatic anomalies (e.g., lymphangiectasis)
- Cloudy, milky fluid with high concentrations of lipids (triglycerides, cholesterol, chylomicrons, and fat-soluble vitamins)



Pseudochylothorax

- Accumulation of cholesterol-rich fluid in the pleural cavity due to chronic inflammation
- Etiology: chronic pleural inflammation (e.G., Due to rheumatoid arthritis, pulmonary tuberculosis)
- Cloudy, milky appearance
- In contrast to chylothorax, a pseudochylothorax is characterized by **high cholesterol and low triglyceride levels in the pleural fluid**. The **presence of cholesterol crystals** may also help differentiate a pseudochylothorax from a chylothorax.

Hemothorax



Red Blood Cell

- Accumulation of blood in the pleural cavity
- Most commonly due to penetrating or blunt trauma
- A hemothorax, however small, must always be drained because blood in the pleural cavity will clot if not evacuated, resulting in a trapped lung or an empyema.

Let's review

- Which is NOT a type of fluid that may cause a pleural effusion?
 - empyema
 - chylothorax
 - pneumothorax
 - hemothorax

This is a fluid that may cause a Pleural Effusion



Empyema (pus),
Chylothorax (chyle), and
hemothorax (blood) are all
fluids that may result in a
pleural effusion.

Correct, this is not a fluid!

Pneumothorax is a collection of air in the pleural cavity.



Signs and symptoms

- Patients with a small pleural effusion (< 300 mL) are often asymptomatic. (*Symptoms typically only develop with large (> 300 mL) effusions.*)

Characteristic symptoms

- Dyspnea
- Pleuritic chest pain
- Dry, nonproductive cough
- Symptoms of the underlying disease (e.g., fever in empyema, cachexia in cases of malignancy, symptoms of left-sided heart failure)



Physical exam findings

Inspection and palpation:

- Asymmetric expansion and unilateral lagging on the affected side
- Reduced tactile fremitus due to fluid in the pleural space

Auscultation

- Faint or absent breath sounds over the area of effusion
- Pleural friction rub
- **Percussion:** dullness over the area of effusion



Diagnosis

Imaging can confirm a pleural effusion, but analysis of the pleural fluid (via thoracentesis) is usually required to establish the underlying etiology.



- **Chest radiograph (x-ray)**

- Very small pleural effusions (< 300 mL) may not be visible on a chest x-ray

- **Chest ultrasound**

- Very sensitive: can detect fluid amounts as low as 20 mL

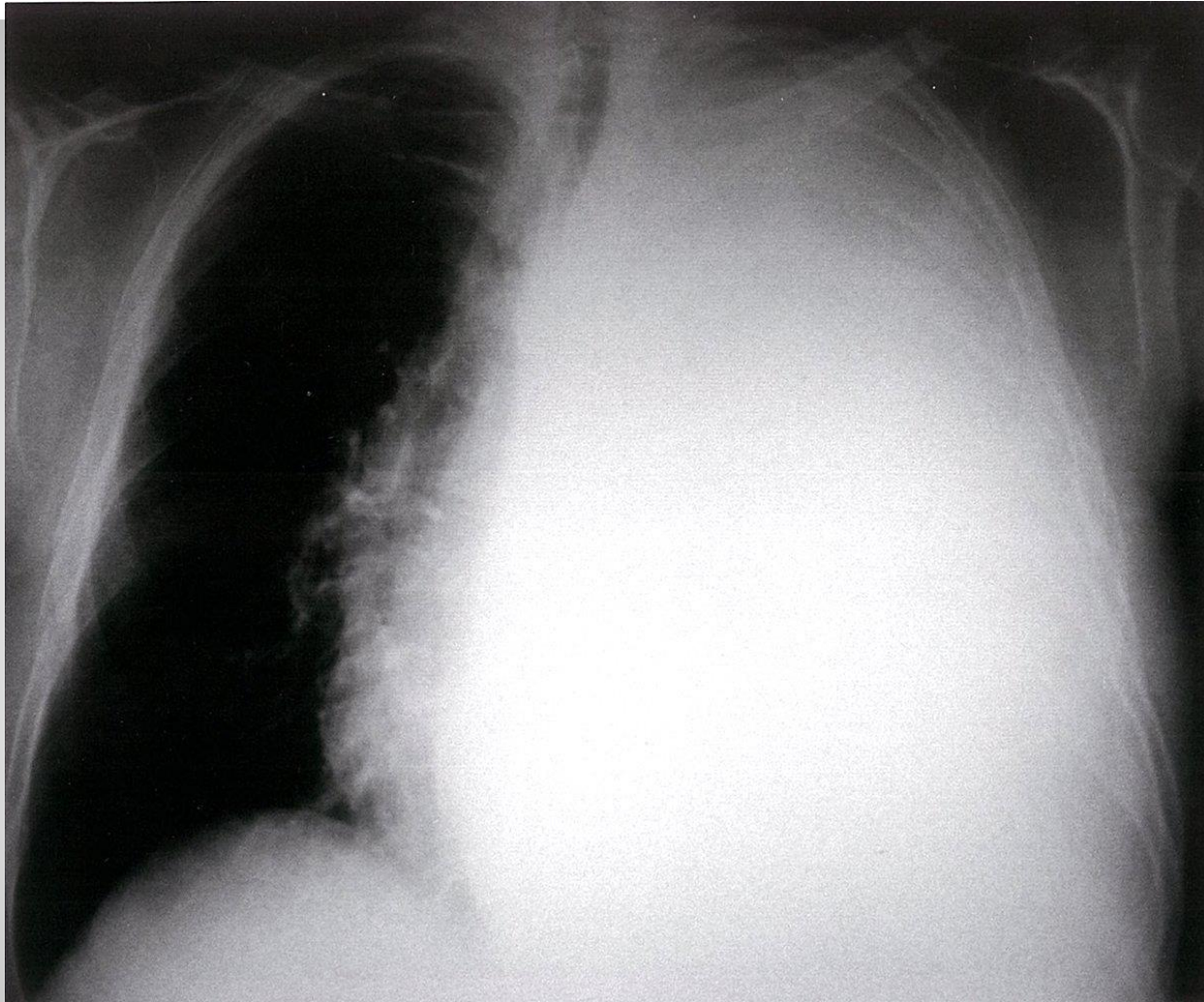
- able to give precise position of accumulation - commonly used for planning thoracentesis

