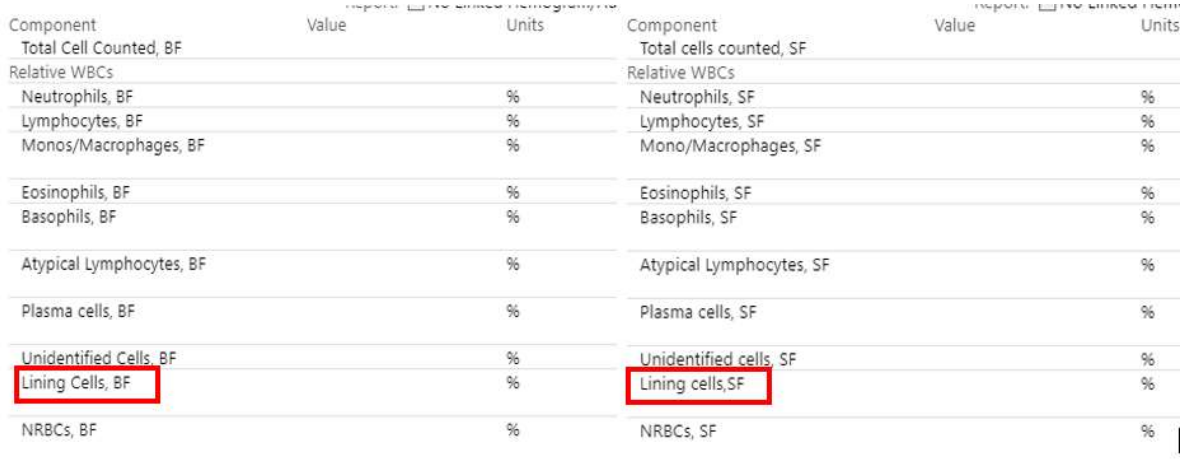
Body Fluid Lining Cells clarification

1. Part of CAP requirement regarding reporting out Body fluid differentials is to report out lining cells if we are reporting Total Nucleated Cells instead of WBC. Starting today, **you must** report out lining cells along with the WBCs (e.g. Mesothelial cells, synovial lining cells, ventricular lining cells, bronchial lining cells, epithelial cells) under **[Linning Cells, BF] or [Linning Cells, SF] (refer to the images below). There are resource books and Atlas in the Hematology resulting bench if you need reference of what these lining cells look like, and you can also let us know if you need a show and tell.**



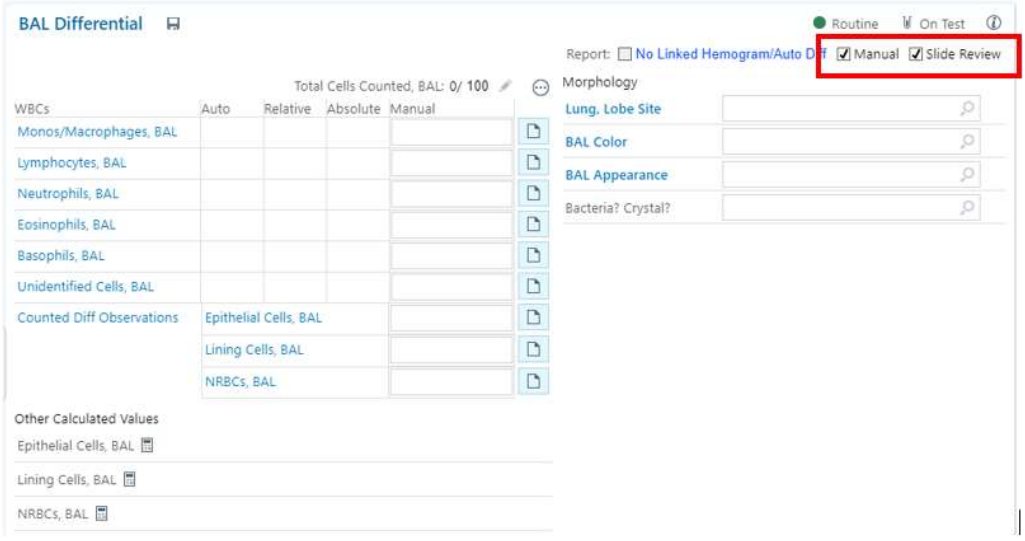
Component	Value	Units
Total Cell Counted, BF		
Relative WBCs		
Neutrophils, BF		%
Lymphocytes, BF		%
Monos/Macrophages, BF		%
Eosinophils, BF		%
Basophils, BF		%
Atypical Lymphocytes, BF		%
Plasma cells, BF		%
Unidentified Cells, BF		%
Lining Cells, BF		%
NRBCs, BF		%

