PULMONARY CYTOLOGY

NYU Medical Center

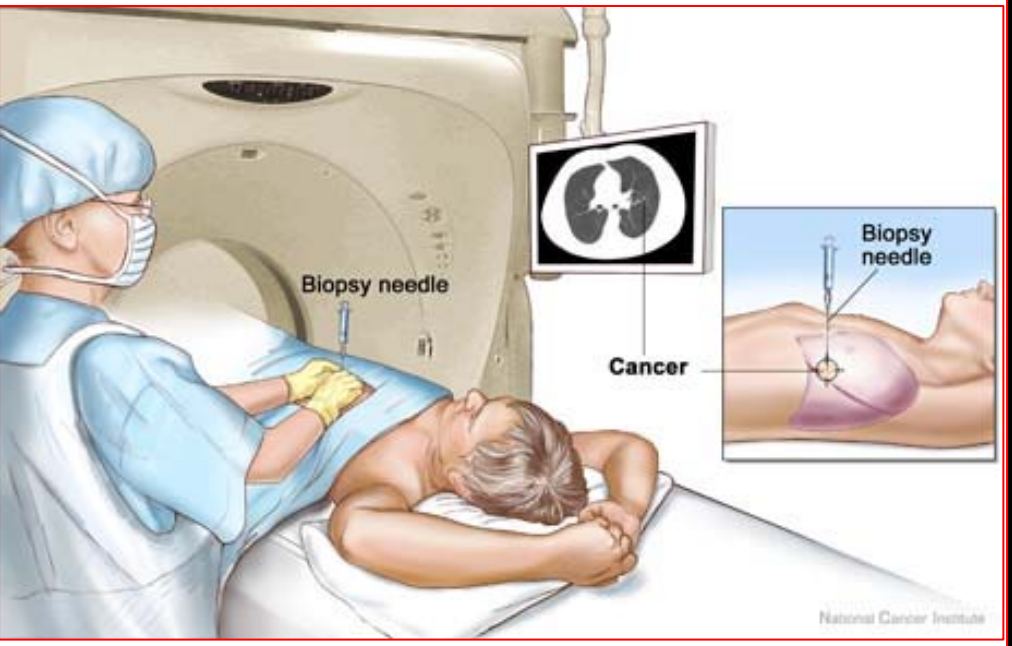
Wei Sun, M.D.

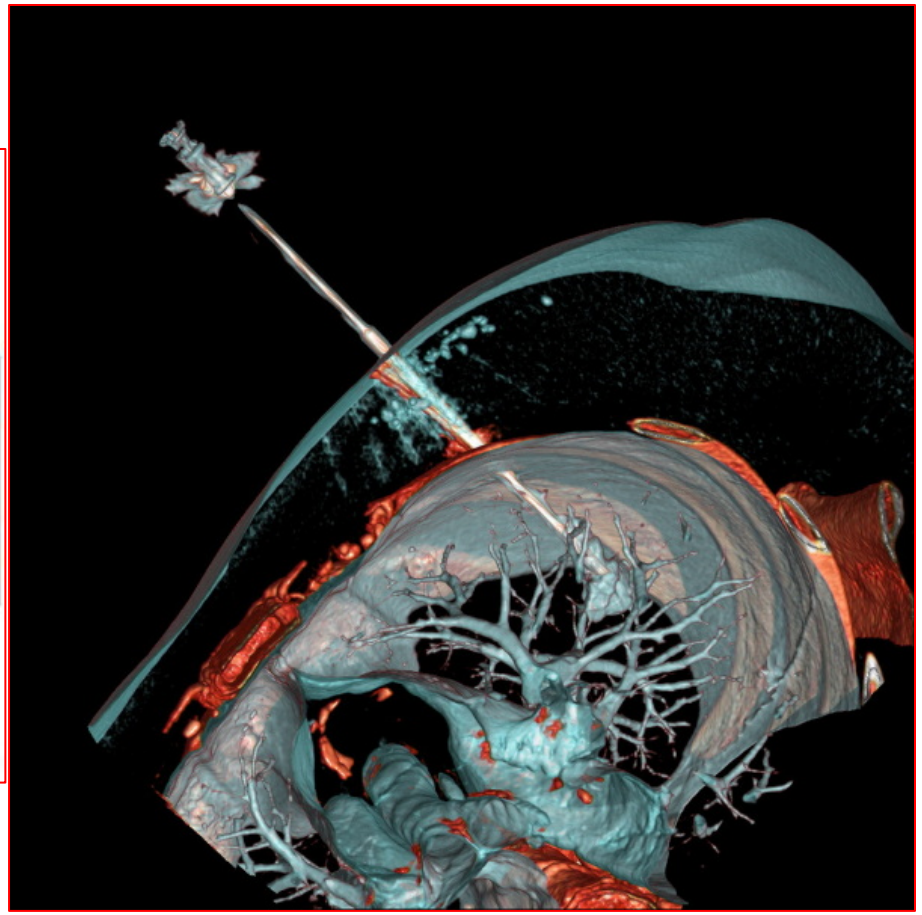
New York University School of Medicine

Cytologic Sampling Methods

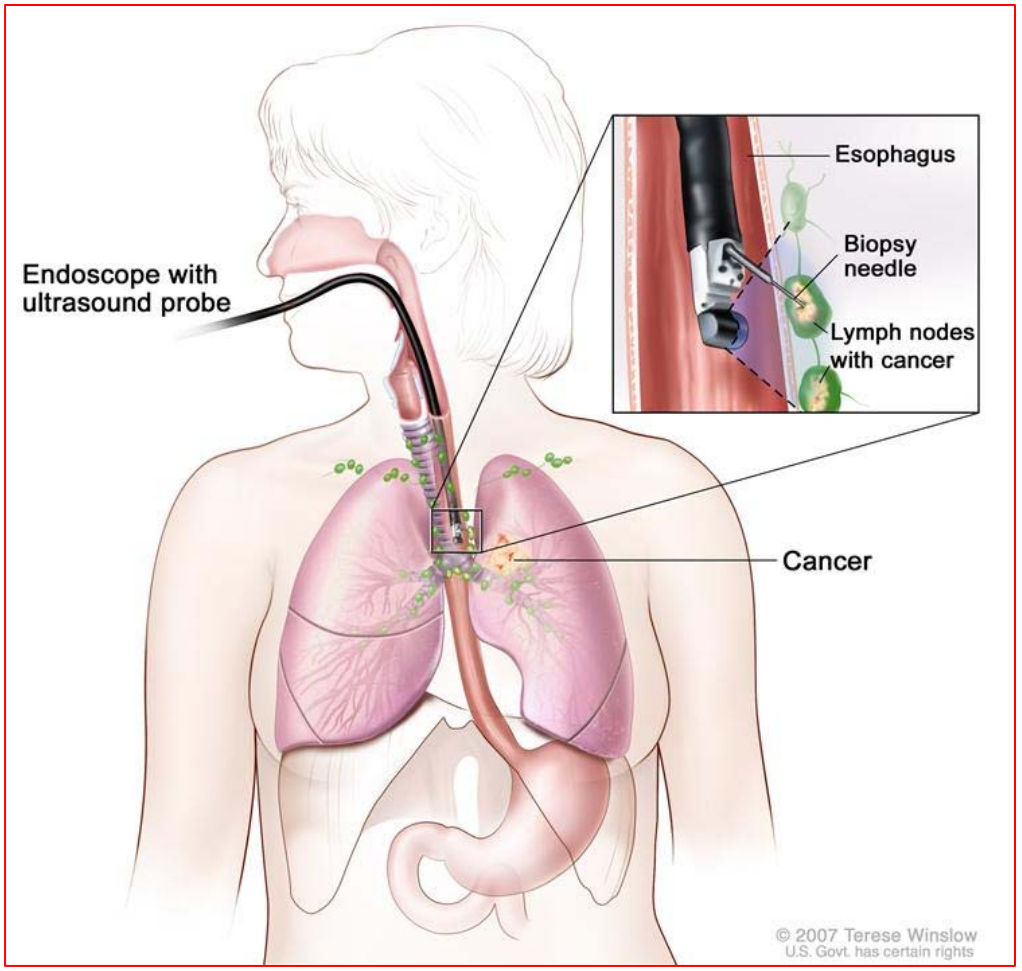
- **Sputum:** from a spontaneous deep cough, obtained on arising in the morning when a change in position
- **Bronchial Brushings:** using bronchoscope
- **Bronchial Washings:** using bronchoscope
- **Bronchoalveolar Lavage (BAL):**
  - Therapeutic: clear the alveolar space
  - Diagnostic: Pneumocystis carinii , bacteria, fungal, parasitic, bronchoalveolar carcinoma
- **FNA (CT guided and EBUS guided)**

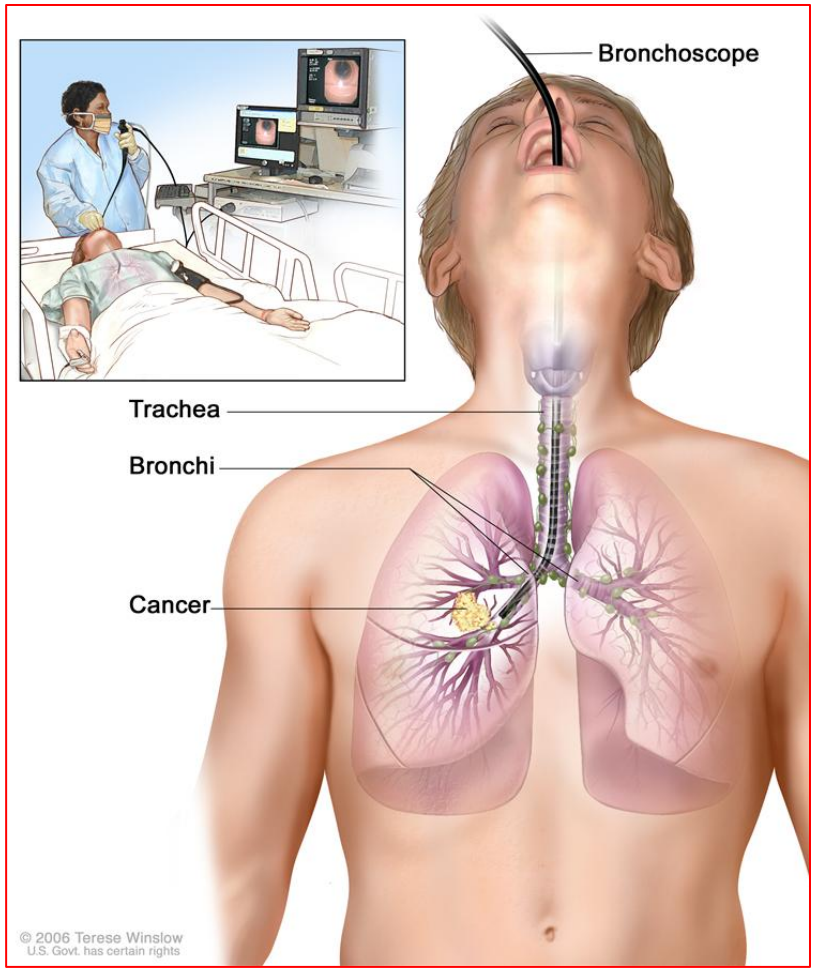
CT Guided Lung FNA





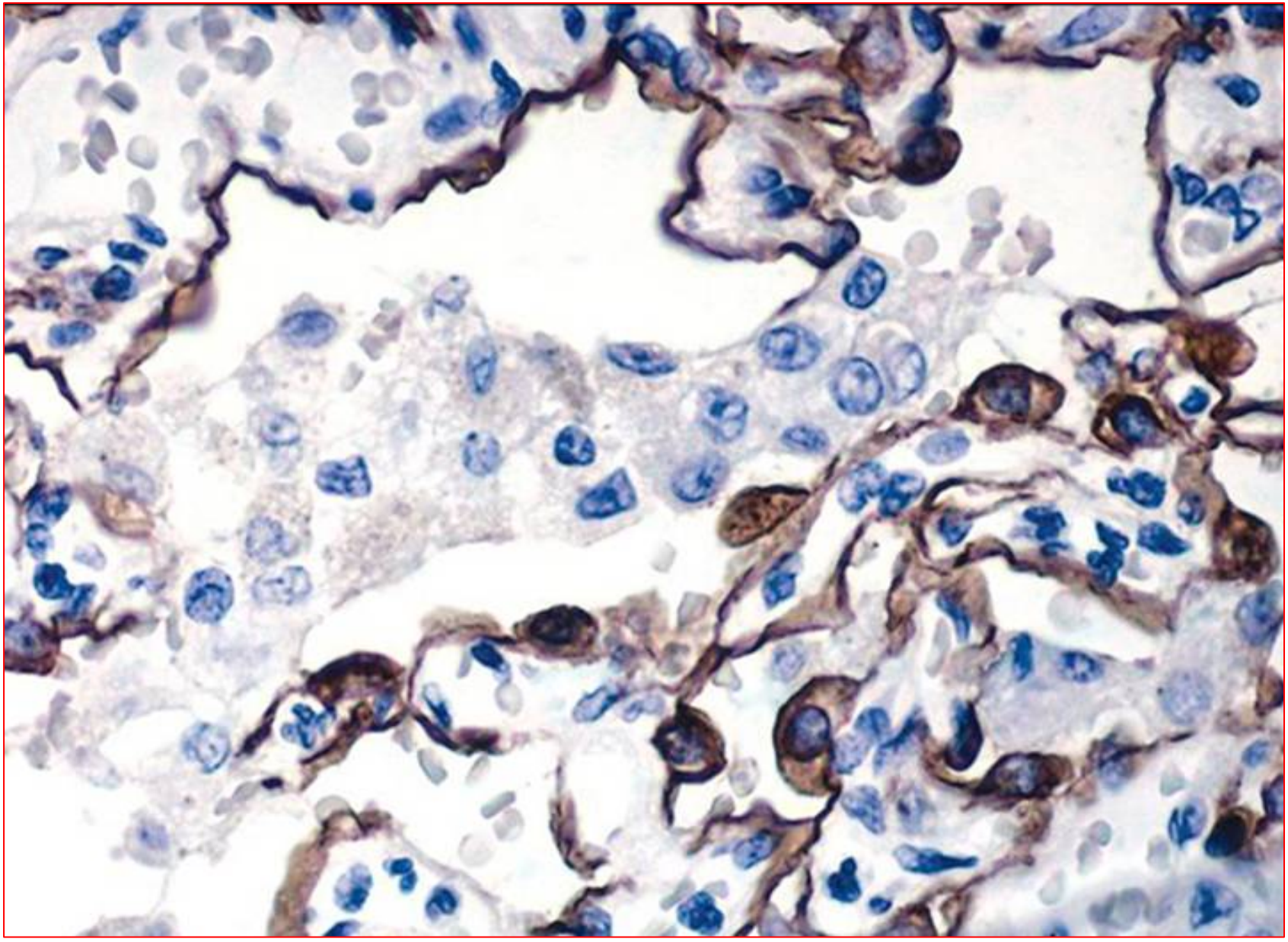
Endobronchial Ultrasound (EBUS) guided Lung FNA



