

# Serous body fluid analysis



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At the end of this morning, you will be able to:

- Describe at least 3 etiologies each for transudates and exudates
- How to differentiate between transudates and exudates
- Describe the common tests performed on these fluids
- Describe how they can be obtained for testing

# Serosal Fluid

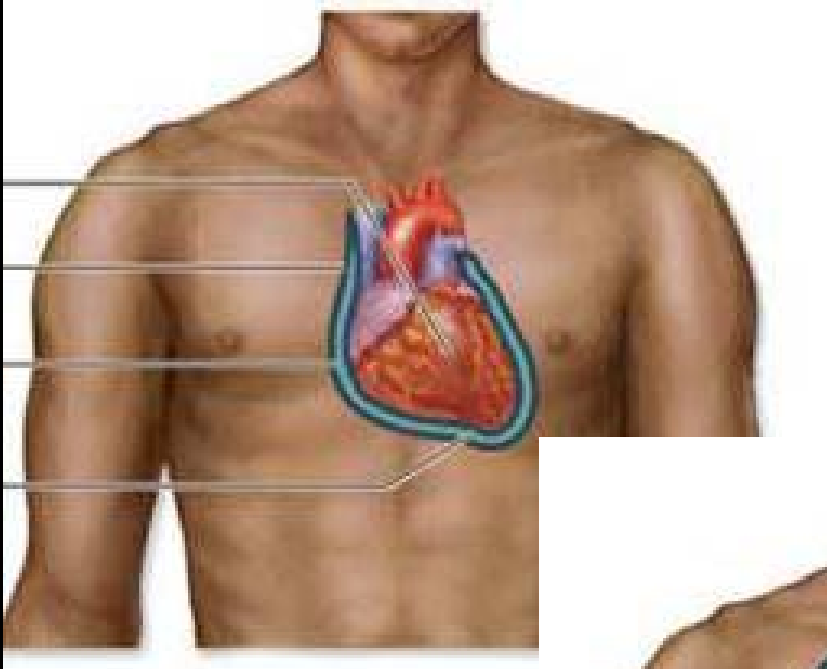
serous body cavities are those which surround various organs(heart,lungs,abdominal) and lined with serous membranes.

# Serous Body Cavity

serous fluid fills space between the parietal membrane and visceral membrane, and functions as lubricant between the membraned of that body wall and organs.

# Serous Body Cavities

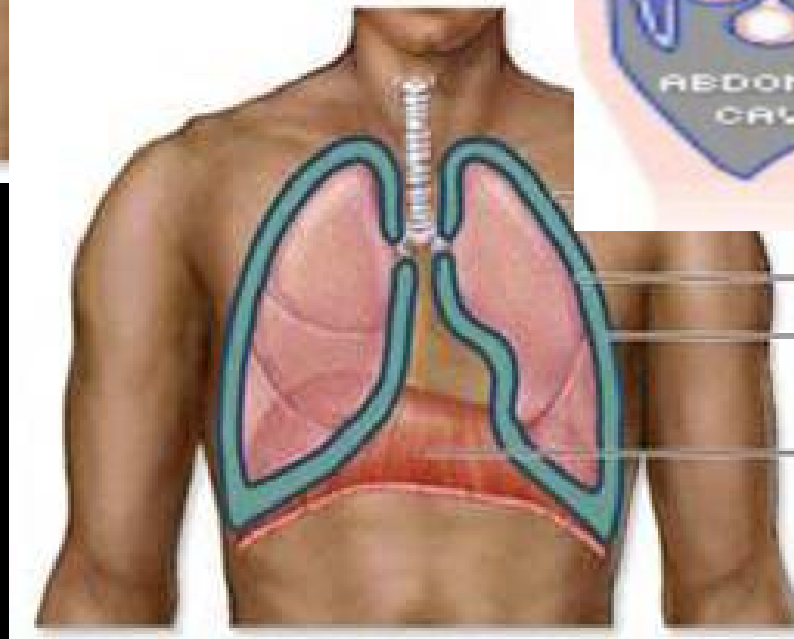
Pericardial cavity < 50ml



Peritoneal cavity < 100ml



Pleural cavity < 30ml



Differentiating between  
transudates and exudates

# What are transudates?

- **Transudates** —
  - due to imbalances in hydrostatic and oncotic pressures in the chest
  - Due to movement of fluid into pleural and peritoneal spaces