Component	Value	Units
Total cells counted, SF		
Relative WBCs		
Neutrophils, SF		%
Lymphocytes, SF		%
Mono/Macrophages, SF		%
Eosinophils, SF		%
Basophils, SF		%
Atypical Lymphocytes, SF		%
Plasma cells, SF		%
Unidentified cells, SF		%
Lining cells,SF		%
NRBCs, SF		%

2. Lining cells and NRBC are added to the CSF Diff and Fluid keyboards.
3. The table below shows the cells included or not included in the 100-cell differential for each body fluid type. Please note that when it says “do not include” -the cells will be counted and noted on the diff but will not contribute towards the 100-cell differential.

Body Fluid	Unidentified Cells	Lining Cells	NRBC	Epithelial Cells
CSF	Include	Include	Include	N/A
Body Fluid	Include	Include	Include	N/A
Synovial Fluid	Include	Include	Include	N/A
BAL	Include	Do not include	Do not include	Do not include

4. BAL Diff keyboard in Beaker now has Linning cells, Epithelial cells, and NRBC built. These are not included in the calculation for the 100-cell differential. These will be classified as “Other Calculated Values” and will have an attached comment as an observation each time these are noted. Make sure the Manual and Slide Review box are checked so the results can cross to the patient’s chart.

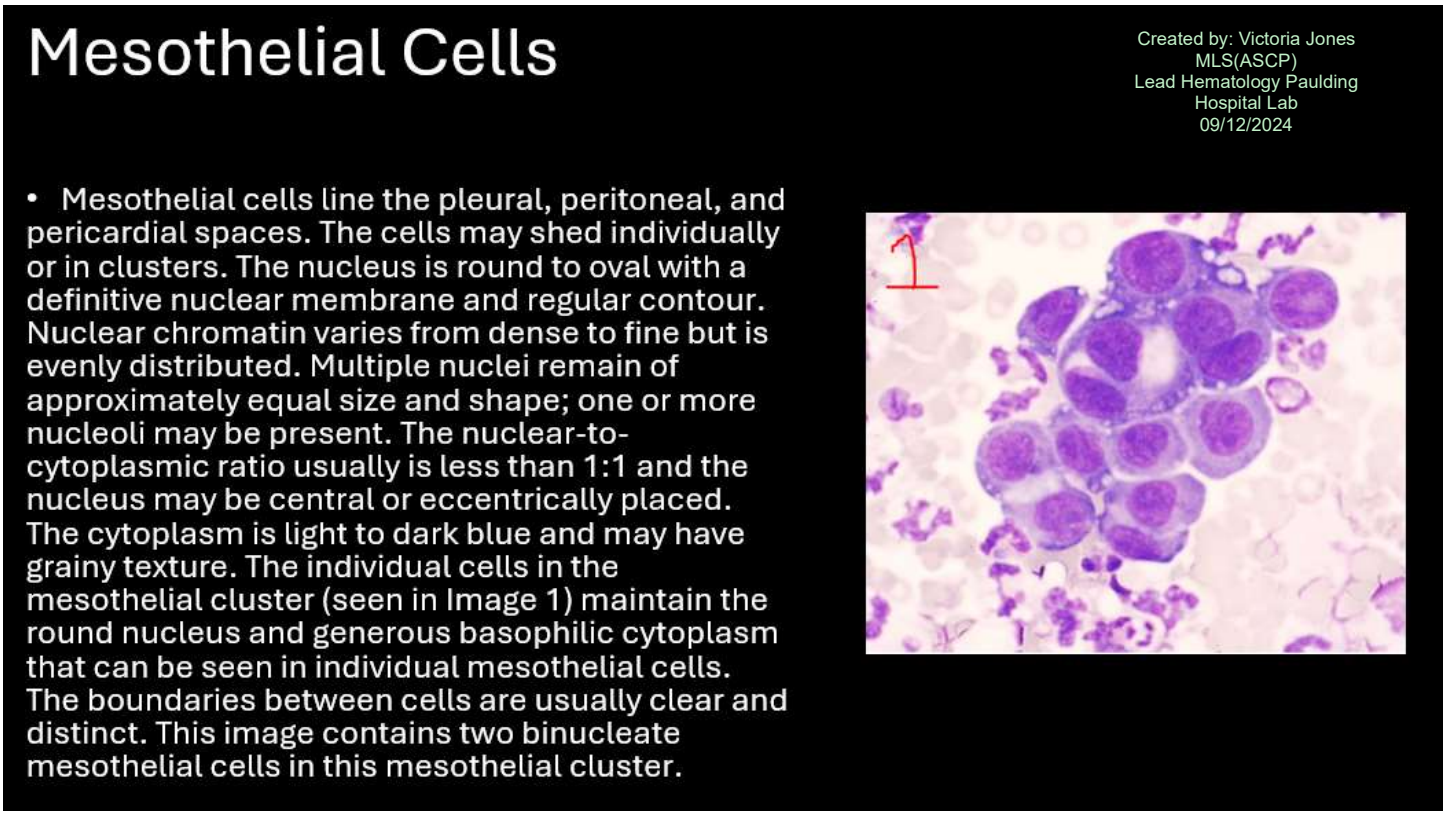


Lining cells Overview