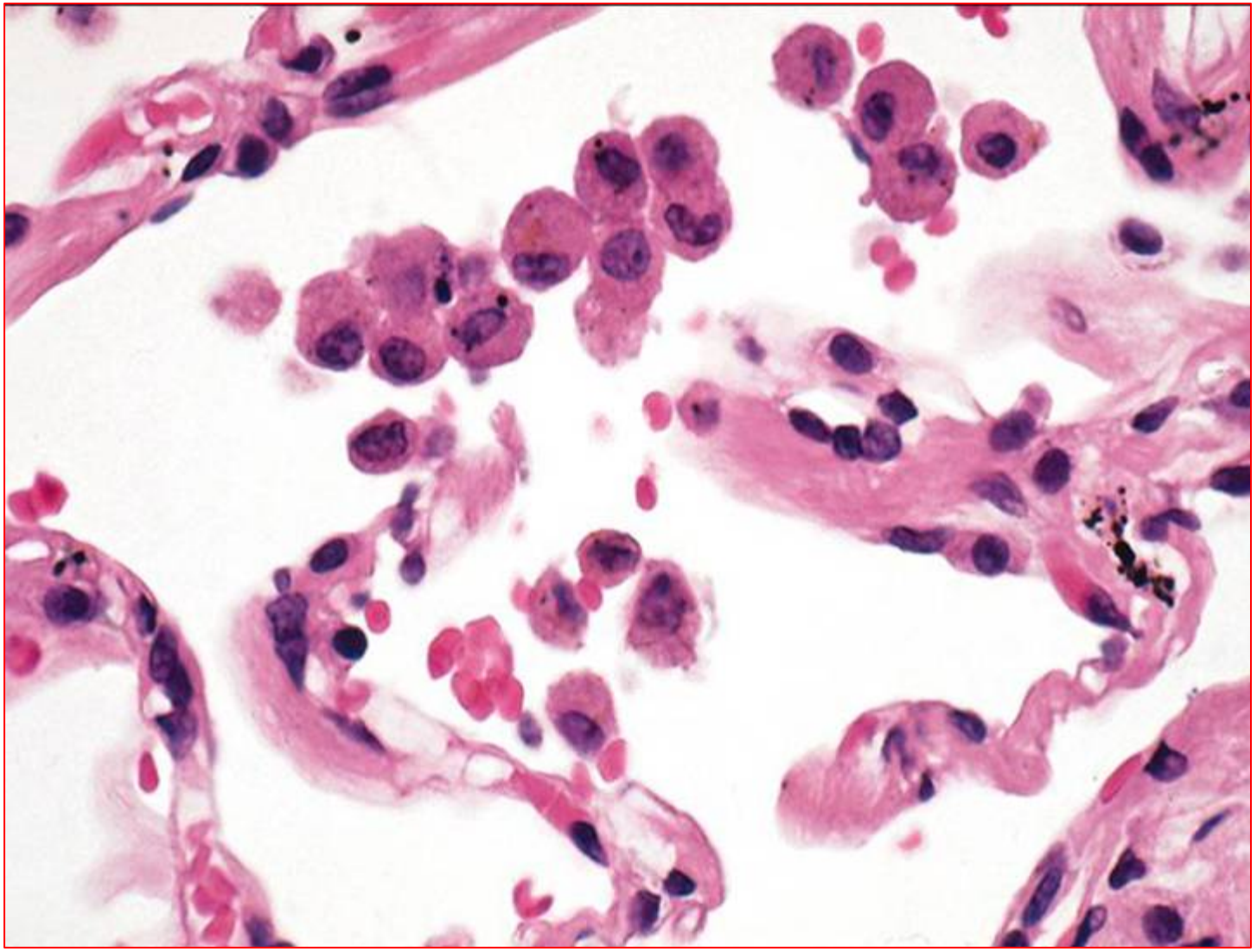


I. Non-Tumor Pulmonary Cytology

Pulmonary alveoli (AE1/AE3), pneumocyte I & II



Pulmonary alveolar macrophages

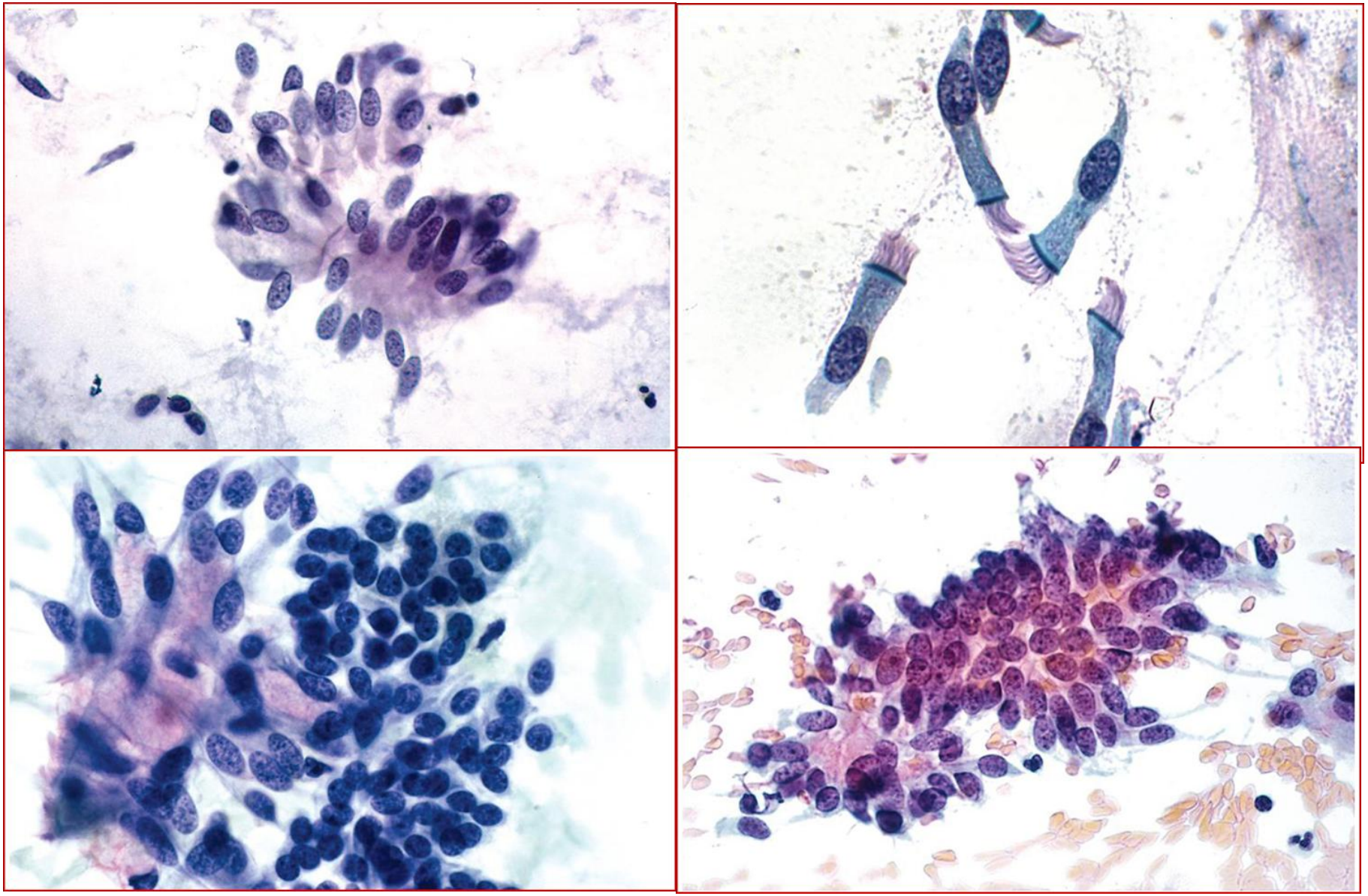


Normal Bronchial cells

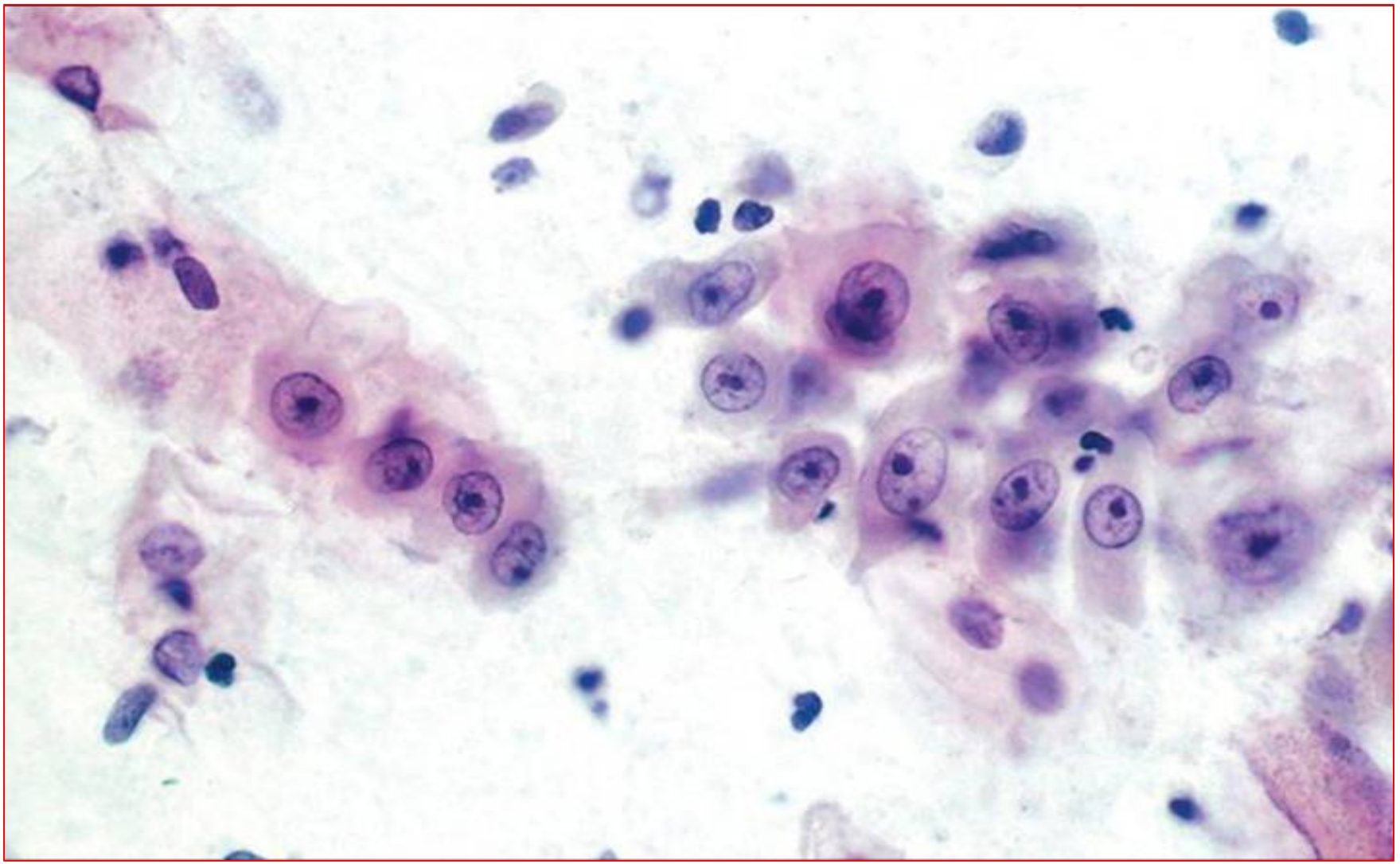
- May be hypercellular
- Often elongated
- Round nuclei
- Fine chromatin
- Cilia

- CK+
- TTF-1+

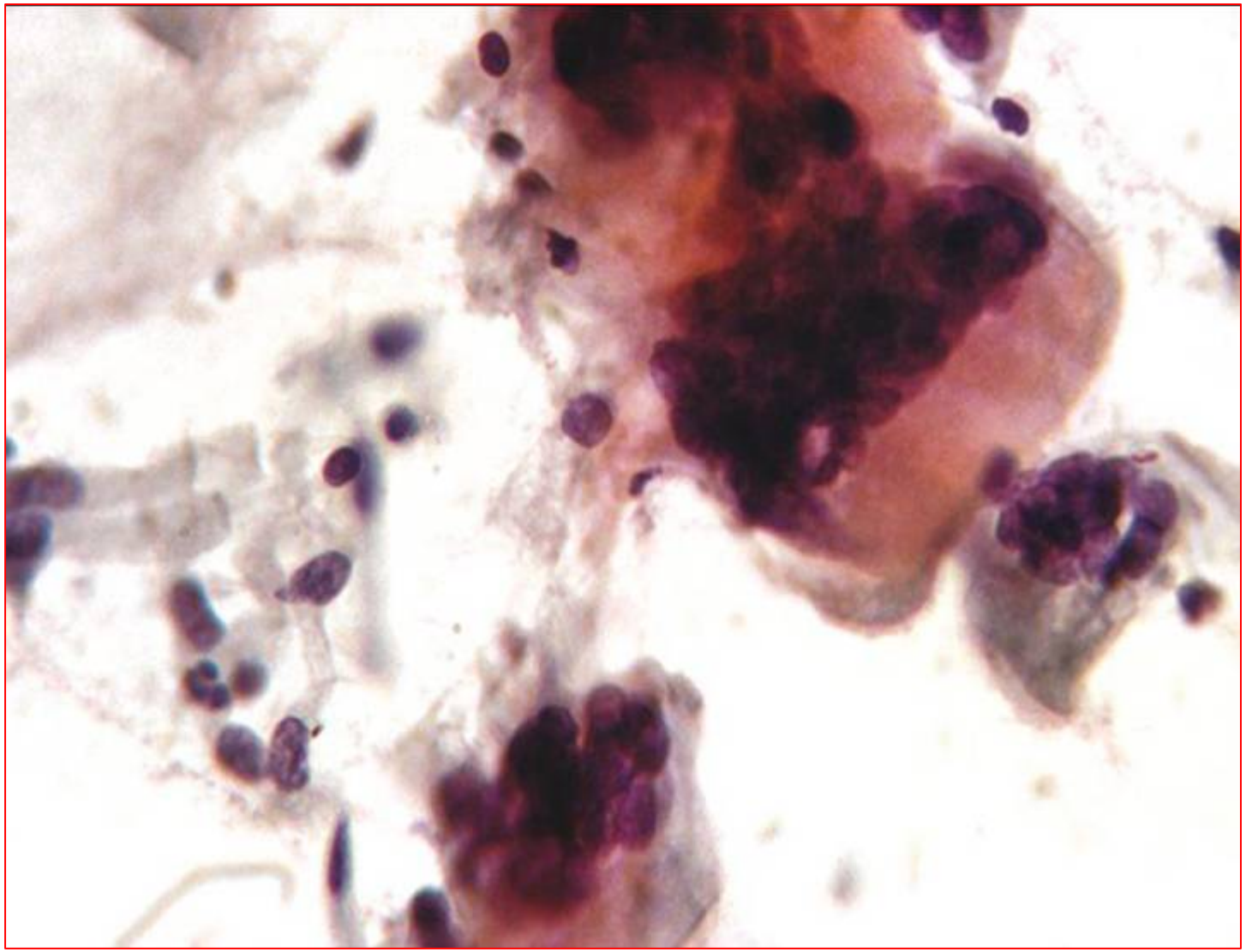
Benign bronchial cells



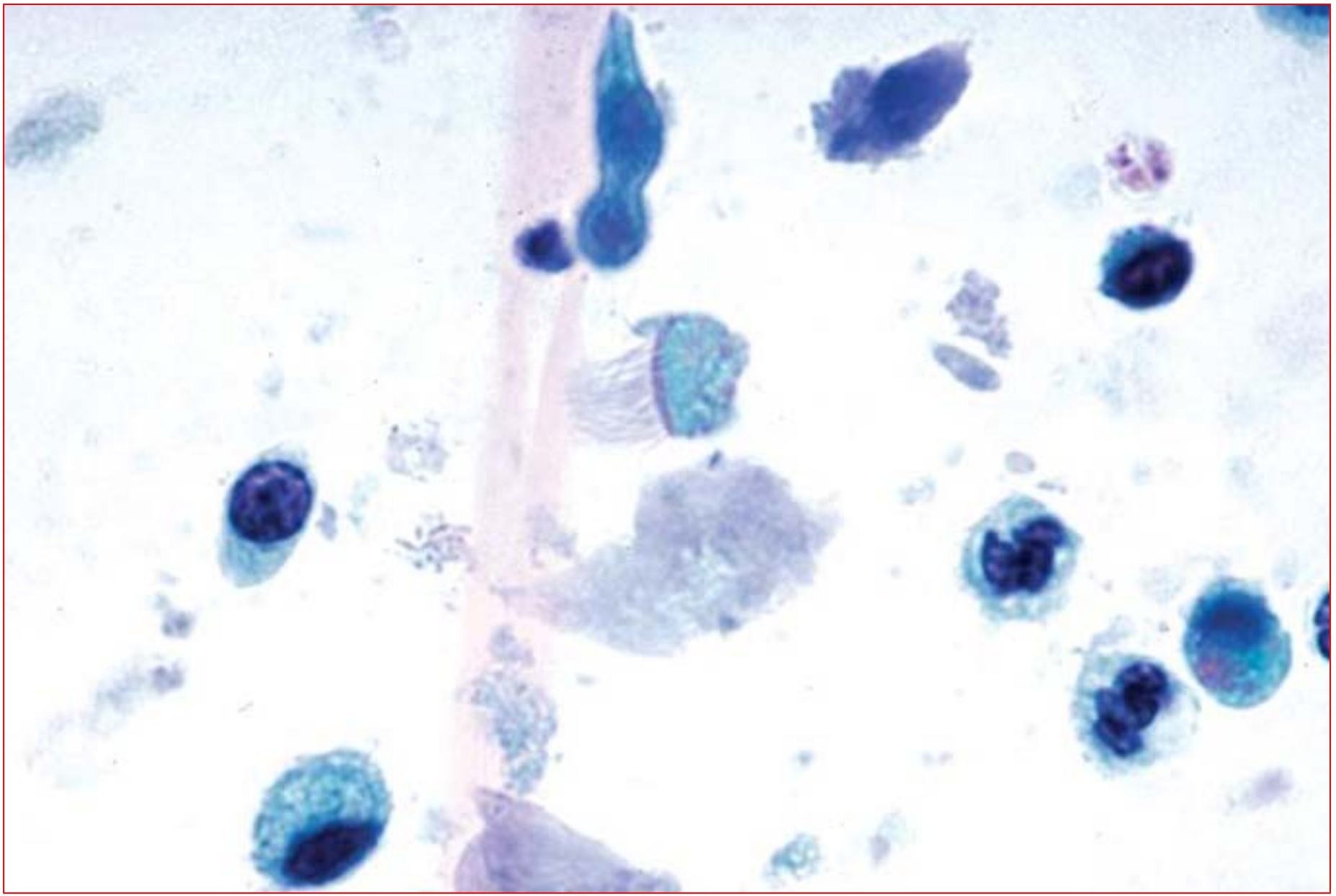
Nonspecific bronchial cell atypia: Reactive