- **Computed Tomography (CT) scan**

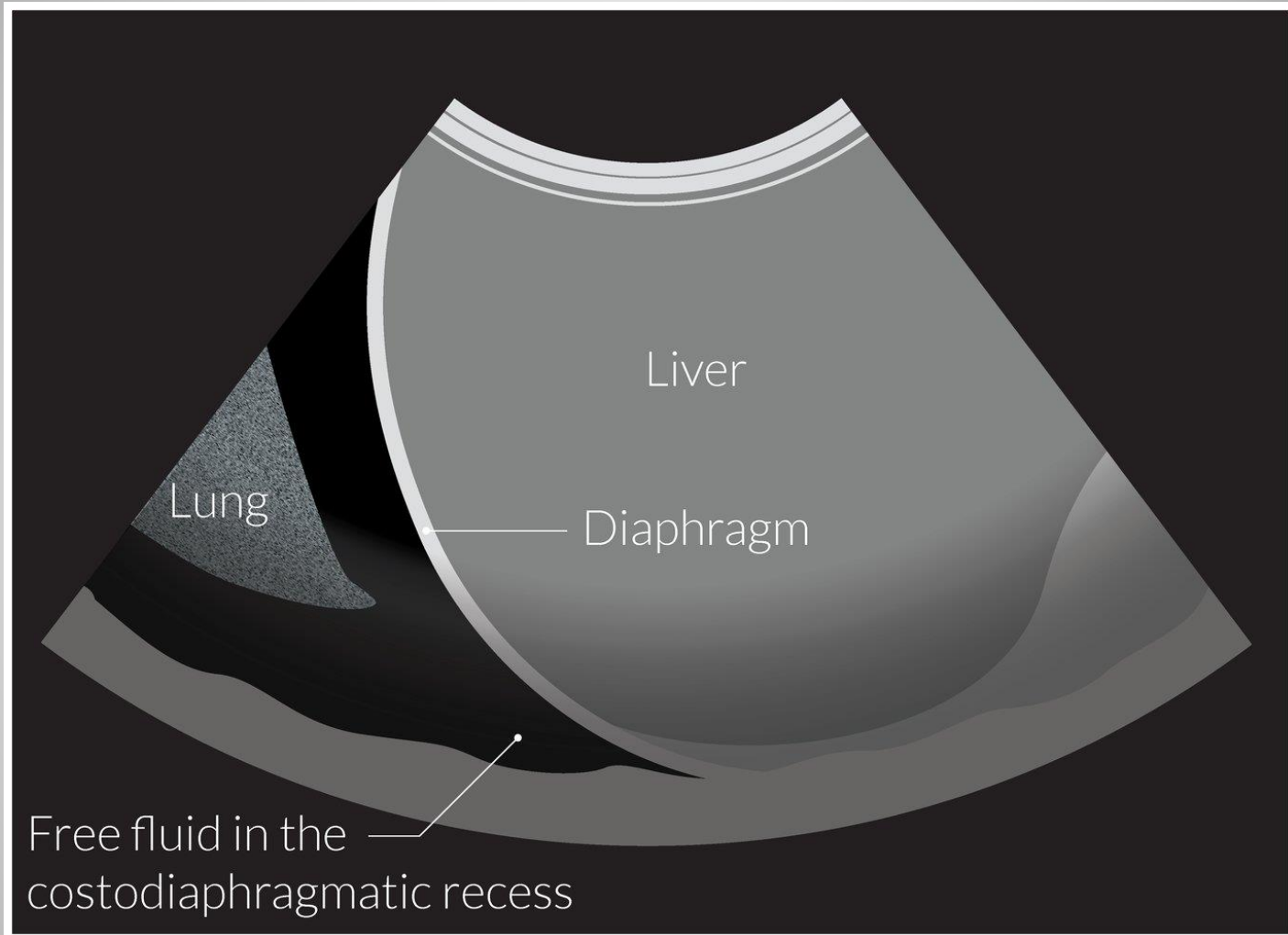
- more sensitive than CXR and ultrasound in identifying small pleural effusions but not required for diagnosis