Lining cells are specialized epithelial cells that form protective barriers and line various structures in the body, including organs, cavities, and blood vessels. Examples include squamous epithelium, endothelial cells, and mesothelial cells.

Detailed Examples:

- **Epithelial Cells:** These cells line the internal surfaces of the body and form the outer layer of the skin. They can be classified by their shape (squamous, cuboidal, columnar), the number of layers (simple or stratified), and specialized functions like secretion or absorption.
    - **Simple Squamous Epithelium:** Forms a single layer of thin, flat cells, found in the lungs, blood vessels (endothelium), and body cavities (mesothelium).
    - **Stratified Squamous Epithelium:** Consists of multiple layers of cells, including keratinized and non-keratinized forms, lining the skin and oral cavity, respectively.
    - **Columnar Epithelium:** Column-shaped cells, lining the stomach, colon, and rectum.
- **Endothelial Cells:** Specialized epithelial cells forming the inner lining of blood vessels, heart, and lymphatic vessels.
- **Mesothelial Cells:** Found in the pleural, pericardial, and peritoneal cavities.
- **Transitional Epithelium:** Found in the urinary system, specifically the ureters and urinary bladder, with cells that can change shape as the bladder fills with urine.
- **Synovial Lining Cells:** Found in the lining of joint spaces, producing synovial fluid.
- **Bone Lining Cells:** Present on bone surfaces, involved in bone remodeling.