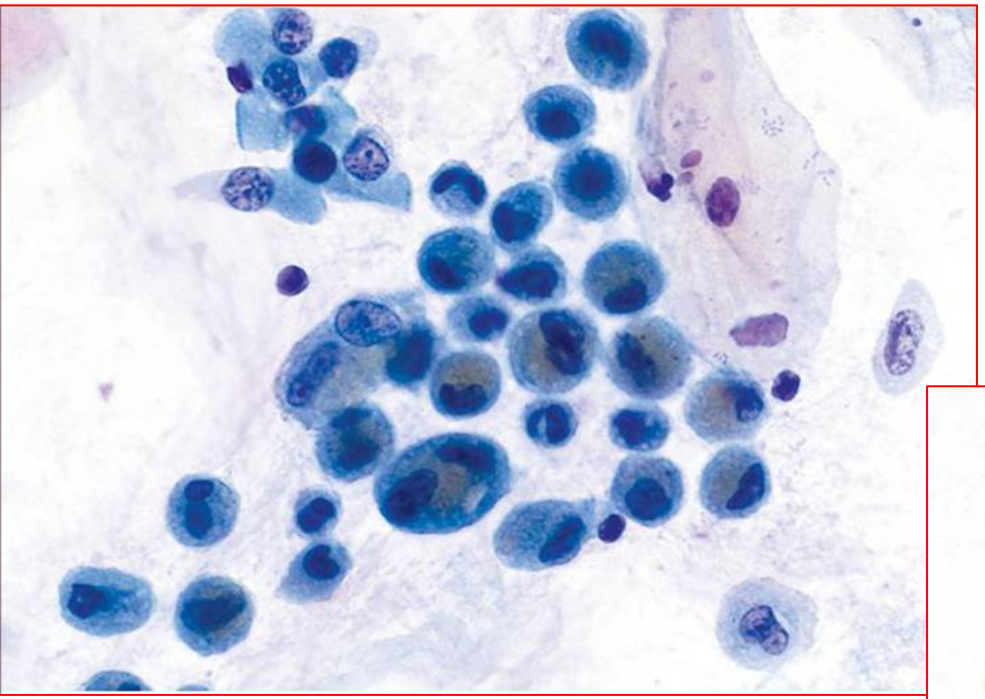
Nonspecific bronchial cell atypia: Syncytia

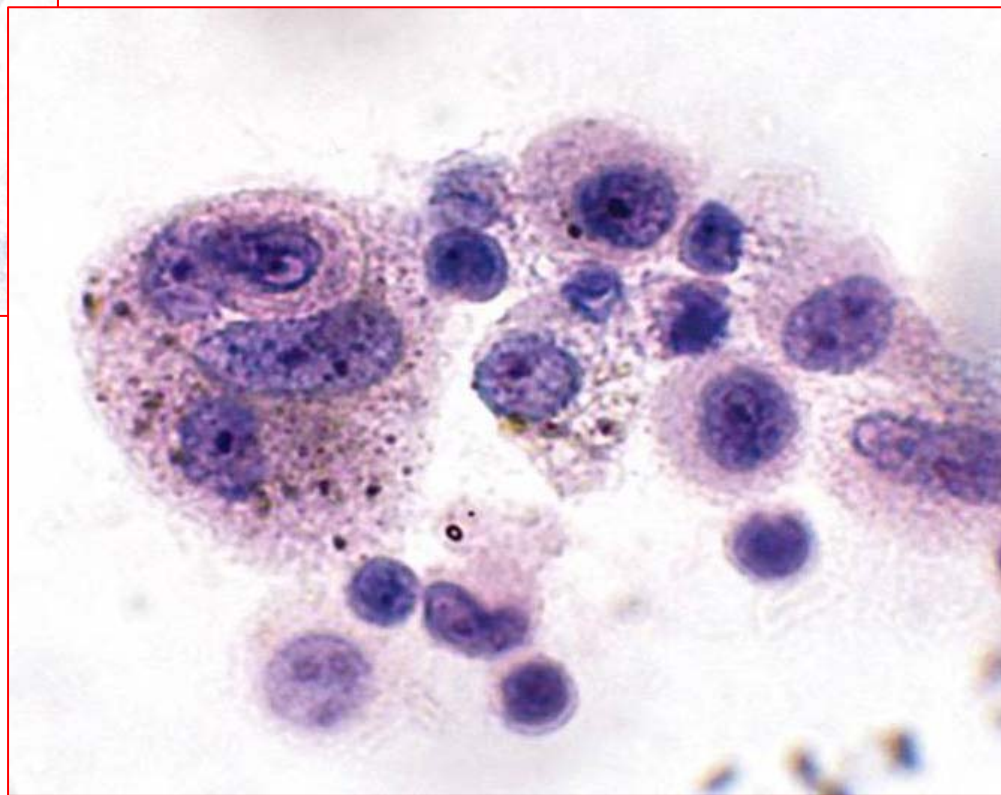


Ciliocytophthoria

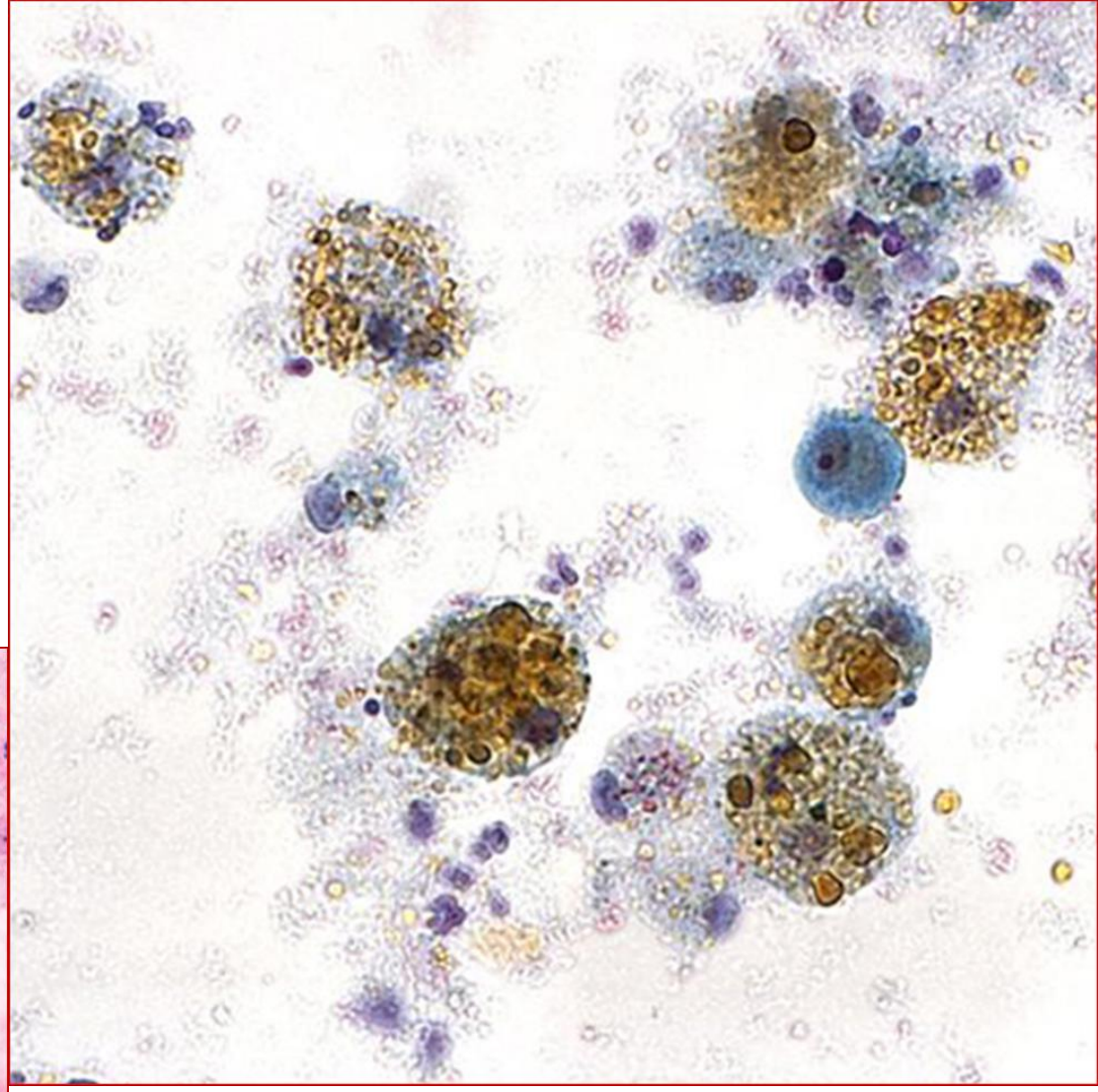


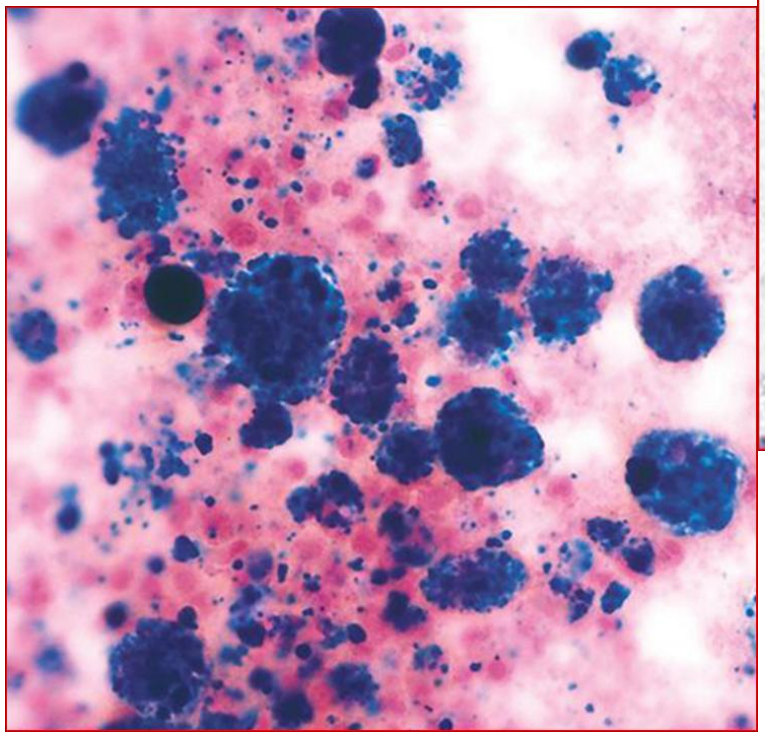
Pulmonary macrophages (dust cells)