- measurement of fluid density on CT scan may provide a clue to the underlying etiology (e.g., hyperattenuation of blood in hemothorax).

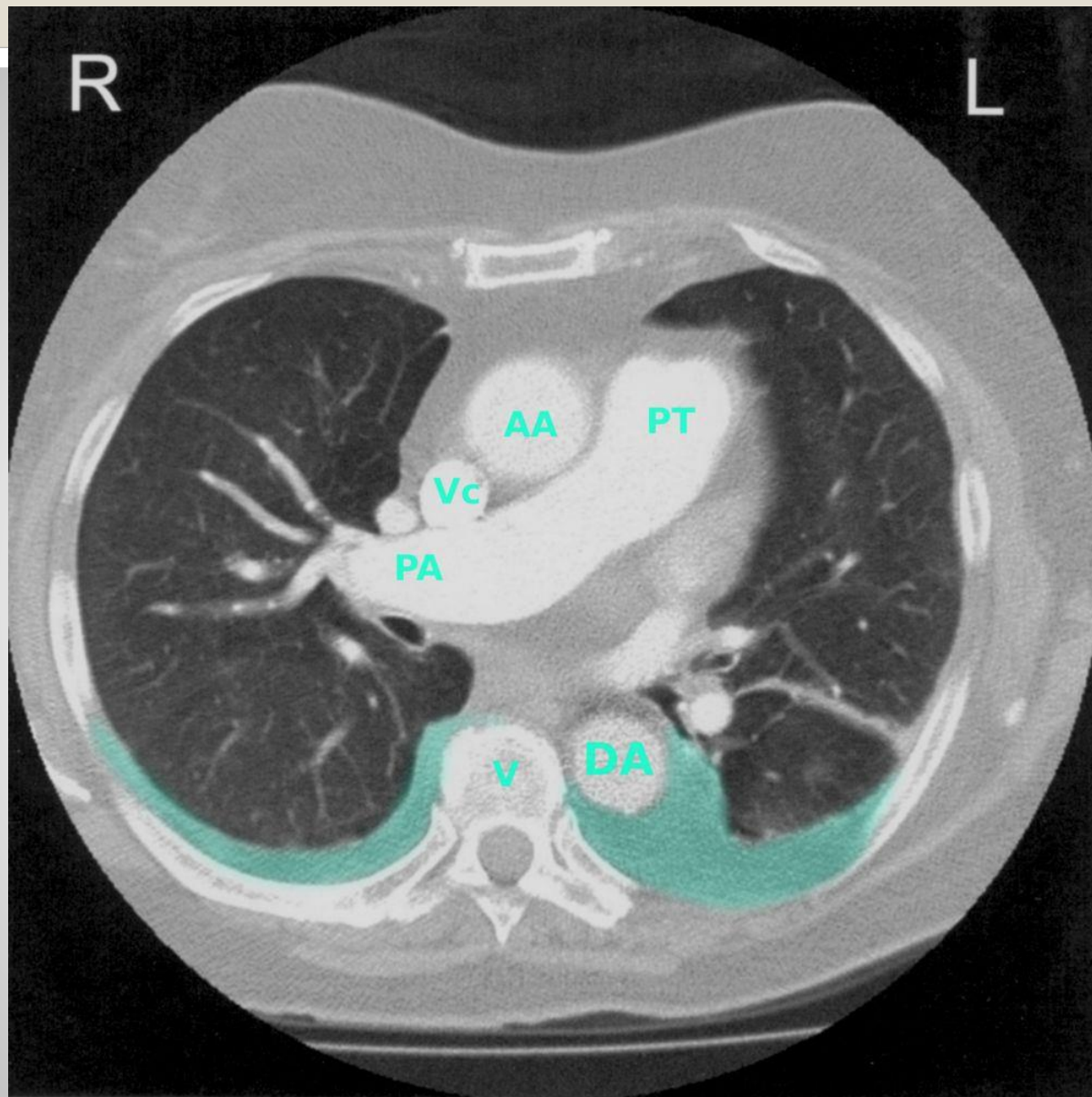
- consider IV contrast if there is a concern for underlying malignancy