Mesothelial Cells

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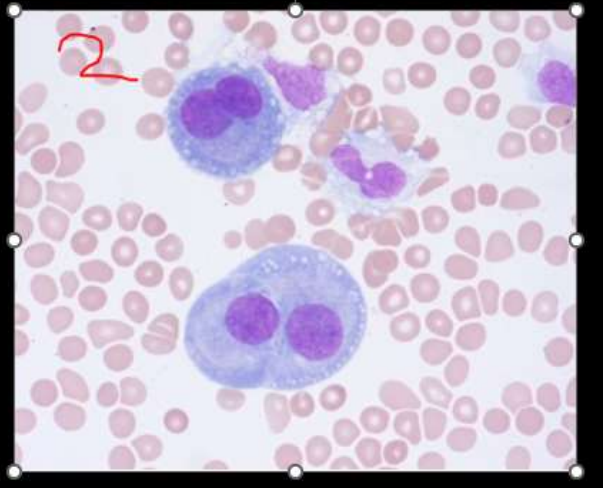
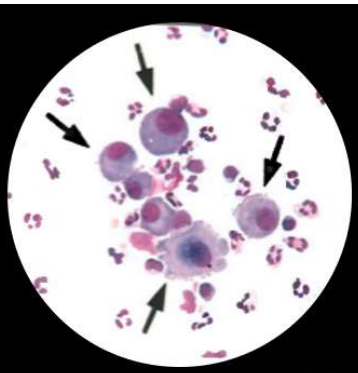
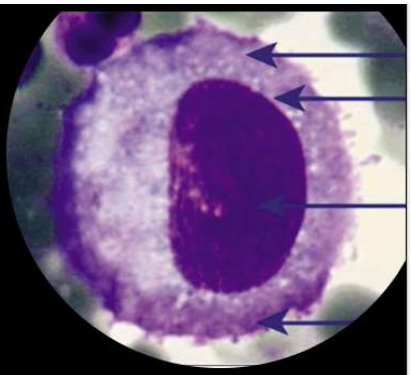
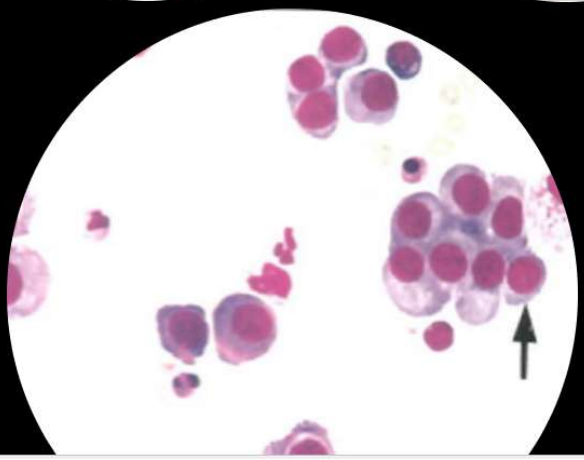
- Binucleate mesothelial cells (seen in Image 2) are a normal variant found in any fluid with mesothelial cells. Rarely, trinucleate mesothelial cells can be seen; however, any fluid that has mesothelial cells with more than 3 nuclei is abnormal and should be sent for hematology or pathology review



Mesothelial Cells







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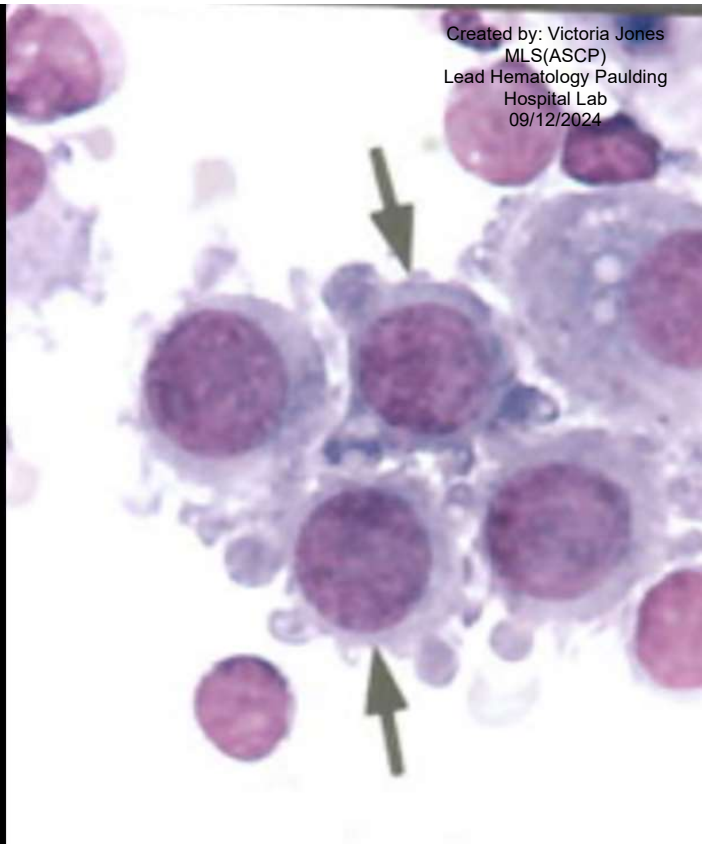
Reactive Mesothelial Cells