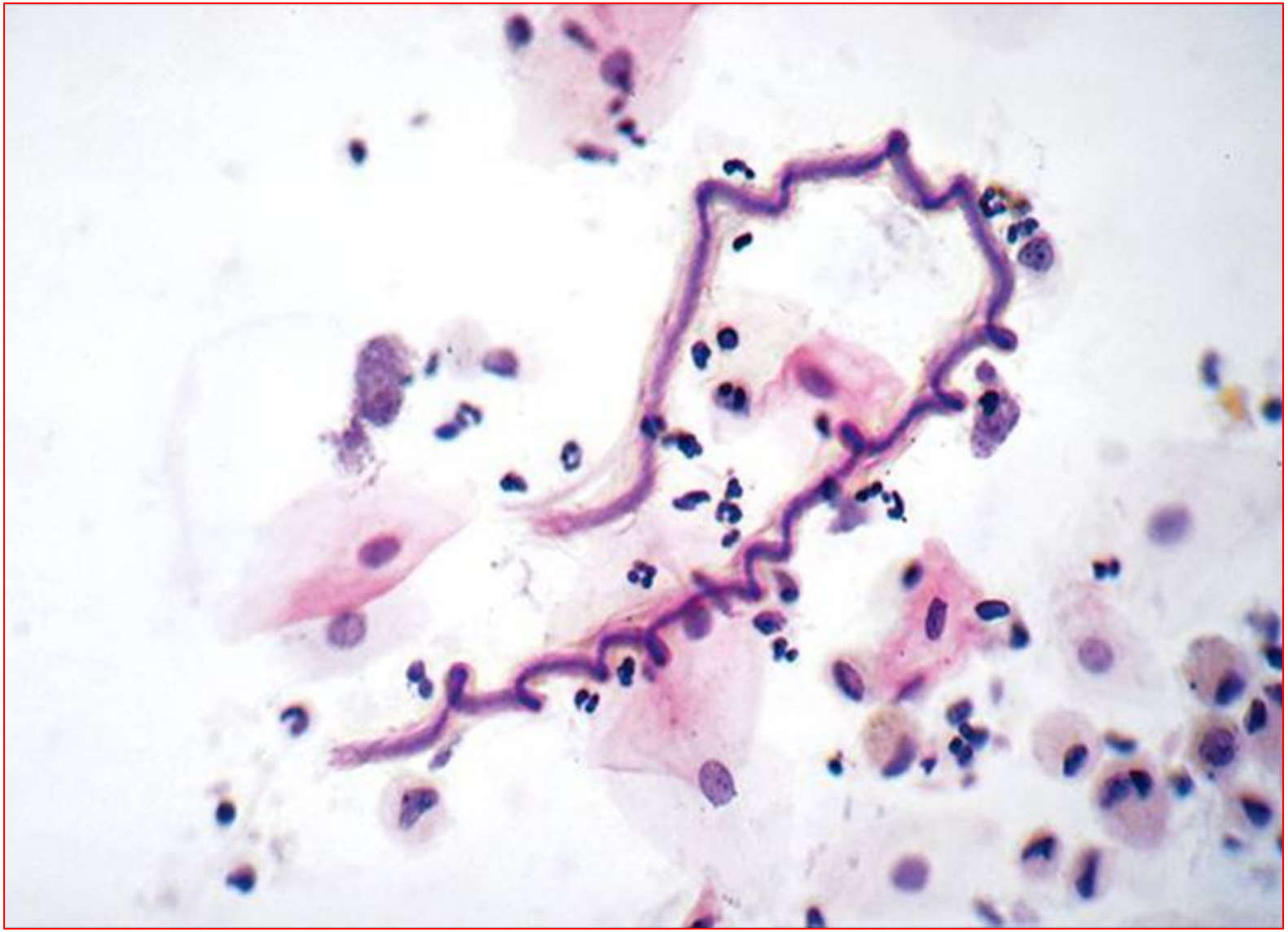
“Heart failure” cells



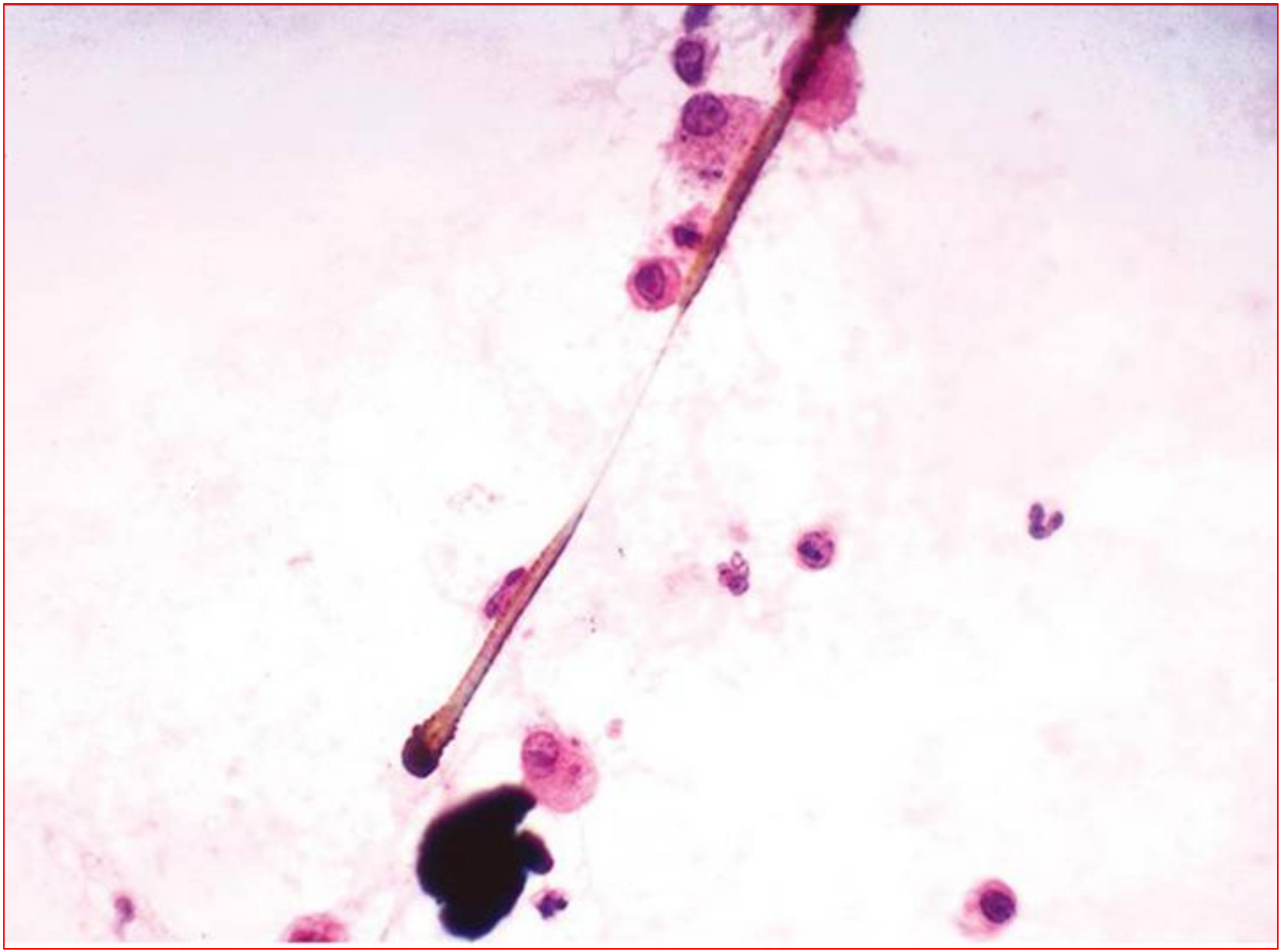


Charcot-Leyden crystals

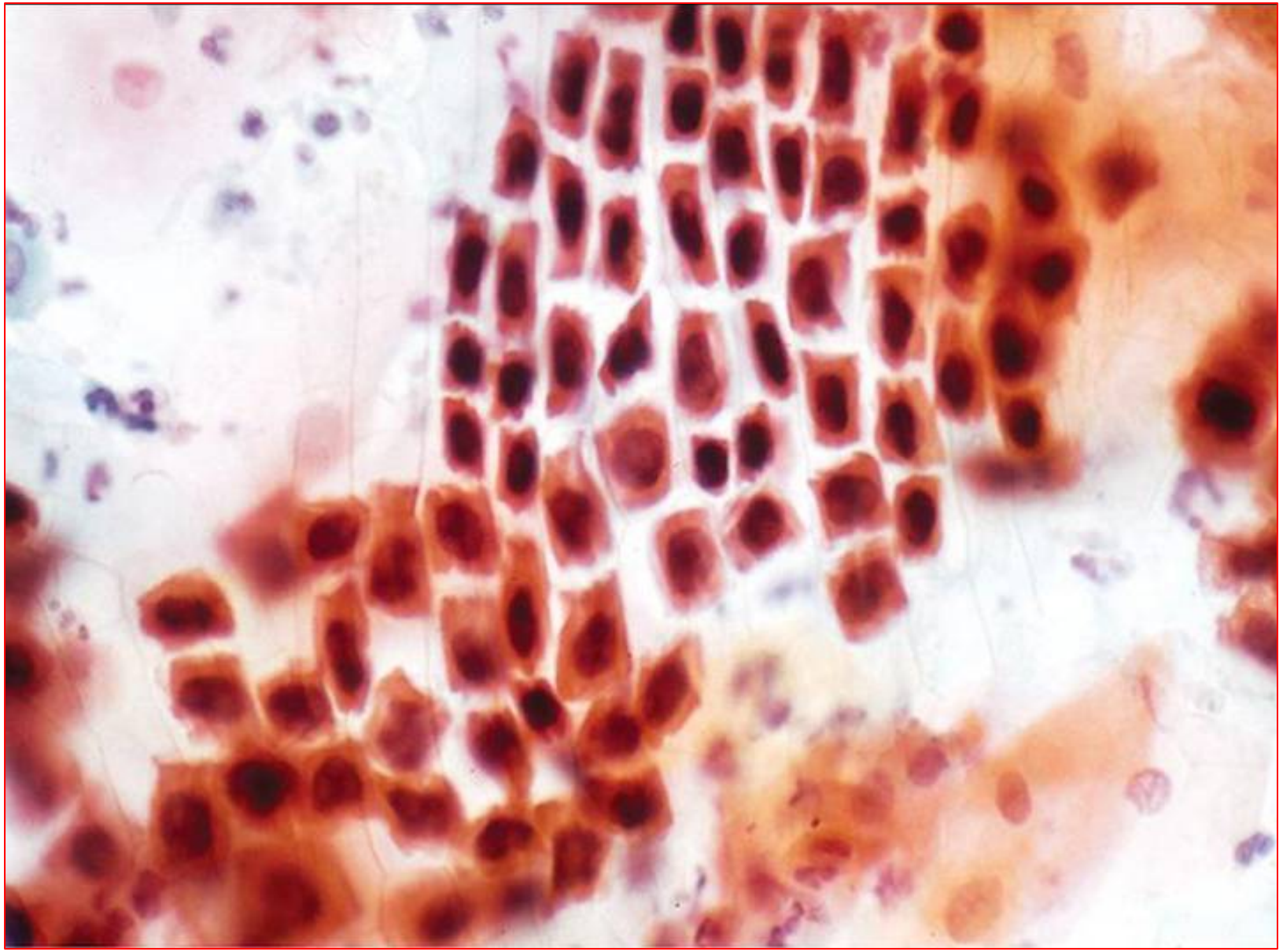
Curschmann spiral



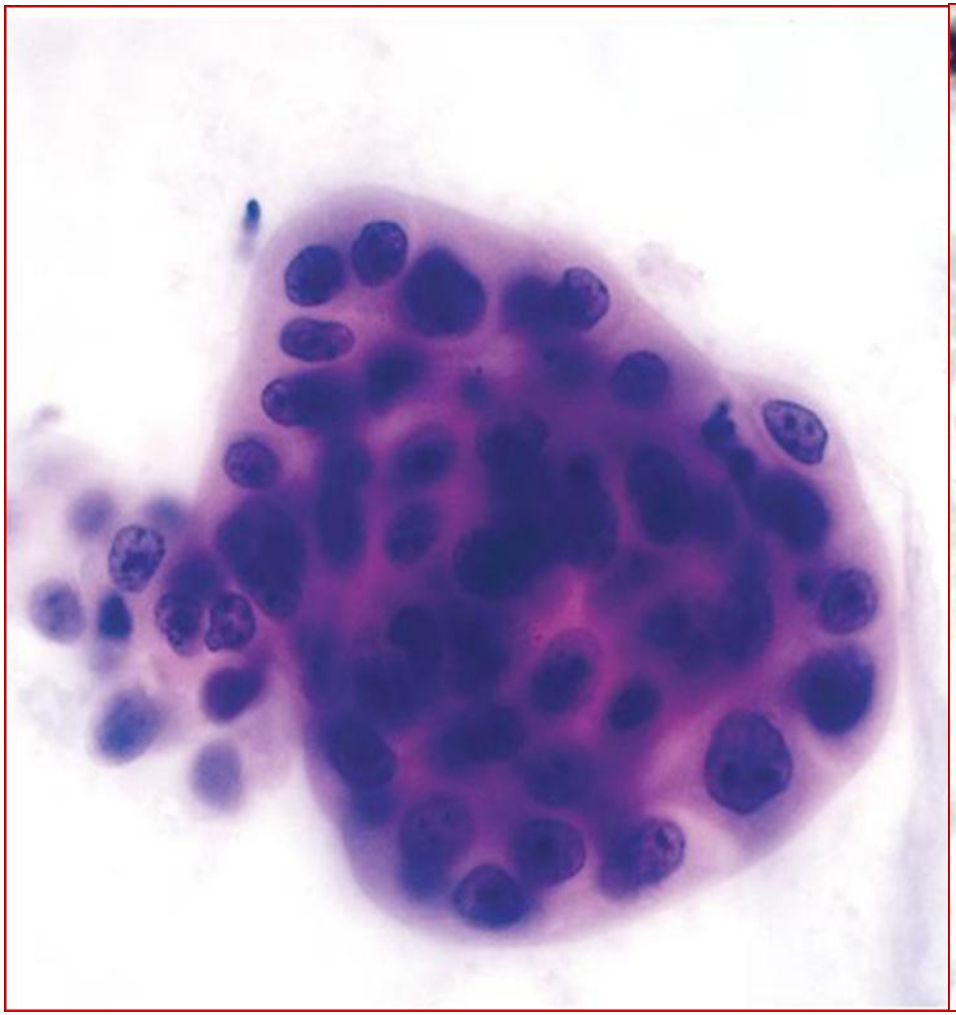
Ferruginous Bodies (Asbestos Bodies)