Malignant pleural effusion in lung cancer



**Fluid in the right
costodiaphragmatic recess**



Bilateral pleural effusion

Thoracentesis

- Aspiration of fluid from the pleural space for diagnostic (e.g., transudate vs. exudate) and/or therapeutic purposes

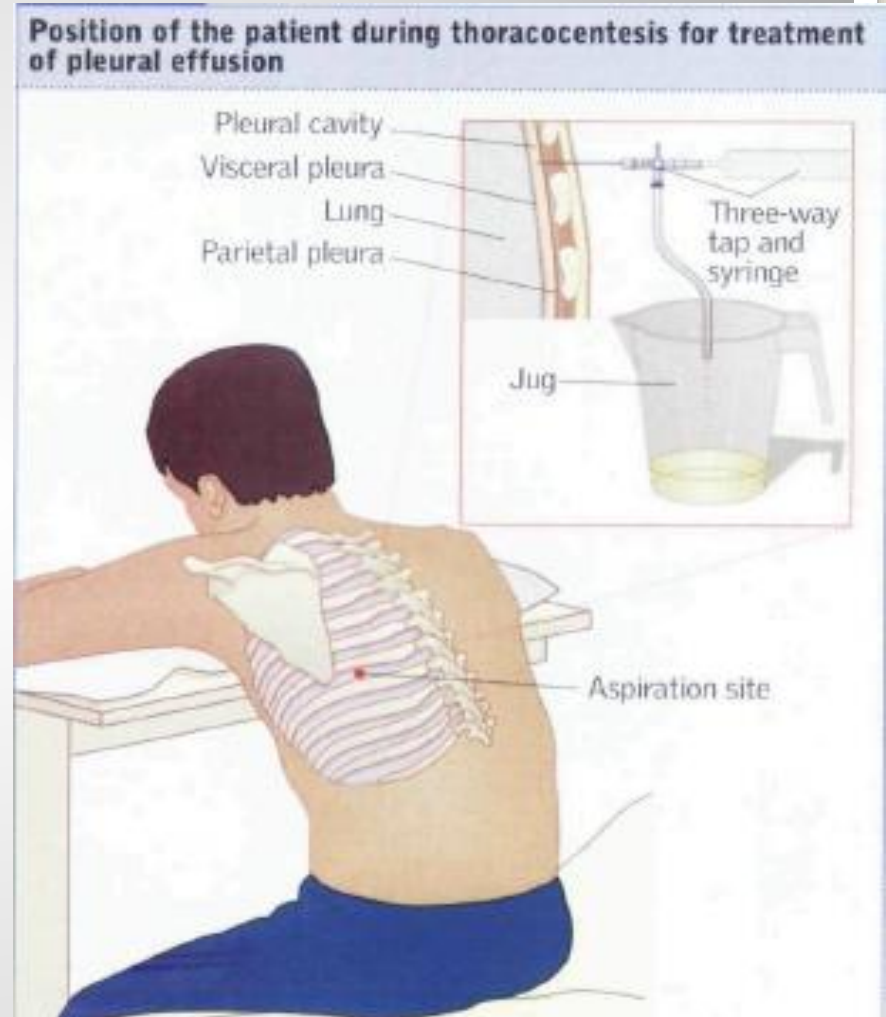
Indications:

- Any new unilateral effusion > 1 cm on x-ray in an undiagnosed patient (*Except in patients with obvious signs of typical heart failure or very small effusions in patients with an established diagnosis*)
- History of malignant tumor with effusion > 1 cm on x-ray
- Large effusion with dyspnea and/or cardiac decompensation

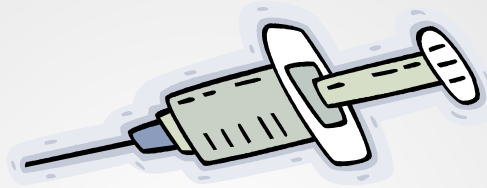


Thoracentesis

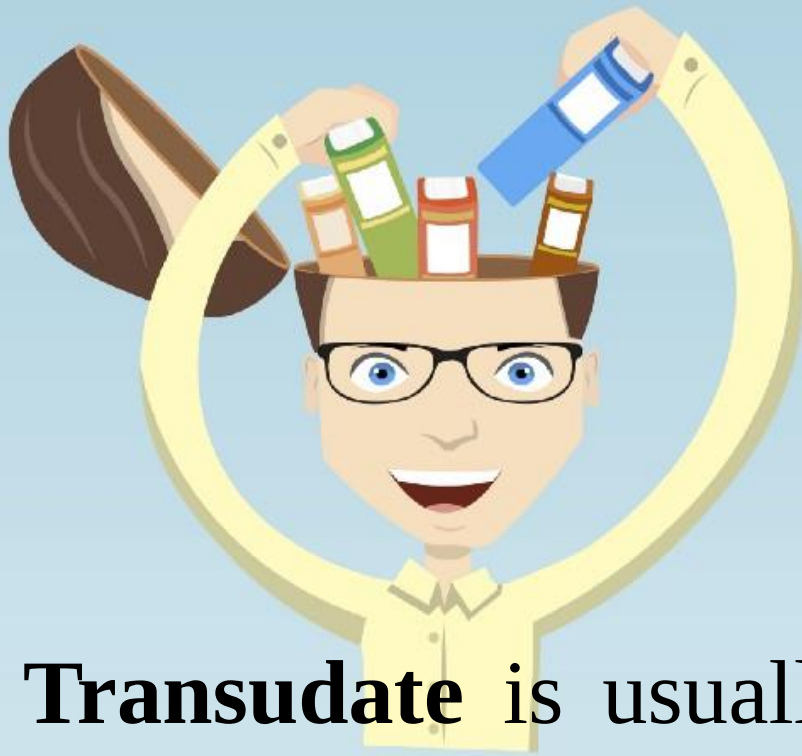
- A needle is inserted into the chest wall to remove the collection of fluid
- 50-100ml of fluid is sent for analysis
- Determines the type of fluid (transudate or exudate)



Thoracentesis



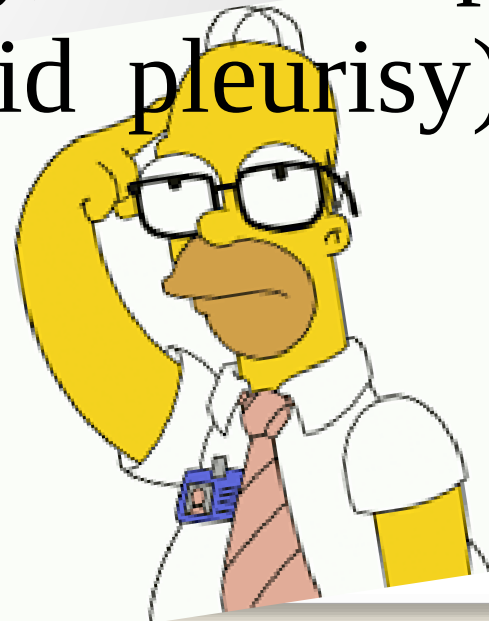
- Not a permanent solution, fluid may reaccumulate after a few days
- Will temporarily relieve symptoms
- Potential complications include bleeding, infection, and pneumothorax



Transudate is usually clear, has a decreased cell count, and has low levels of protein, albumin, and LDH. **Exudate** typically appears cloudy, has an increased cell count, and has high levels of protein, albumin, and LDH.



Think **MEAT** to memorize causes of pulmonary effusion with decreased glucose content: **M** = Malignancy, **E** = Empyema, **A** = Arthritis (rheumatoid pleurisy), **T** = Tuberculosis!



**PLEURAL FLUID WITH A
BLOODY APPEARANCE
SUGGESTS A MALIGNANT
ETIOLOGY OR HEMOTHORAX!**



Congratulations!



You have successfully completed
this topic!