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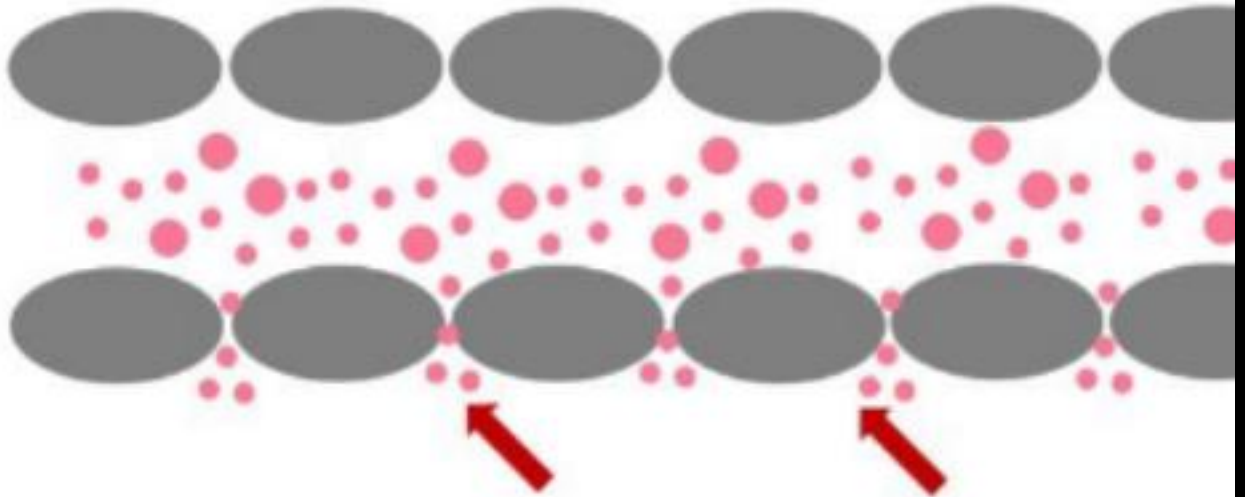


# What are exudates?

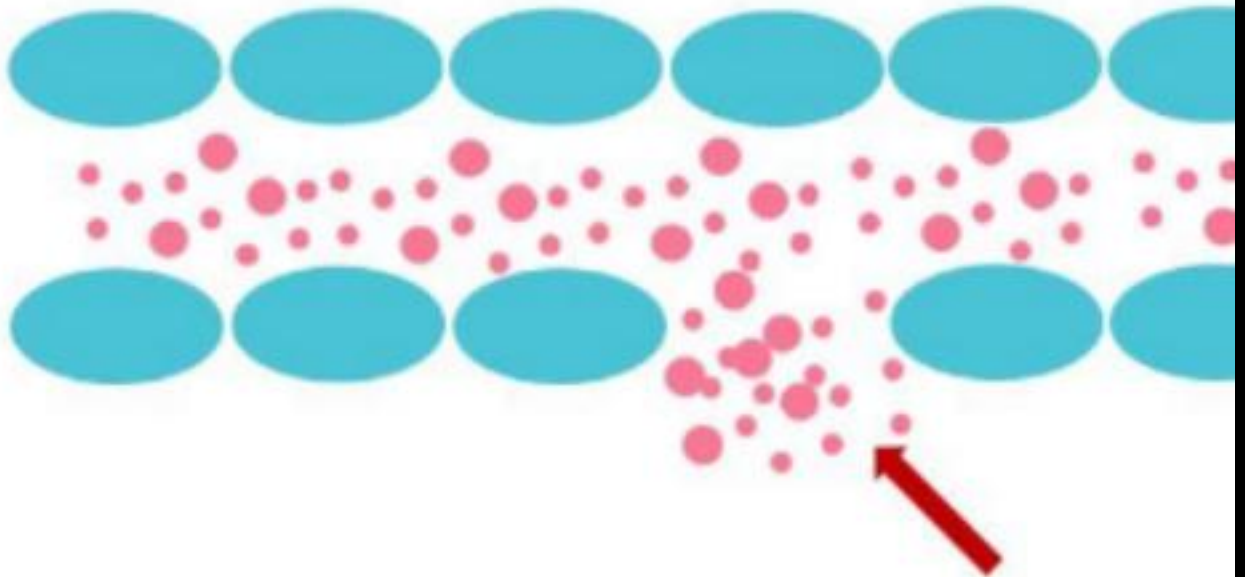
- Result from serosal inflammation, resulting in increased capillary and pleural membrane permeability
- Result from impaired lymphatic drainage of the pleural or peritoneal space