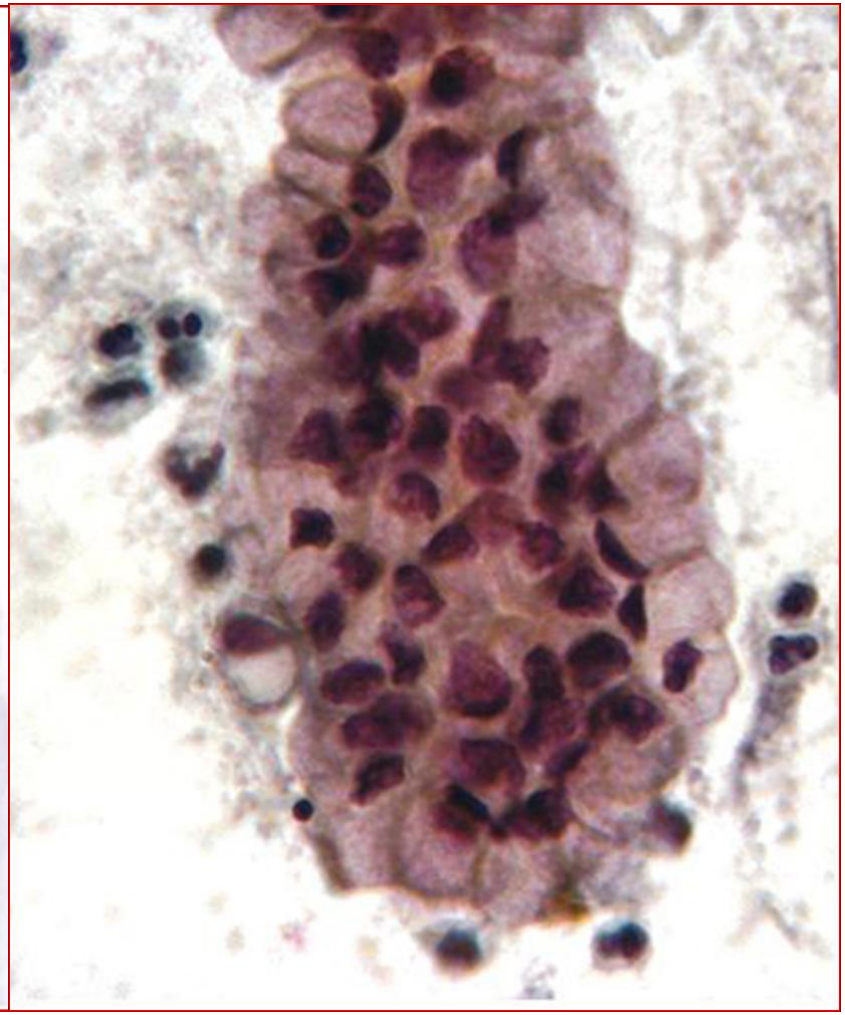


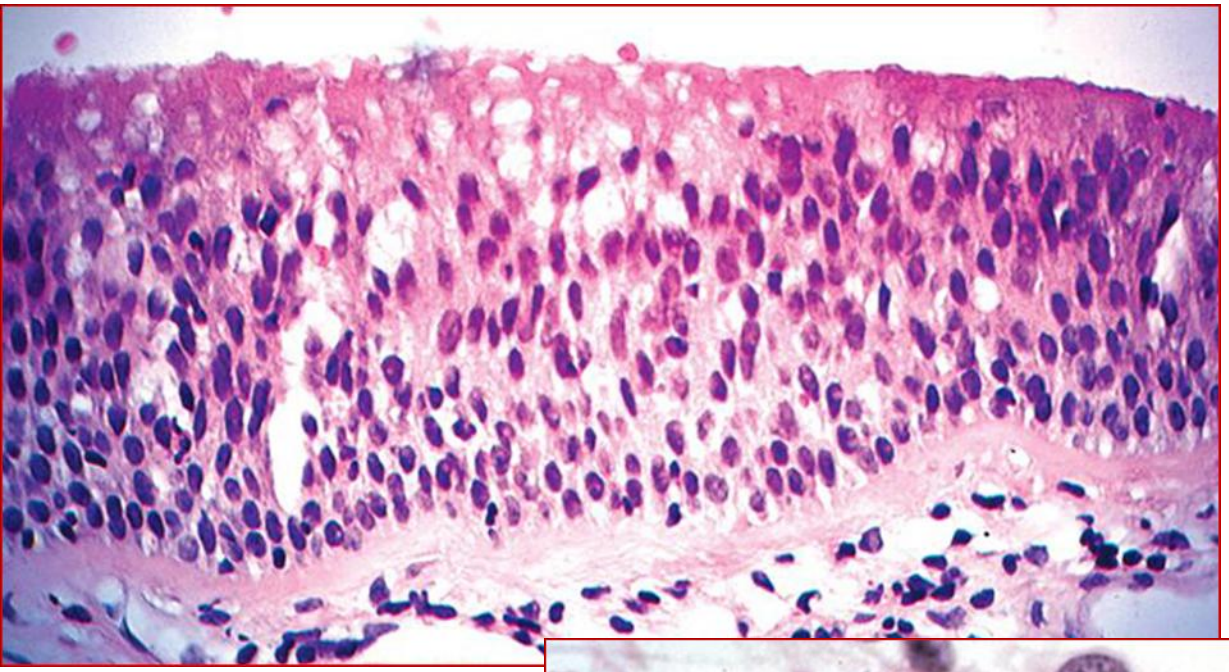
Vegetable (plant) cells



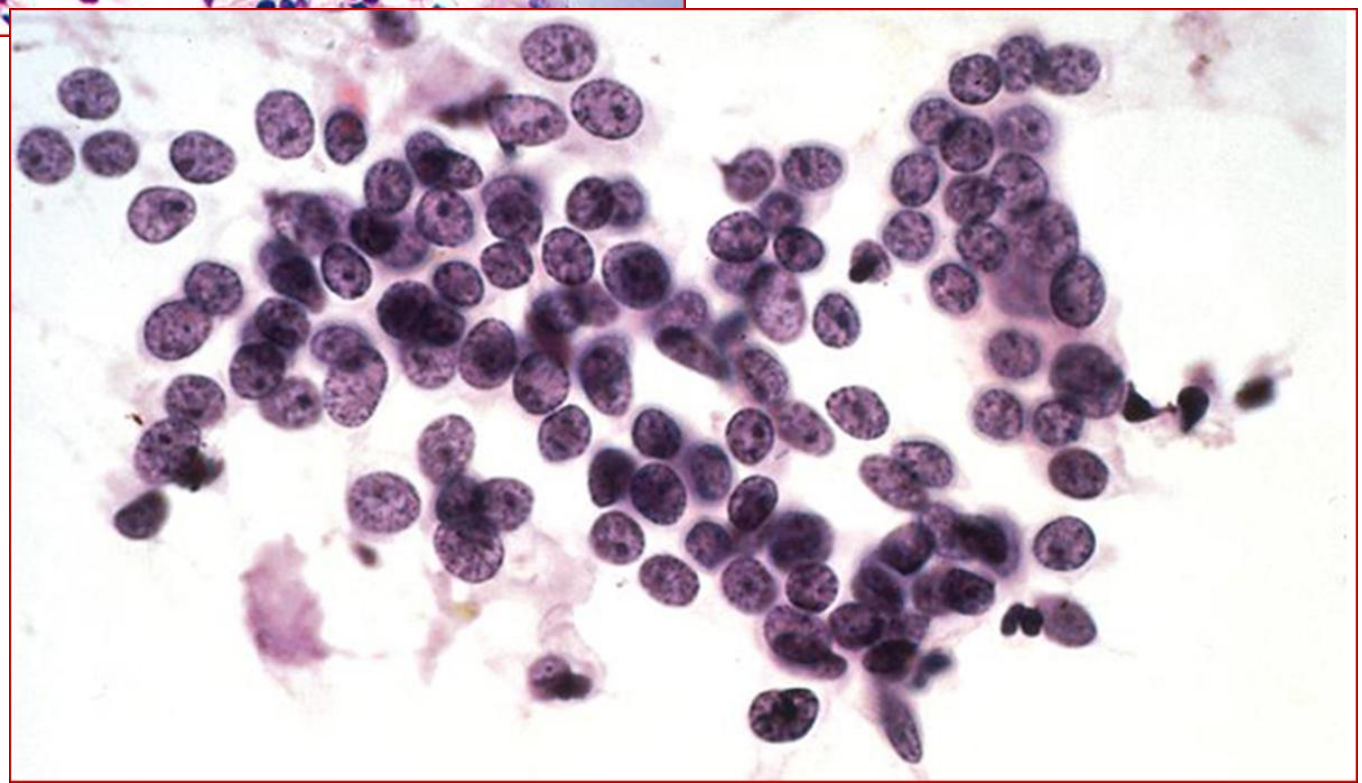
Creola bodies: **Fragments of hyperplastic reactive bronchial epithelium**



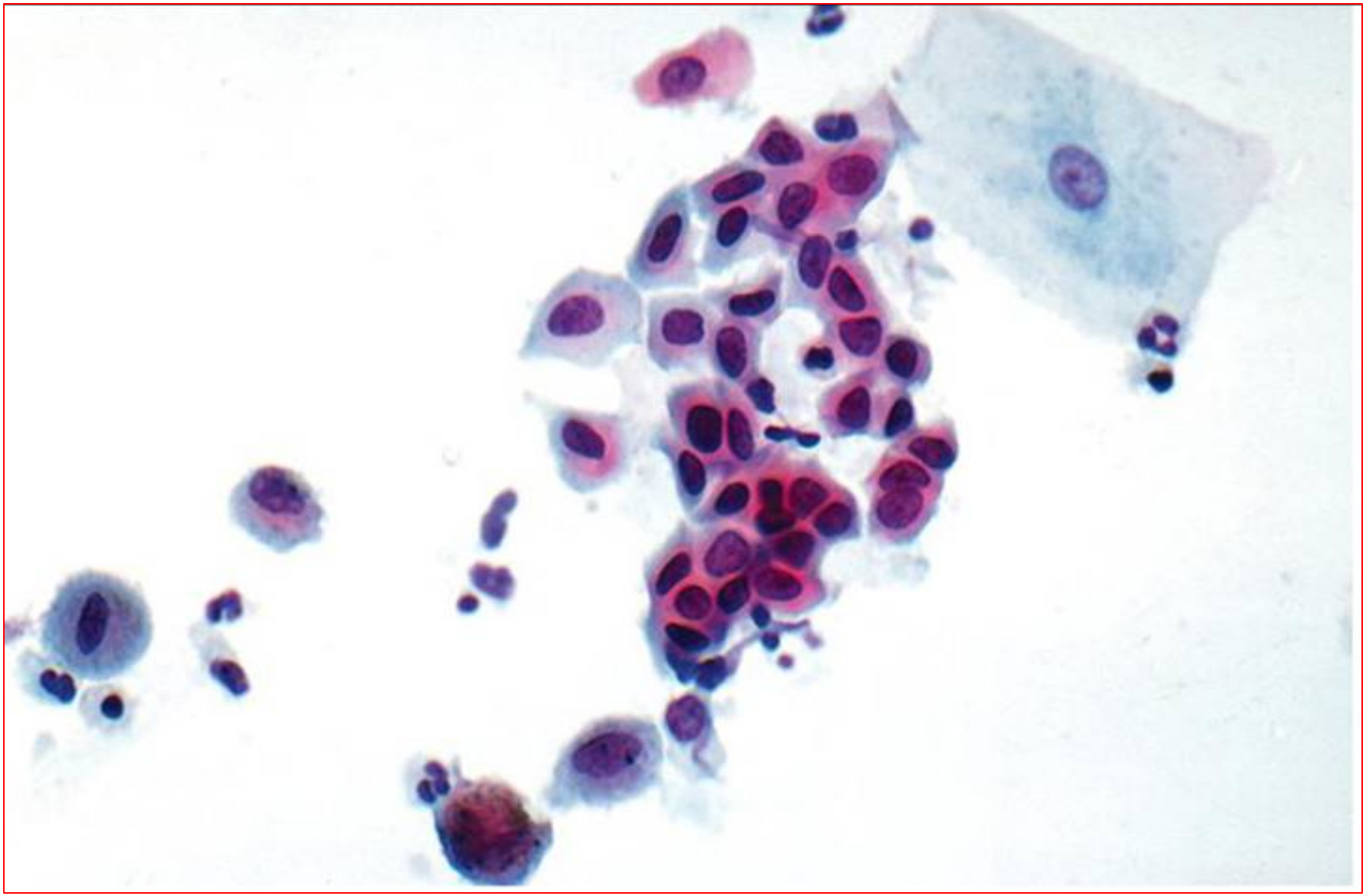




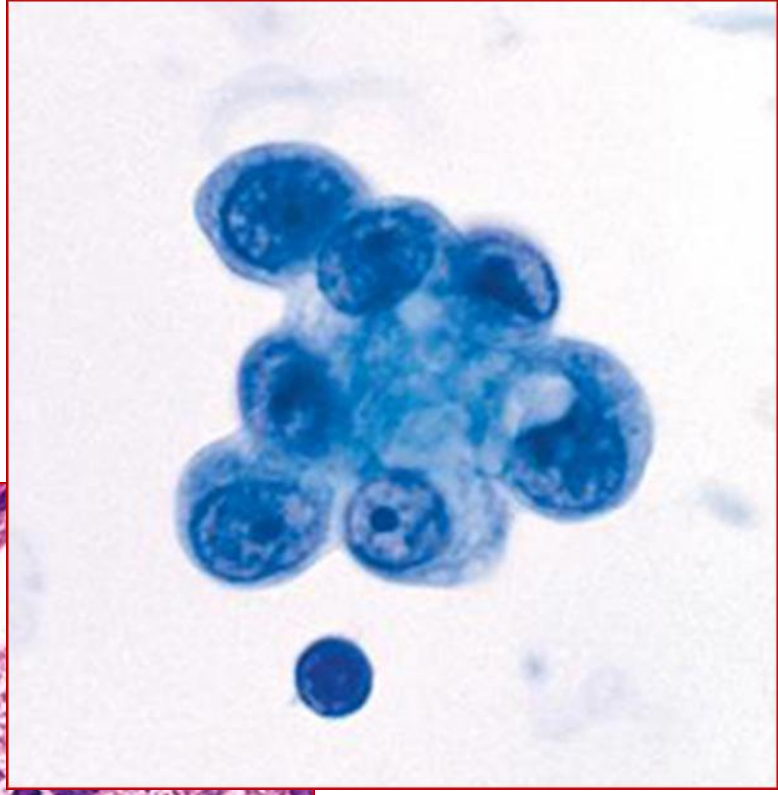
Basal cell hyperplasia of bronchial epithelium

