Introduction

- Challenging to everyone
- Almost any benign or malignant process may involve serous cavities
- Most cells round up in fluid, altering morphology considerably
- Classic stains used are Papanicolaou and Giemsa
- Immunocytochemistry has become a frequent standby on fluids & cell blocks
- All adjunctive tests can be performed on fluids
**The Body Cavities**

- Dynamic space
- 5-10L of fluid is filtered and reabsorbed each day
- Any significant accumulation is abnormal
- Maximum accumulation:
  - 20L in peritoneal cavity
  - 3L in each pleural cavity and
  - 600cc in pericardial cavity

**Neoplastic Exudates**

**Metastasis:**
- most frequent
- direct involvement or extension

**Primary tumors:**
- Mesotheliomas
- Serous tumors

**Advantages of fluid examination**

- Easily accessible
- Repeated access for monitoring
- Provide useful clinical information:
  - Diagnosis, adjunctive tests
  - Staging and prognosis
  - Follow up and disease monitoring
  - Frequent site of recurrence, metastasis
**Fluid collection**

- Thoracentesis
- Paracentesis
- Culdocentesis
- Peritoneal washing
- Pelvic washing
- During surgery
- During endoscopy

**SEND THE FULL VOLUME**
70 – 100ml lower limit

---

**Cells in Benign Fluids**

- Mesothelial cells
- Macrophages
- Leukocytes

---

**Normal mesothelial cells**

- Single-layered, flat lining cells of serous membranes.
- 10-20 microns in diameter
- Appear singly or in small aggregates when naturally shed
- Appear in sheets if actively washed
- Round, regular nuclei with small nucleoli. May have grooves.
Normal mesothelial cells

- Basophilic, sharply demarcated cytoplasm
- Two-tone cytoplasm with brush borders.
- Perinuclear dense zone (due to organelles)
- Peripheral clear zone with lacy edge
- Intercellular “windows” between cells
- EM: regular, LONG microvilli on cell surface

Benign mesothelial cells (Pap)
Normal mesothelial cells
Pap and Giemsa

Mesothelial cells:
**Reactive mesothelial cells**

- Cellular, with 3D clusters, mimic epithelial cells
- Nuclear enlargement, binucleation and multinucleation, can appear atypical
- Can have hyperchromasia with mostly regular nuclear membranes
- Cytoplasmic vacuolization resemble signet-ring cells (never mucin positive).
- Often with inflammatory background.
Reactive mesothelial cells (MGG)

Other cells

- Histiocytes - ubiquitous (likely transformed mesothelials)
  - Similar in size to mesothelials
  - Lightly stained cytoplasm
  - Irregular nuclei with low N/C ratio
    - Some kidney-bean shaped,
    - Multinucleated
    - Phagocytized debris
    - Foamy cytoplasm
    - Cytoplasmic vacuolation
      (MGG)

Other Cells

- Lymphocytes:
  - Chronic and chylous effusions, TB, (CLL/SLL)
- Neutrophils: Infection, infarction, rupture
- Eosinophils: designated eosinophilic if >10%
  - Trauma
  - Hypersensitivity/allergy
  - ~ 5% associated with malignancy,
  - Hydatid disease
**Congestive Heart Failure**
- Most common cause of benign effusion
- Pleural, pericardial effusion and ascites
- Usually transudates except when associated with inflammation
- Rarely blood-stained
- **CYTOLOGY:**
  - Reactive mesothelial lymphs if chronic

**Cirrhosis**
- Usually transudates:
  - Low protein synthesis
  - Portal hypertension
- **CYTOLOGY:**
  - Reactive mesothelial cells
  - Atypical mesothelial cells:
    - Papillary clusters
    - Acini, rosettes
    - Signet ring forms

**Acute inflammatory processes**
- Composed of purulent exudate
- Bacterial pneumonia
- Lung abscess
- Pleurisy, pericarditis, peritonitis
- **CYTOLOGY:** Neutrophils ++
  - Few mesothelial cells
**Systemic Lupus Erythematosus**

- Exudates due to collagen vascular disease
- Normal to high glucose
- LE cells: Fairly specific feature when present
  - Neutrophils with phagocytized cytoplasmic homogeneous degenerated material
- Tart cells:
  - Histiocytes with phagocytized degenerated nuclear debris.

### Lupus Erythematosus

![LE cell (MGG)](image)

![LE cell (Pap)](image)

**Rheumatoid Arthritis**

- Female > Male
- Chronic active disease
- Effusion male > female
- Green, turbid, pseudochylous
- Decreased glucose
- Cytology:
  - Background of granular amorphous debris (may be eosinophilic, cyanophilic, or green)
  - Elongated fibroblast-like cells and multinucleated giant cells, degenerated leukocytes (from rheumatoid nodule)
**Rheumatoid Pleurisy**

- Multinucleated giant cells
- Fibrinoid debris

**Tuberculosis**

- Pseudochylous
- When TB doesn't directly involve pleura:
  - Lymphocytosis - mostly T cells
  - Plasma cells
  - Rare Langerhans' cells
  - Decreased/absent mesothelial cells

**TB pleurisy**
**Pulmonary infarction**

- Highly atypical mesothelial cells can be present
- Eosinophils, neutrophils, siderophages and lymphocytes
- Can be blood-stained

**Radiation changes**

- Radiation pleuritis and pericarditis
- Immediate or delayed - months/years
- Differential is recurrent malignancy
- Mesothelial changes:
  - Nuclear enlargement with hyperchromasia
  - Cytoplasmic and intranuclear vacuolation and blebs
  - Multinucleation
**Miscellaneous cells**

- **Hepatocytes**
  - May be seen in right-sided pleural effusion
- **Ciliated bronchial cells**
  - Trauma, broncho-pulmonary fistula
- **Squamous cells** - dermoid cyst
- **Megakaryocytes/hematopoiesis in EMH**

**Detached ciliary tufts**

- Normal, physiologic phenomenon.
  - Anucleated fragments of ciliated columnar epithelial cells from the fallopian tube
- Seen in peritoneal fluids
- Do not confuse with organism
**Peritoneal Washings**

- Obtained intraoperatively during laparotomy for gynecologic surgery
- Mesothelium characterized by large, flat, monolayer sheets of cells fitting together in orderly mosaic pattern
- Nuclei are round, oval, regular, grooved (sometimes kidney-bean and convoluted)

**Mesothelial cells in washings**

**Mesothelial cells in washing specimen**
DAISY CELLS

Mesothelial cells in washings

Collagen ball

With thanks to Jess Crothers for great photo!
Pericardial fluids

- Very large mesothelial cells in aggregates.
- May have prominent nucleoli
- Mechanical, d/t rhythmic heartbeat

Half Time