transudate



exudate



| Effusion site        | Causes for transudate                                                                                                                                                                             | Causes for exudate                                                                                                                                                                 |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pericardial effusion | —                                                                                                                                                                                                 | Cardiovascular disease, coagulation disorders, collagen vascular disorders, infections, metabolic diseases, neoplasms, trauma                                                      |
| Pleural effusion     | Acute atelectasis, congestive heart failure, cirrhosis with ascites; hypoproteinemia, peritoneal dialysis, postoperative, postoperative, postpartum, venous obstruction, congestive heart failure | Collagen vascular disorders, gastrointestinal diseases, infections primary and secondary, neoplasms, postmyocardial infarct, pulmonary emboli or infarct, trauma, bile peritonitis |
| Peritoneal effusion  | Cirrhosis, hypoproteinemia                                                                                                                                                                        | Infections, neoplasms, pancreatitis, trauma                                                                                                                                        |

# Physical Examination

- how much ,  serious

# color

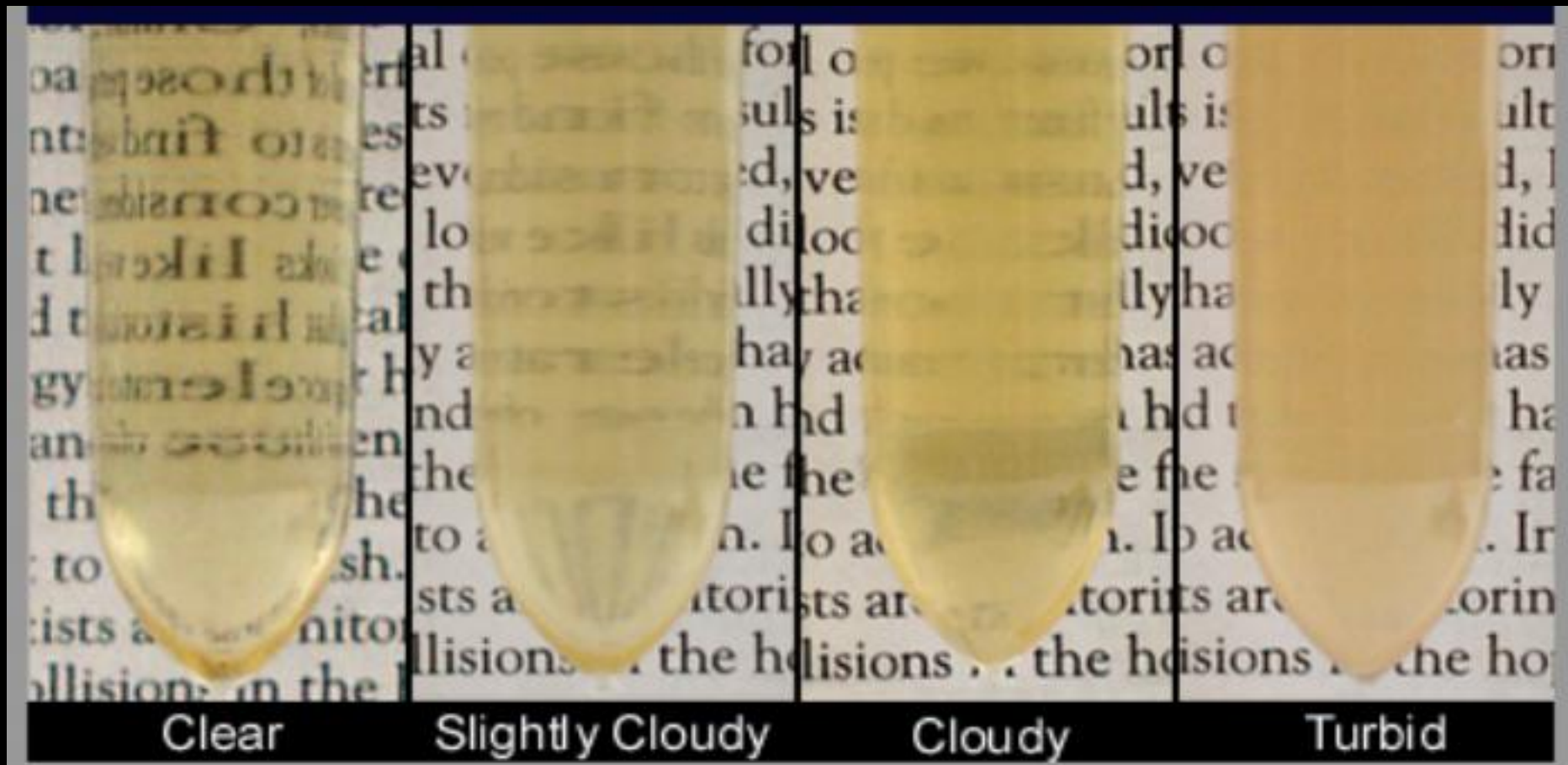


Red :injure ,tumor, tuberculosis, bleeding

White: pyogenic infection

Yellow: jaundice

# transparency



# Specific gravity

- Exudate  $>1.018$
- Transudate  $<1.015$

# Chemical examination

- PH
- Exudate  $<7.2$  bacteria -----acidic materials
- Transudate  $>7.4$

# Chemical examination

- Protein
  - Exudate  $>30\text{g/l}$
  - Transudate  $<25\text{g/l}$
- 
- Pleural fluid /serum protein
  - Exudate  $>0.5$
  - Transudate  $<0.5$

# glucose

- Normal = blood glucose(3.6-5.5mmol/l)
- Exudate <3.3

bacteria ,cell glycolysis

Tumor use glucose

- Transudate >3.3

enzyme

# Fluid LDH levels

- LDH is released into serosal cavities during infection, inflammation and malignant processes
- Elevated LDH or serum /fluid LDH ratios are seen in the above conditions

# LDH activity

| Tests                              | Transudate                          | Exudate                             |
|------------------------------------|-------------------------------------|-------------------------------------|
| Pleural fluid/serum protein ratio* | <0.5                                | >0.5                                |
| Pleural fluid/serum LD ratio*      | <0.6                                | >0.6                                |
| Pleural fluid LD*                  | <2/3 upper limit of normal serum LD | >2/3 upper limit of normal serum LD |
|                                    | LDH<200U/L                          | LDH>200U/L                          |

|                                       | transudate                                                                                                           | exudate                                                                                                                |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| occur                                 | when the systemic factors influencing the formation of pleural fluid are altered such that pleural fluid accumulates | when the local factors influencing the accumulation of pleural fluid are altered such that a pleural effusion develops |