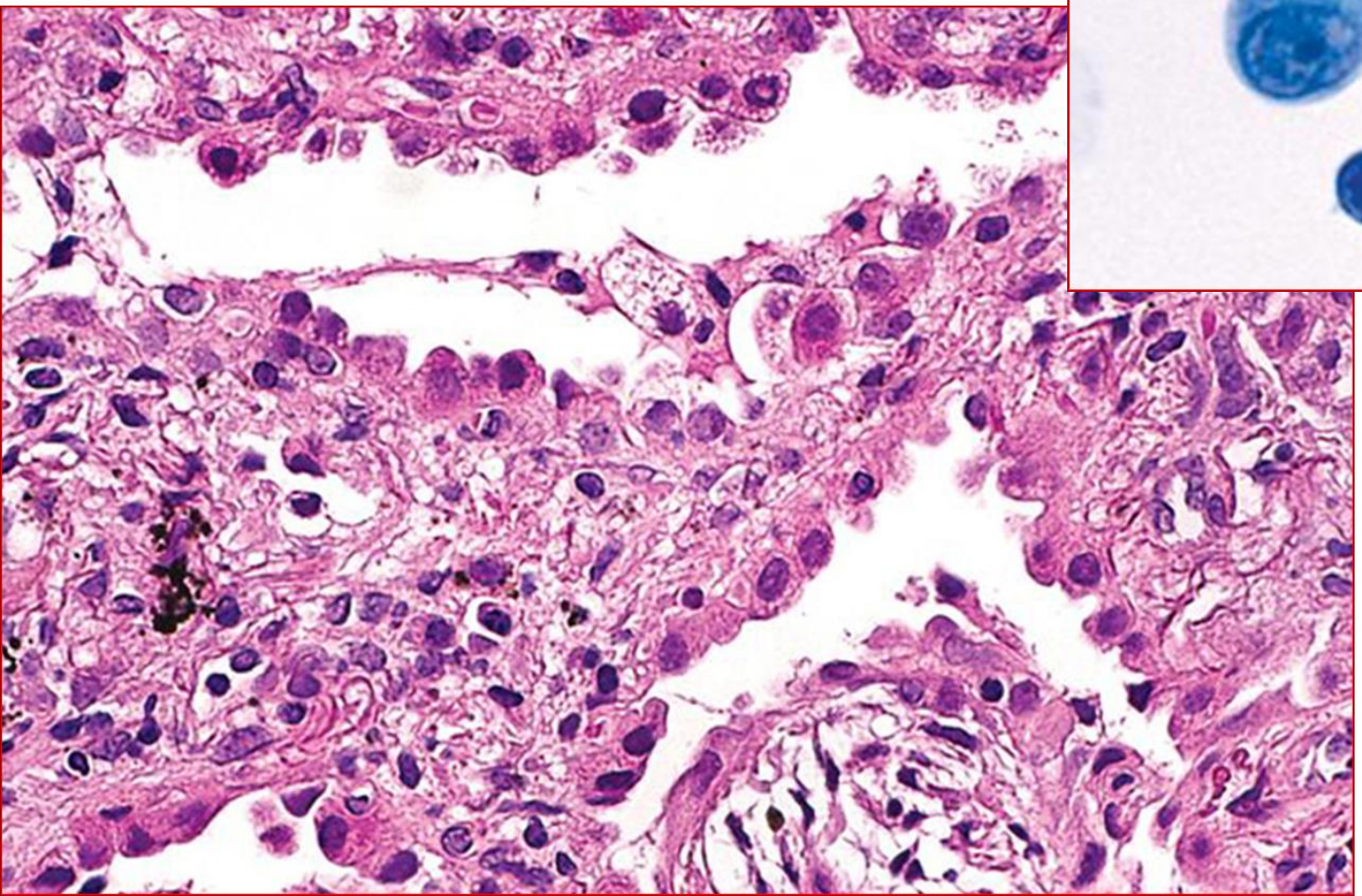


Squamous metaplasia of bronchial epithelium

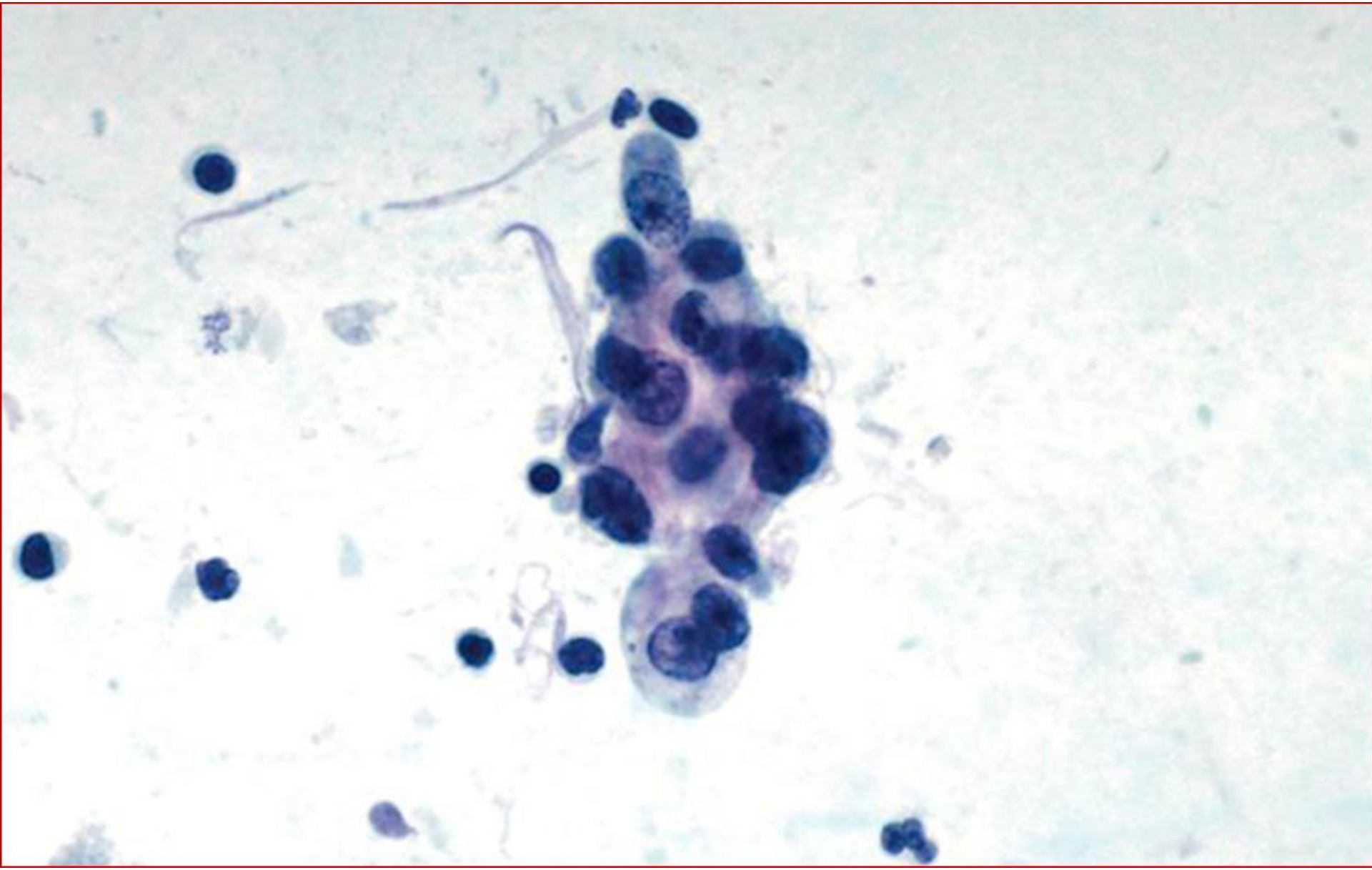


Hyperplasia of type II pneumocytes

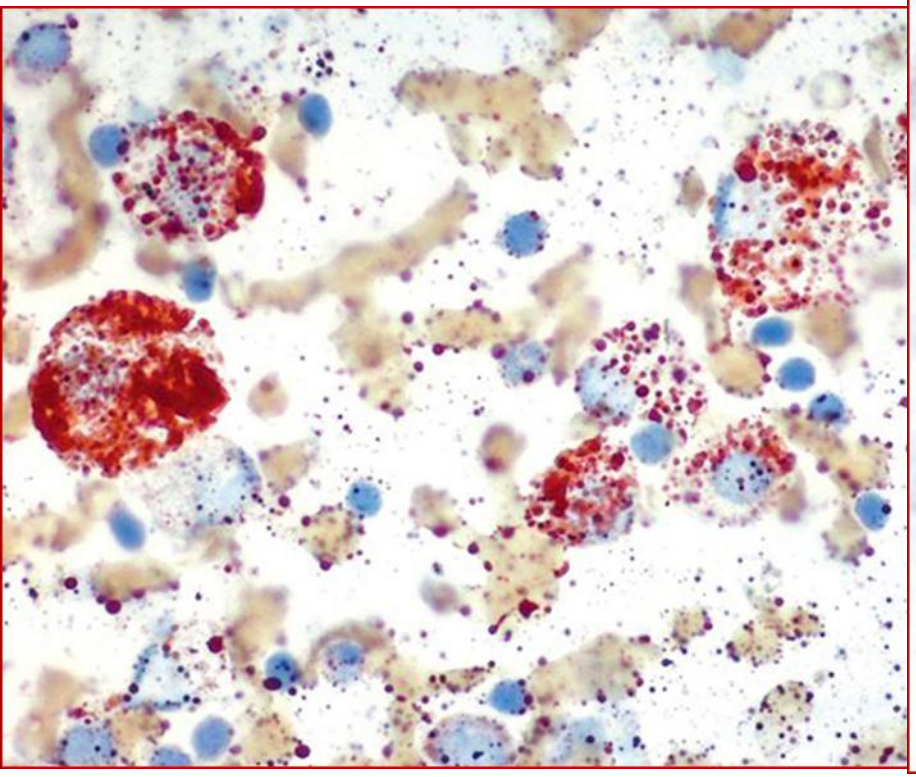


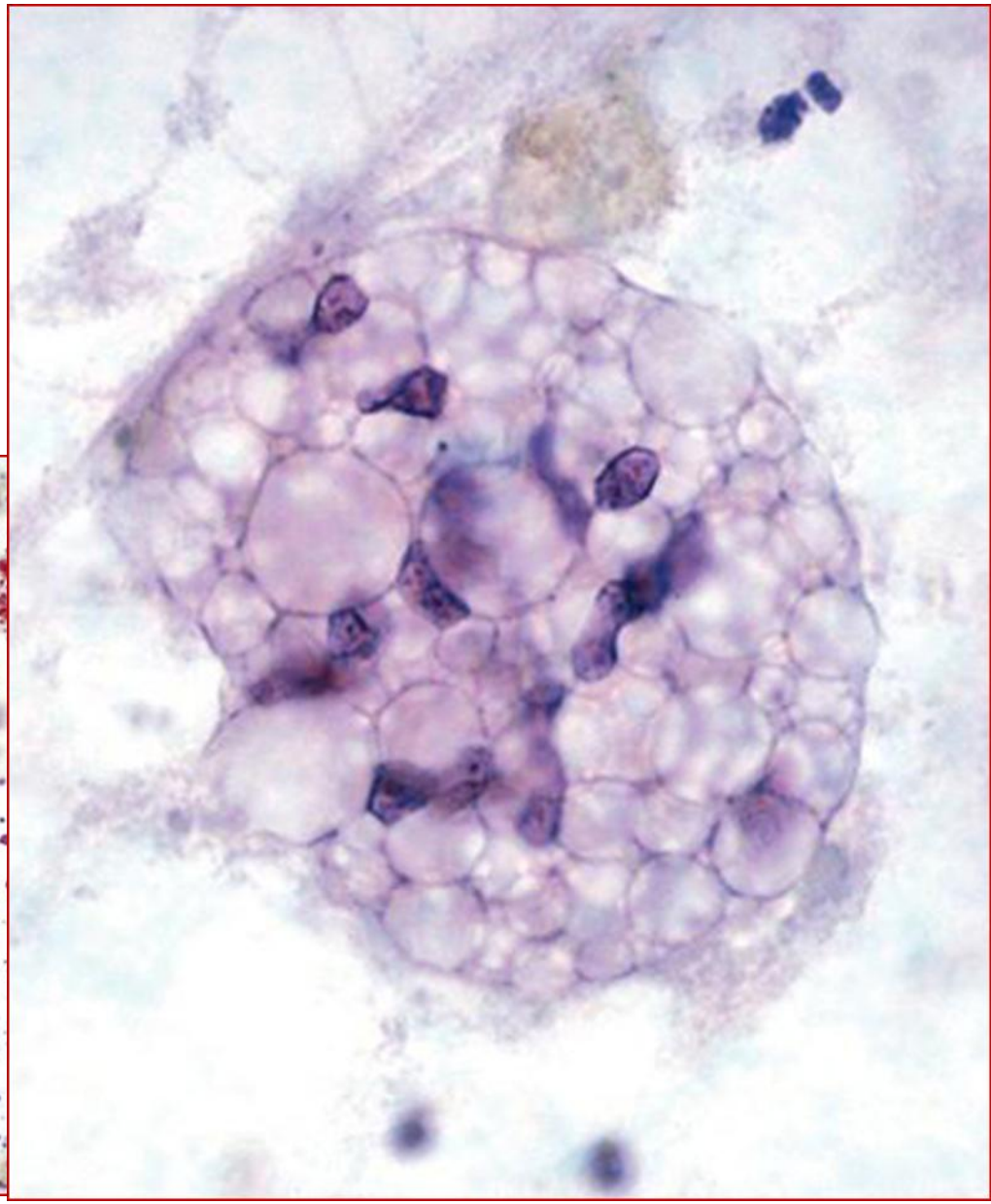


Atypical type II pneumocytes

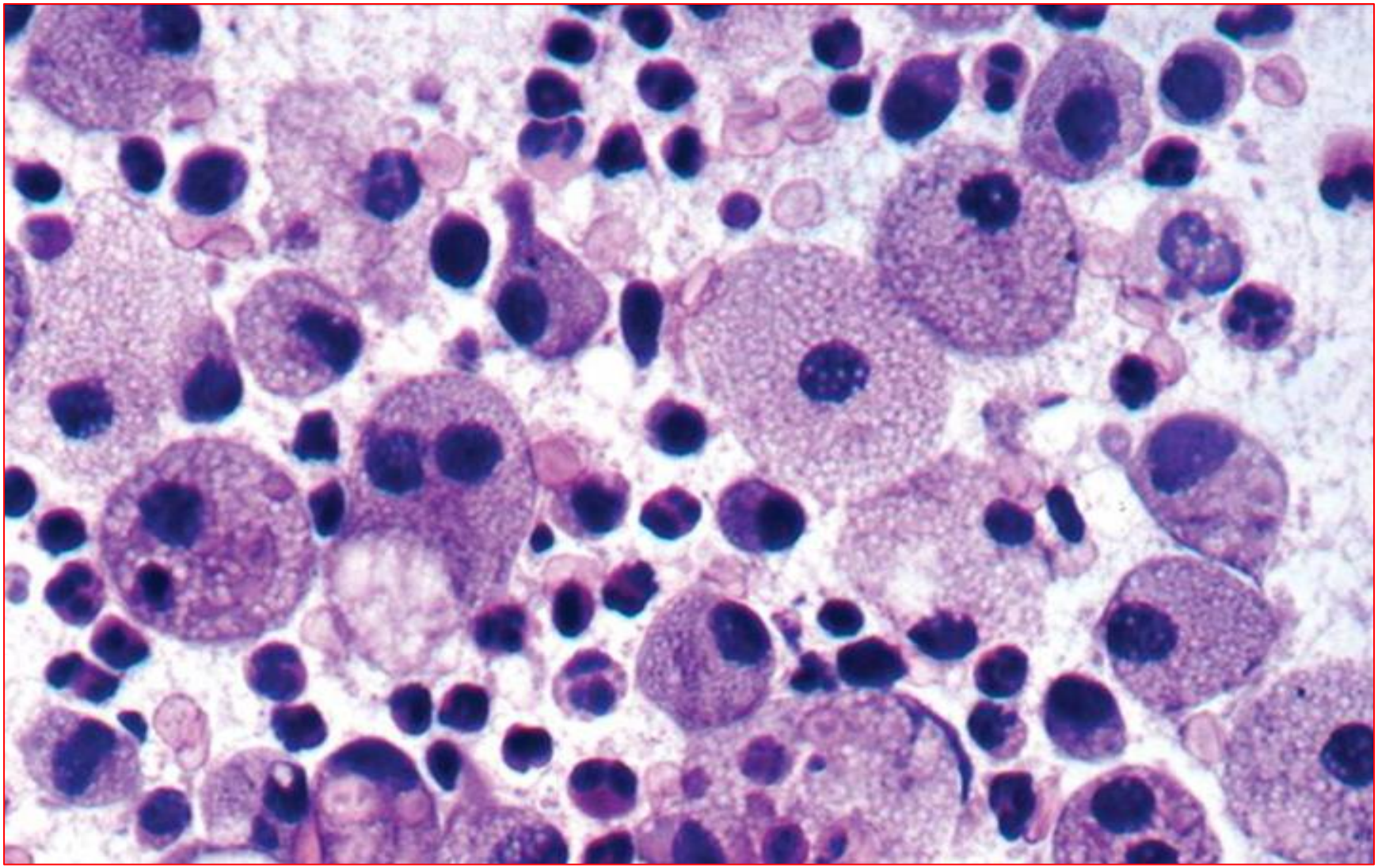


Lipid pneumonia

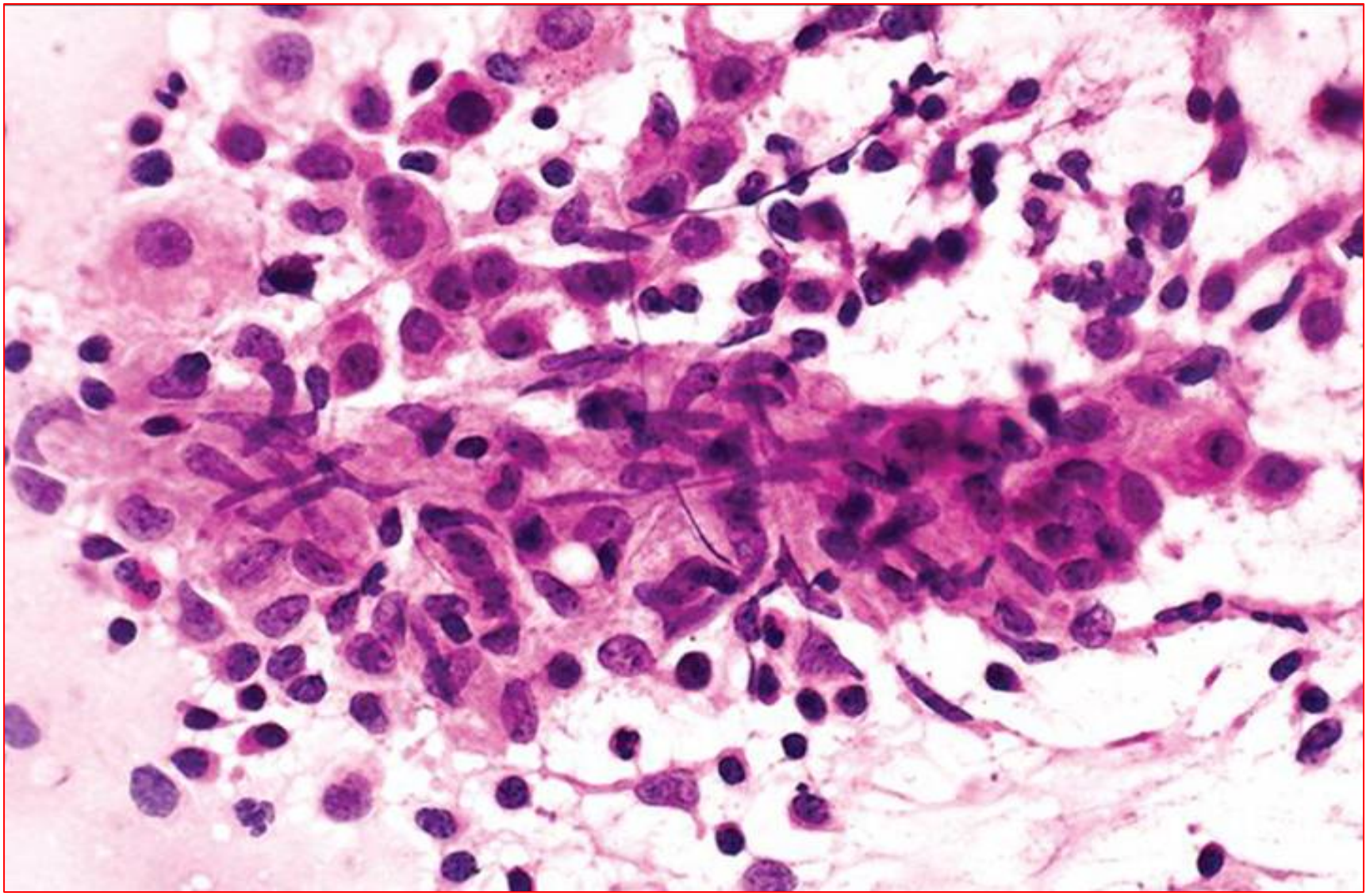




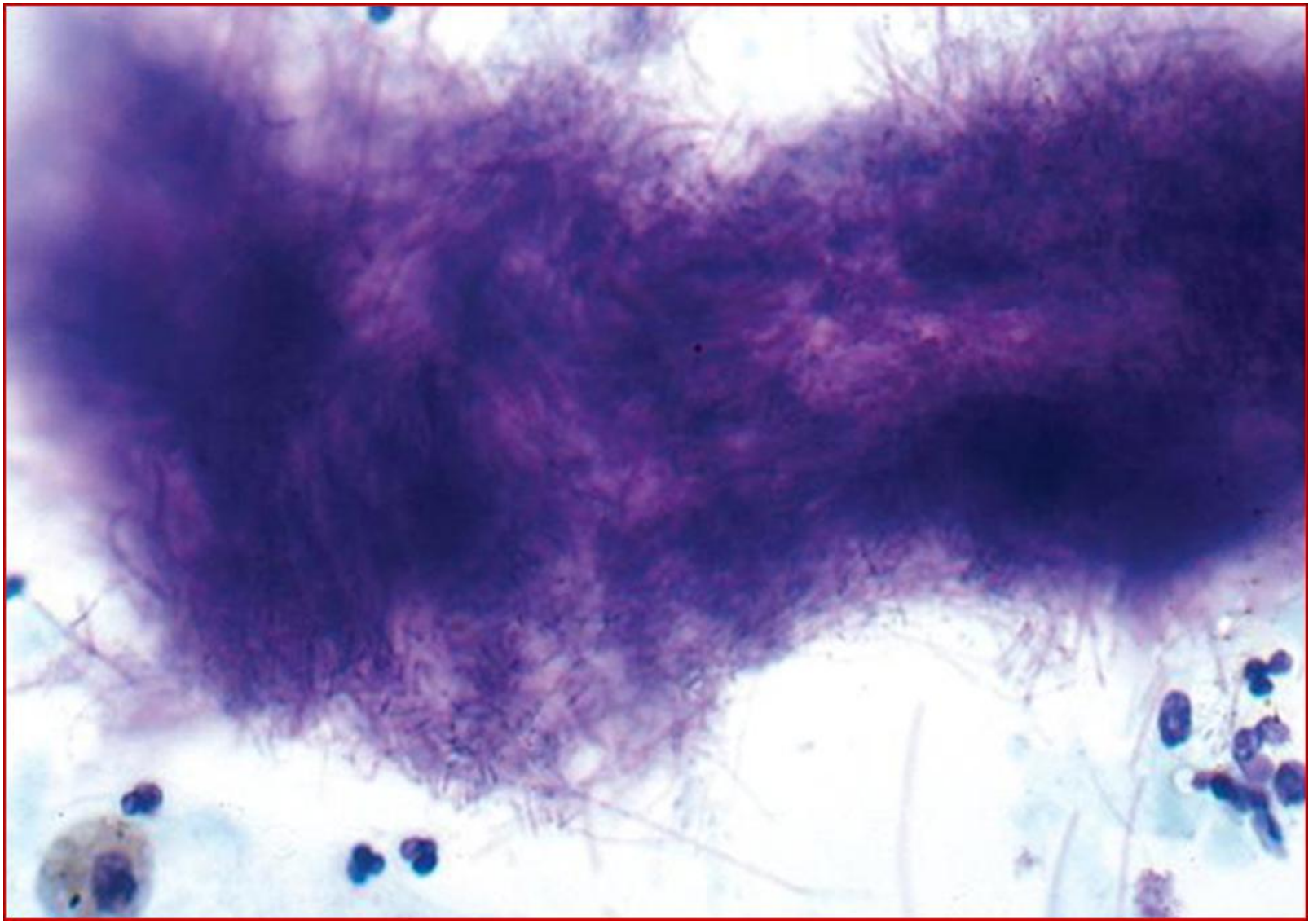
Lipid pneumonia



Granulomatous Inflammation (Tuberculosis)