- The arrowed cells expressed here are reactive mesothelial cells. They are large, with large nuclei and abundant cytoplasm. The nuclear chromatin is reticulated, and an occasional nucleolus is present. The round nuclei have a regular contour and prominent membrane. The cytoplasm is basophilic and grainy with an occasional degenerative vacuole. Prominent cytoplasmic blebs and pseudopod formation are evidence of cell degeneration.
- These cells don't need path review



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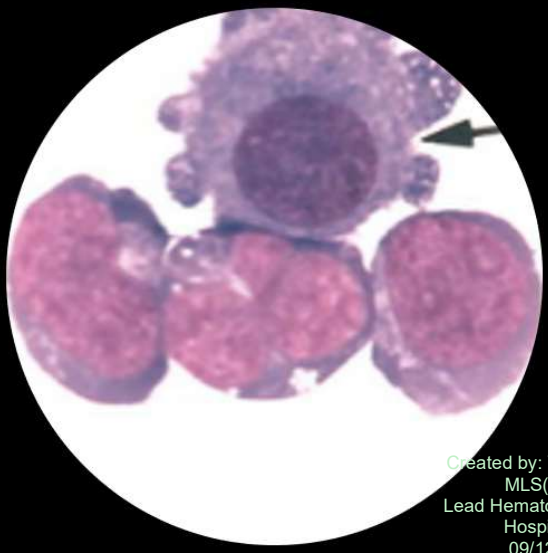
Reactive Mesothelial Cells

- Reactive mesothelial cell with the three lymphoma cells. The mesothelial cell is large with a low nuclear-to-cytoplasmic ratio; the lymphoma cells have a much higher ratio. The nuclear chromatin is reticular, and the nucleolus is apparent. However, the nuclear contour is round and regular, with a defined nuclear membrane. The small vacuoles and cytoplasmic "pseudopods" in the mesothelial cell represent degenerative/cytocentrifuge artifactual changes.



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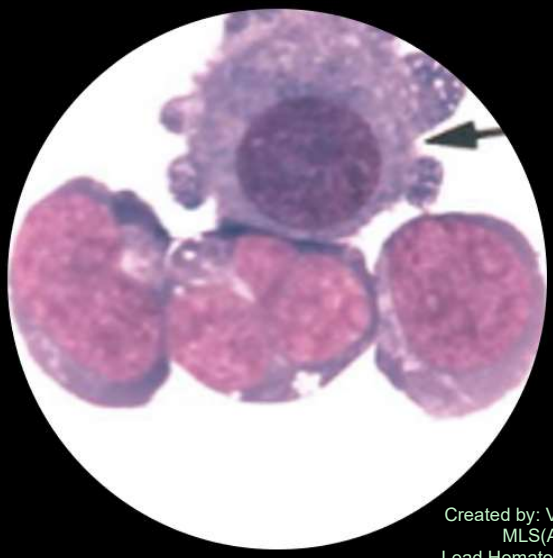

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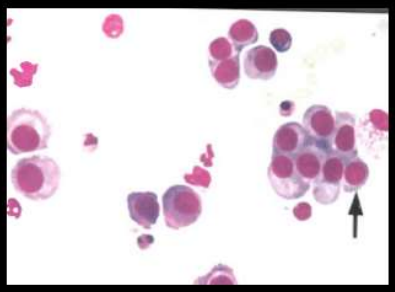
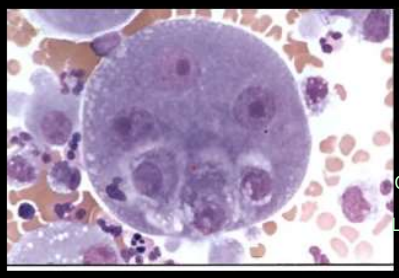
Benign vs Malignant Cells