| main cause                            | increased capillary permeability, etc.                                                                               | infection malignant cancer, etc.                                                                                       |
| pleural fluid/serum protein           | <0.5                                                                                                                 | >0.5                                                                                                                   |
| pleural fluid/serum LDH               | <0.6                                                                                                                 | >0.6                                                                                                                   |
| pleural fluid LDH                     | < two-thirds of upper normal limit for serum                                                                         | > two-thirds of upper normal limit for serum                                                                           |
| serum- pleural fluid albumin gradient | > 1.2g/dl                                                                                                            | <1.2g/dl                                                                                                               |
| cell count( $10^6/L$ )                | often <100                                                                                                           | often >100                                                                                                             |
| pH                                    | >7.4                                                                                                                 | <7.2                                                                                                                   |
| specific gravity                      | <1.015                                                                                                               | >1.018                                                                                                                 |
| protein                               | <25g/L                                                                                                               | >30g/L                                                                                                                 |
| glucose                               | >3.3mmol/L                                                                                                           | <3.3mmol/L                                                                                                             |
| Rivalta test                          | negative                                                                                                             | postive                                                                                                                |
| common diseases                       | hepatocirrhosis, congestive heart failure, etc.                                                                      | rheumatic fever, tuberculous pleuritis, lung cancer, SLE, etc.                                                         |

Is this pleural fluid a transudate or an exudate?

Fluid Protein 3.5 g/dL (35 g/L)

Serum total protein - 60 g/L

Serum LDH – 625 U/L

Is this pleural fluid a transudate or an exudate?

Fluid Glucose 8.6 mmol/l

PH=7.6

fluid LDH – 125 U/L

Is this ascitic fluid caused by portal hypertension? Is this a transudate or exudate?