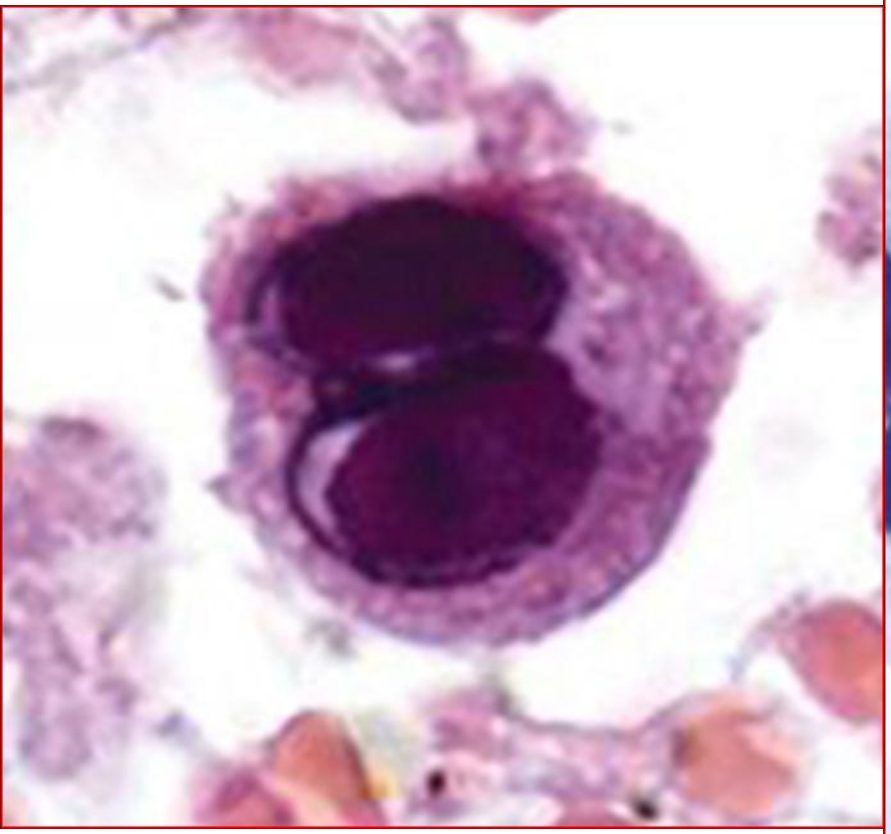


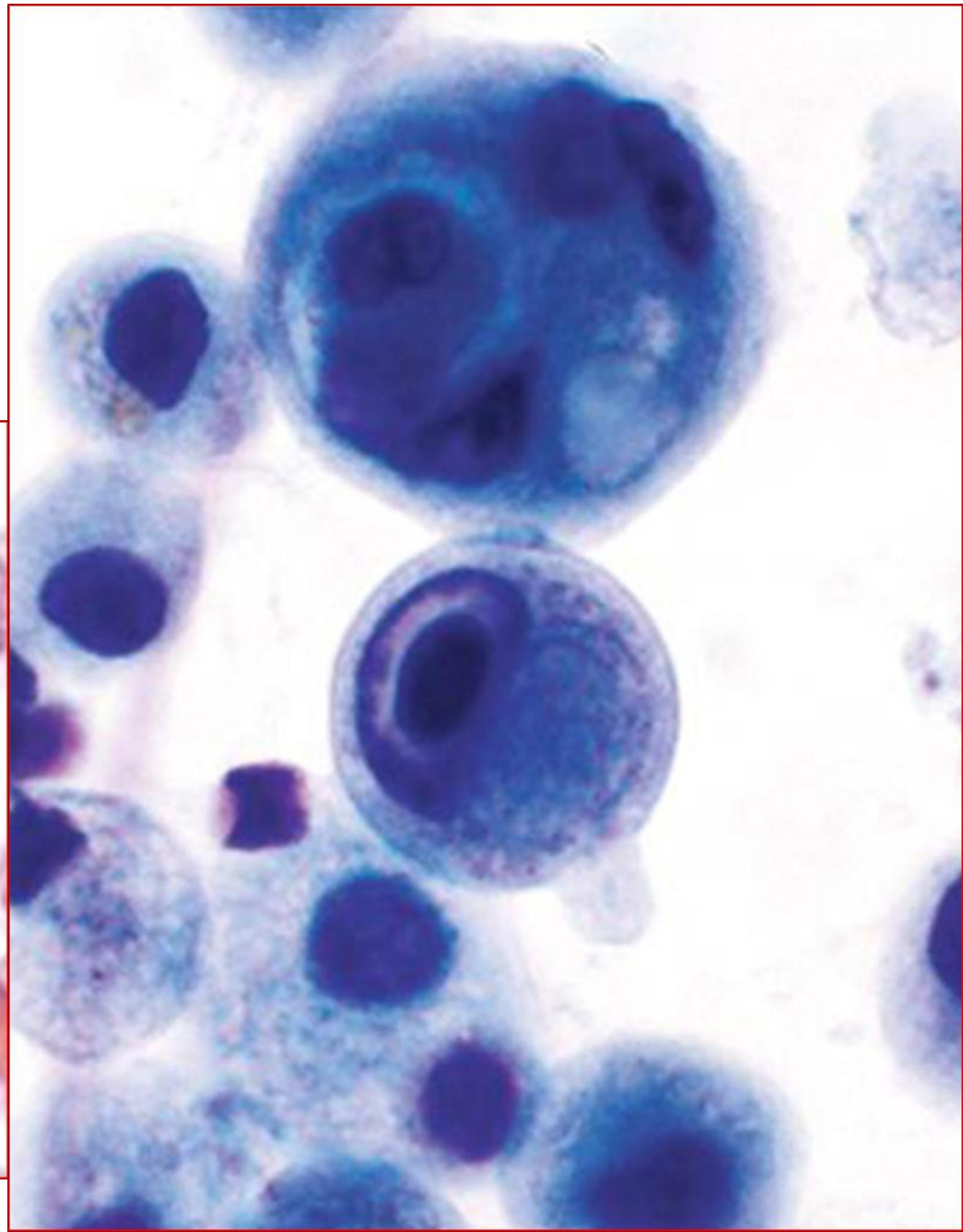
Actinomyces



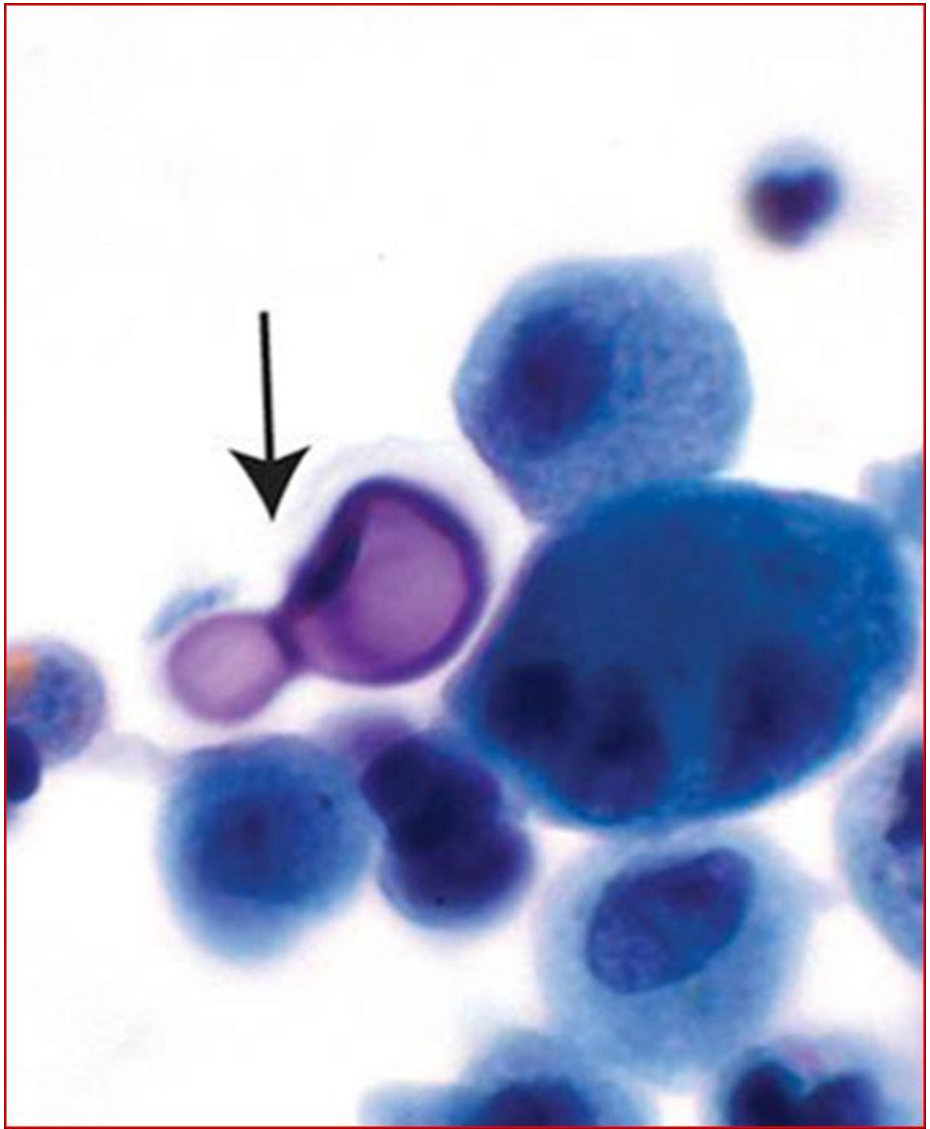
Herpes simplex

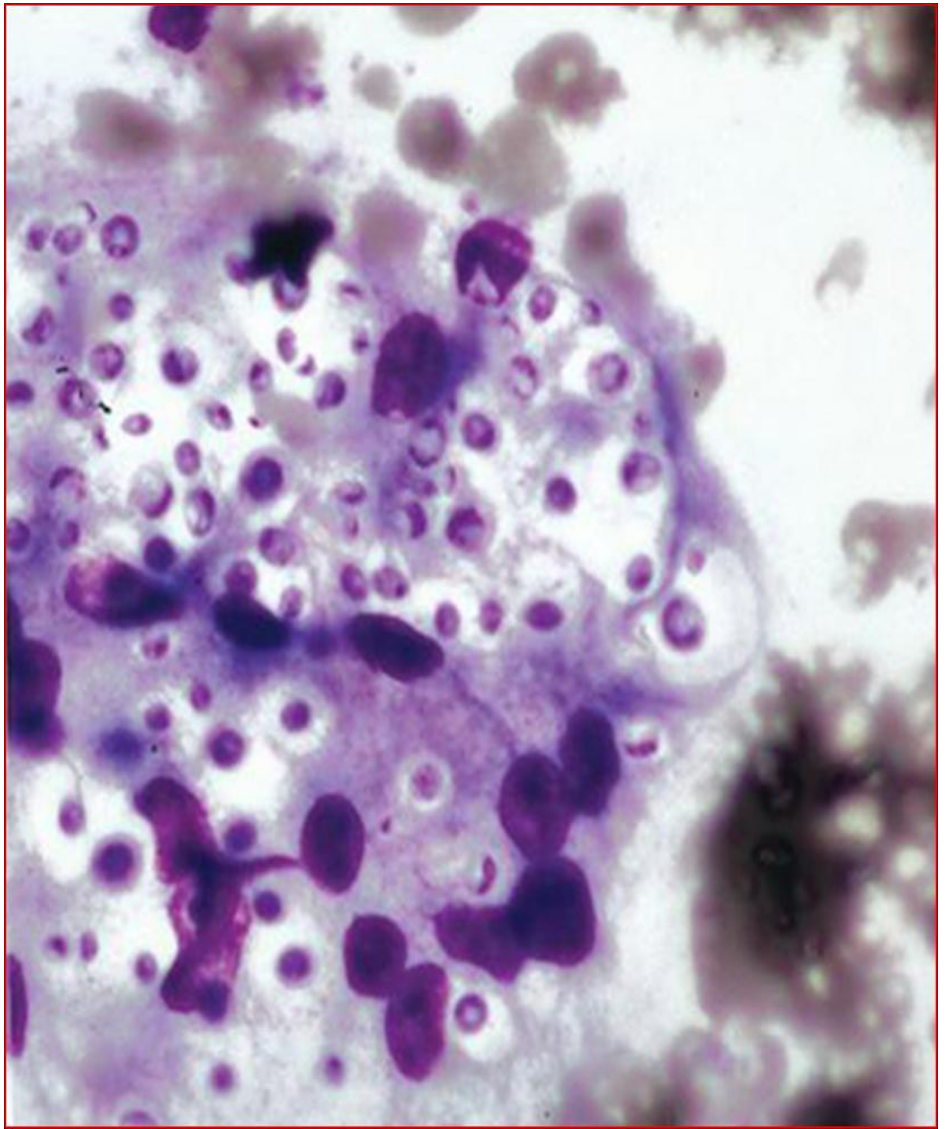
CMV

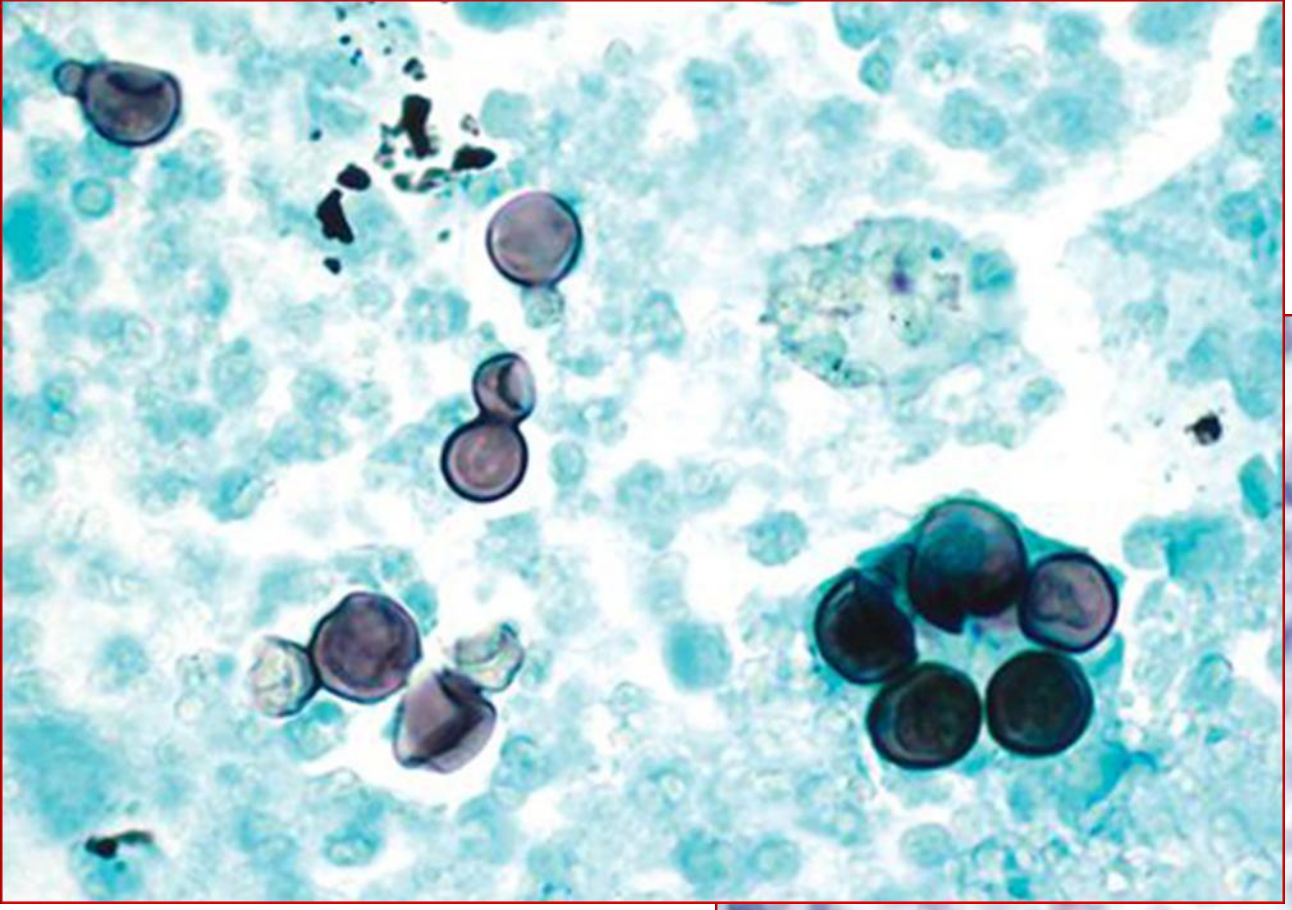