- In Benign cells, the cells rarely show nuclear molding and contact between two nuclei is seen only with phagocytosis.
- Clusters of benign cells look like they came together with demarcation lines or thin spaces. Adjacent mesothelial cells may have a "pincer-like" junction. The outer border of the cell cluster is discontinuous.



- In Malignant cells, the nuclear molding, or indentation of the nucleus in one cell by the nucleus of a separate cell, may occur. The arrangement maybe spheroidal in shape or can assume a linear file appearance.
- Malignant clusters look like they "grew together" forming a morula-like or three-dimensional structure. It is difficult to tell where the cytoplasm of one cell stops and the other begins. The outer border of the cell cluster is continuous and smooth and may be darkly stained.



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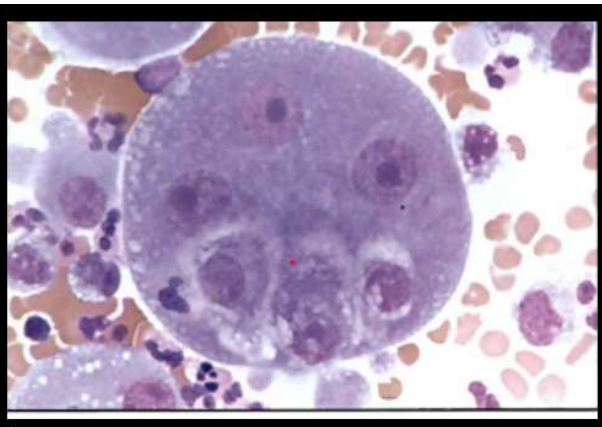
Malignant Mesothelial Cells

- Notice the top photo is a tri-nucleated mesothelial cell which has engulfed three other mesothelial cells and a PMN. The nucleoli are much larger than you would expect in a reactive meso cell.
- The bottom photo is a tight group of cells from a small cell lung carcinoma. The cells show cannibalism. The two cells in the center have been swallowed by a third whose nucleus molds to the engulfed contents.



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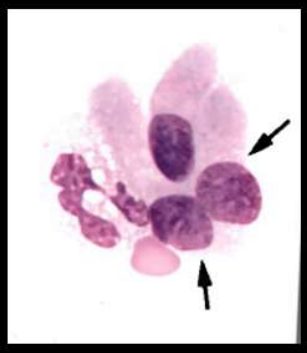

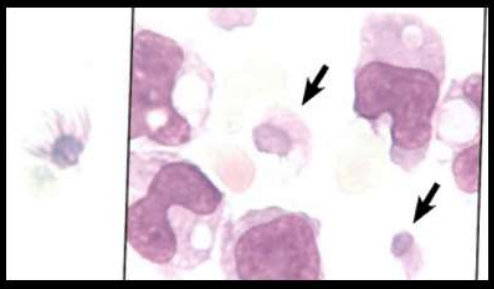

Bronchial Lining Cells

- The elongated rectangular cell with the cilia at the end (indicated by the red arrow) is a bronchial lining cell. These cells are frequently present in BAL samples.
- We are not including bronchial Lining Cells in our count. I just wanted to make sure everyone knew what they looked like.

Bronchial Lining Cells

- Ciliated bronchial lining cells may be obtained as a contaminant in bronchoalveolar lavage (BAL) fluid, indicating sampling from the bronchial tree. These cells have a unique appearance with a columnar shape, a basally placed oval to round nucleus, coarsely stippled chromatin, inconspicuous nucleolus, and amphophilic to pink cytoplasm with a row of cilia at one end. They are seen as single cells or in small clusters.

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