Serum albumin = 30 g/L

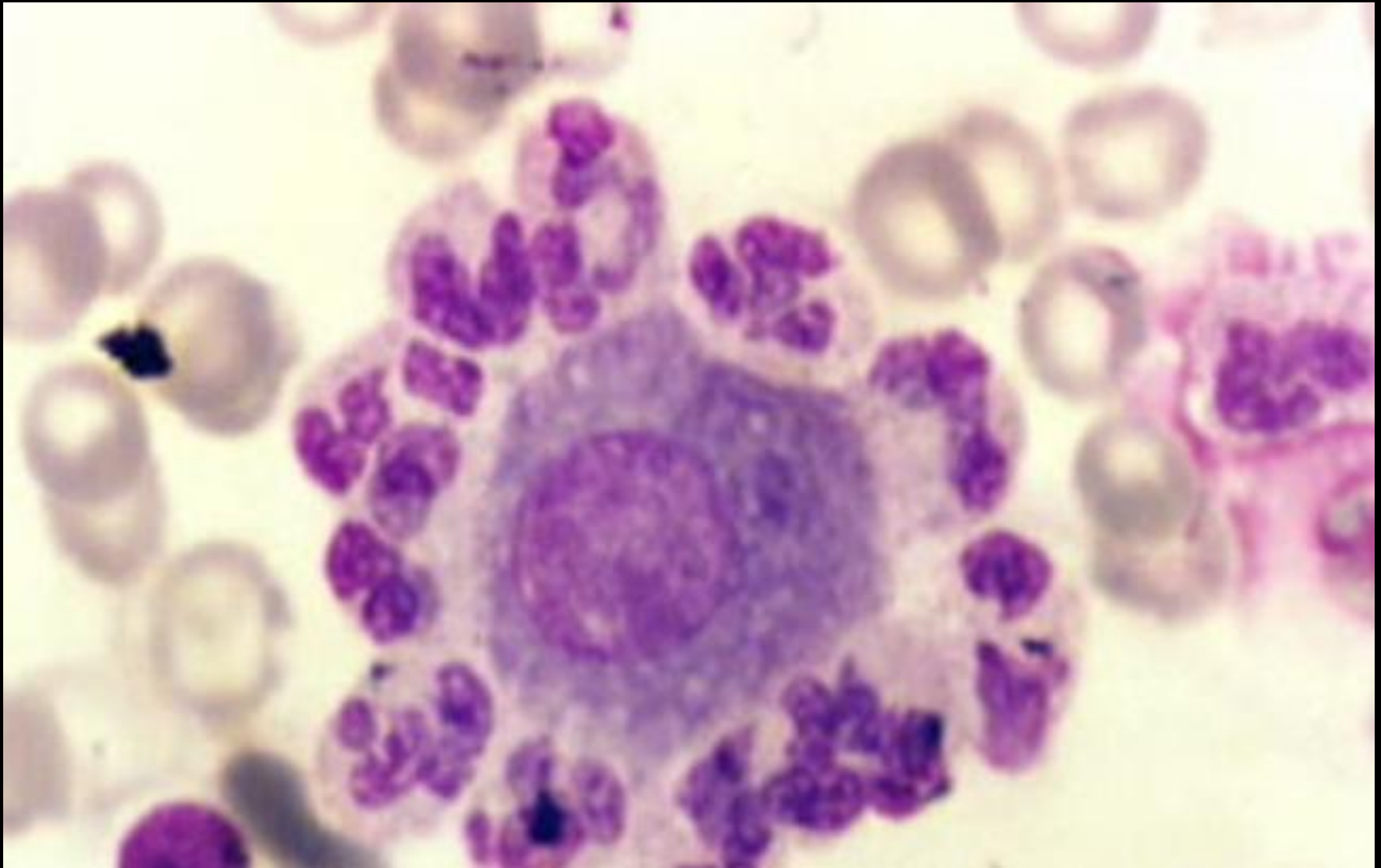
Fluid albumin = 19g/L

Fluid protein = 15g/L

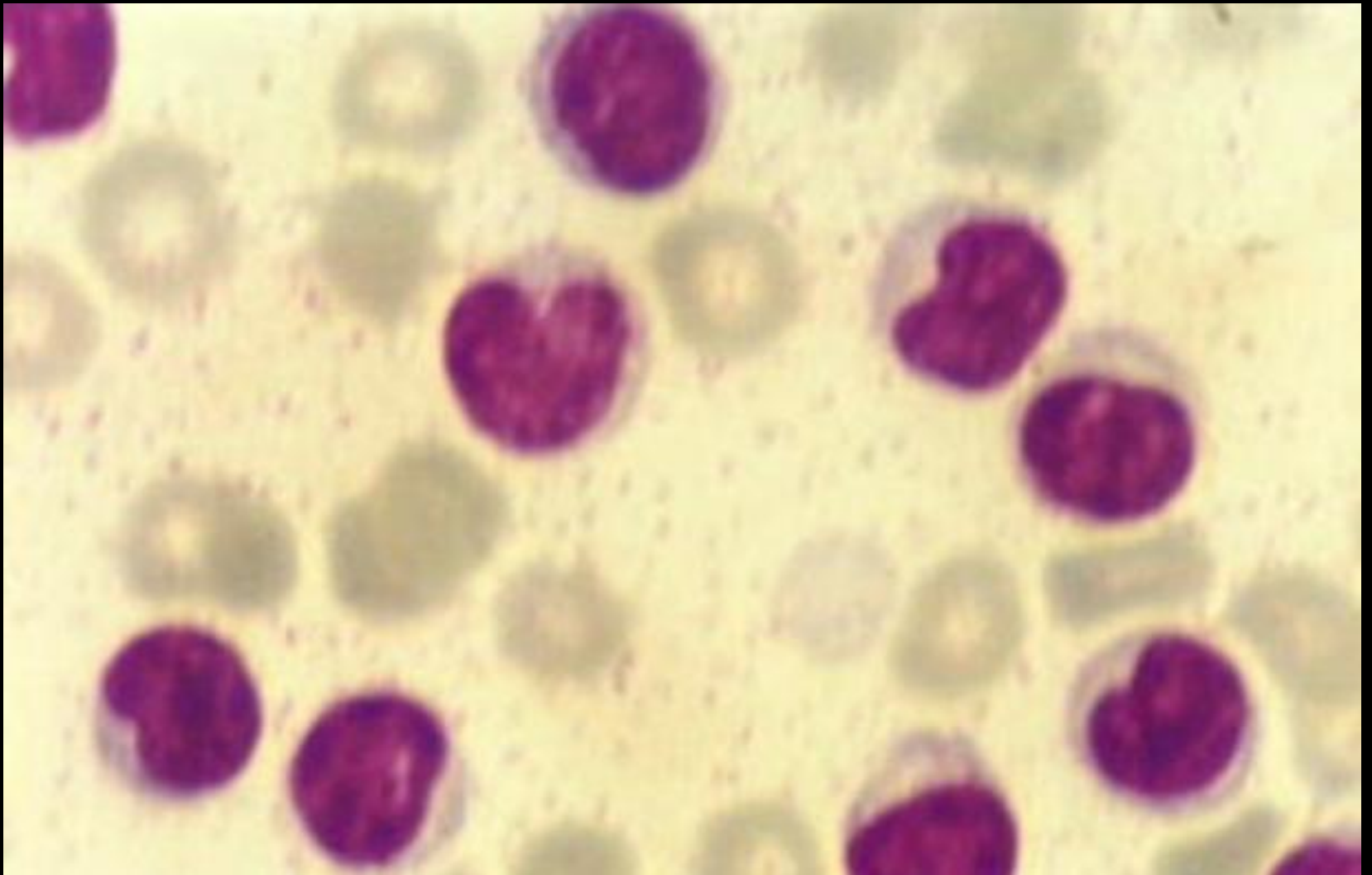
# Fluid nucleated cell count

- In general, the higher the cell count, the more likely it is a bacterial, inflammatory cause.
- Predominant polymorphonuclear/ neutrophil cell counts will indicate a bacterial infection.
- Predominant lymphocytic cell counts will indicate a tuberculous / autoimmune / malignant processes
- Elevated eosinophil counts will suggest air or blood in pleural space, or parasitic, fungal, malignant or medication related causes

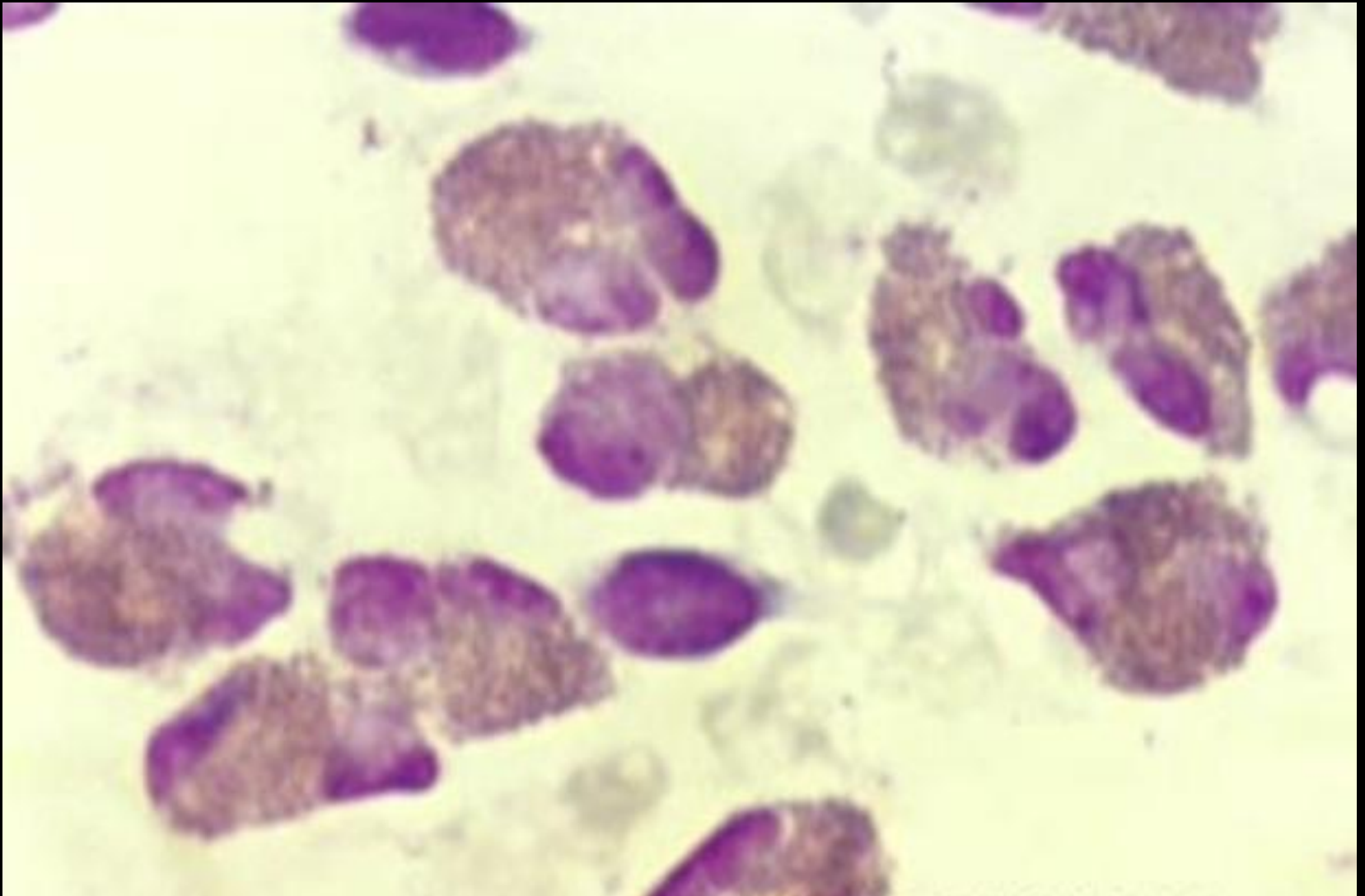
# Polymorphonuclear/neutrophil cells



# Fluid lymphocytosis



# Pleural eosinophilia



# Fluid smears and cultures

- should be obtained on specimens from patients with ascites or pleural effusion with fever, azotemia, acidosis, or confusion
- Need adequate volume of fluid (generally 10 mL per bottle)



# Fluid cytology

- **Yield is highest for patients with peritoneal carcinomatosis**
- **Yield is low for liver tumours and lymphoma**
- **Useful also in ruling out pleural tuberculosis**

# Positive cytology