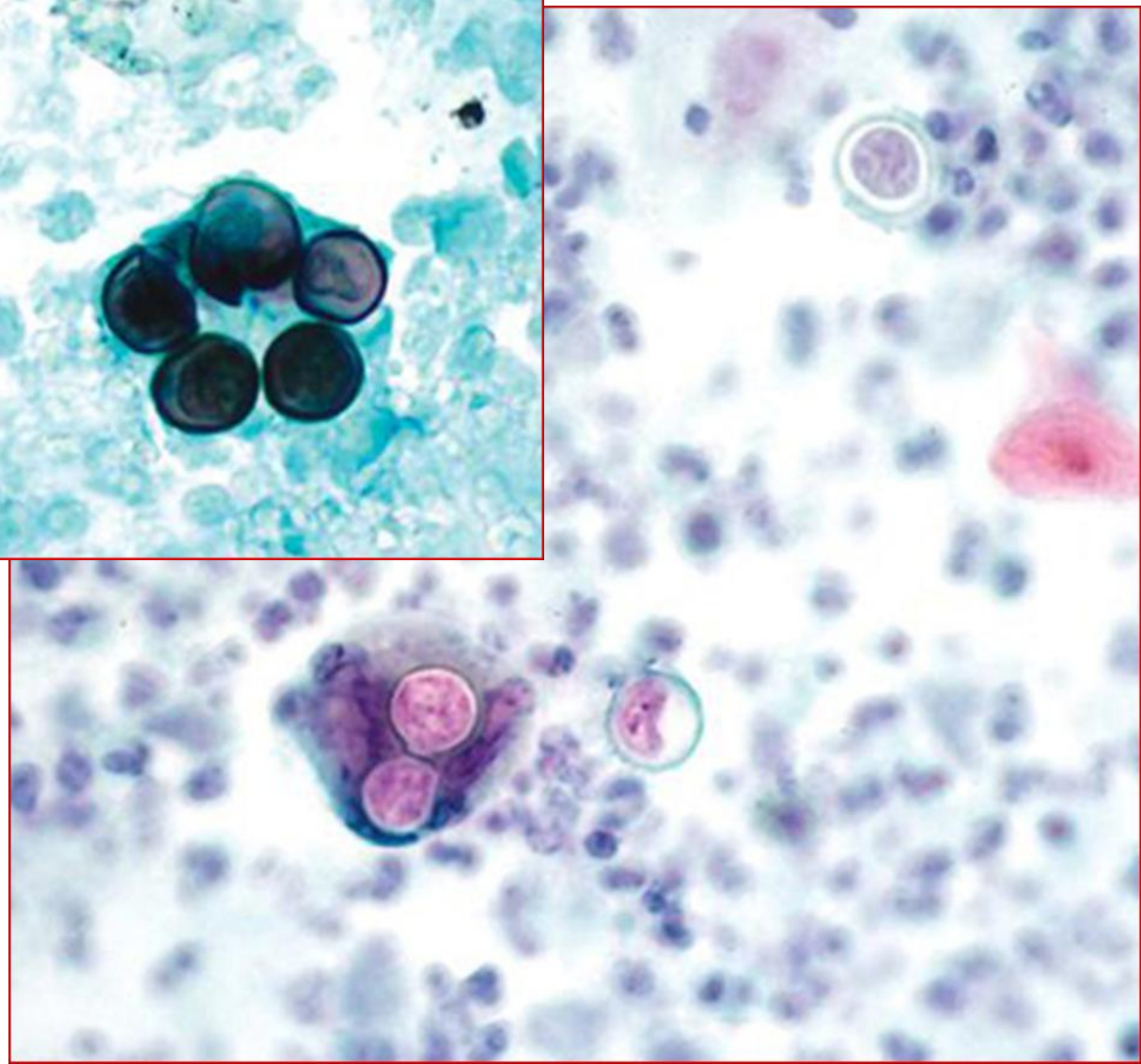


Cryptococcus



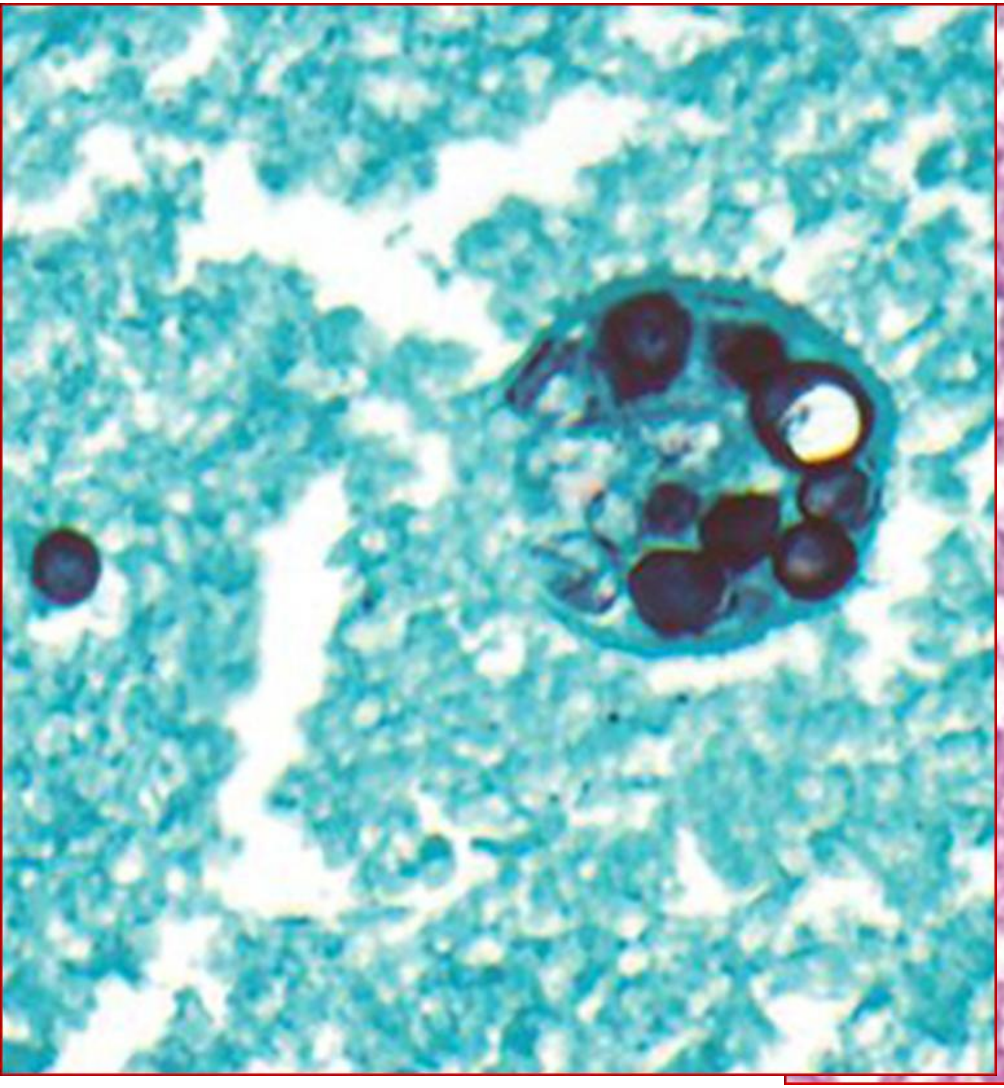


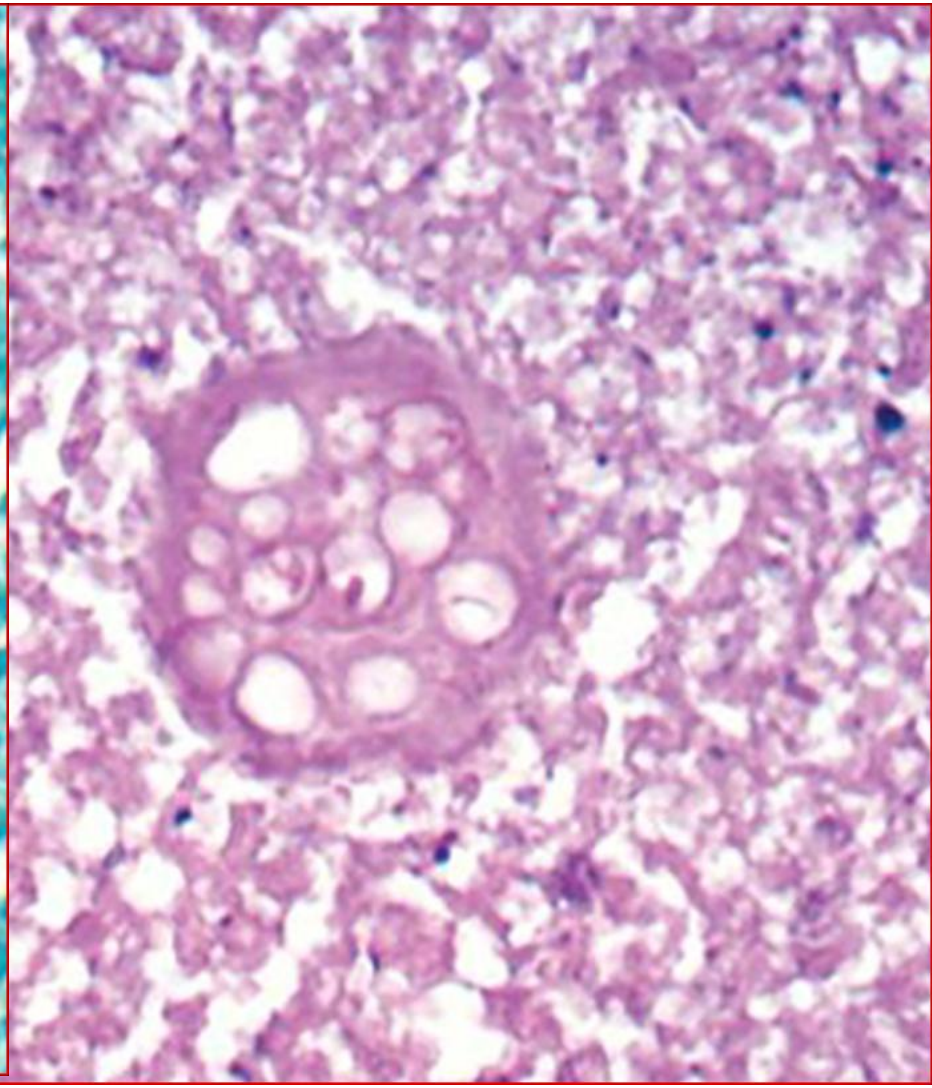




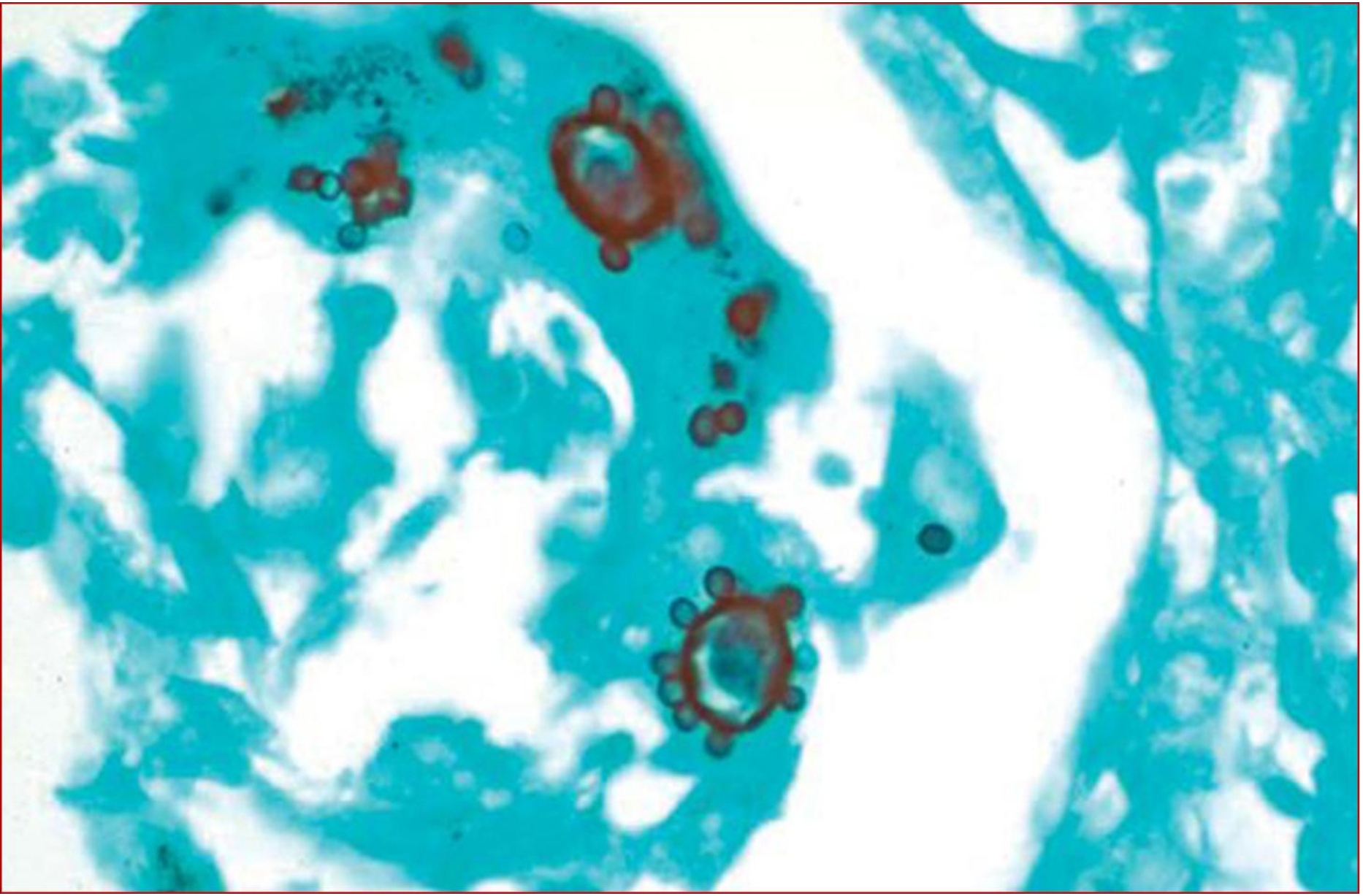
Blastomycosis

Coccidiomycosis

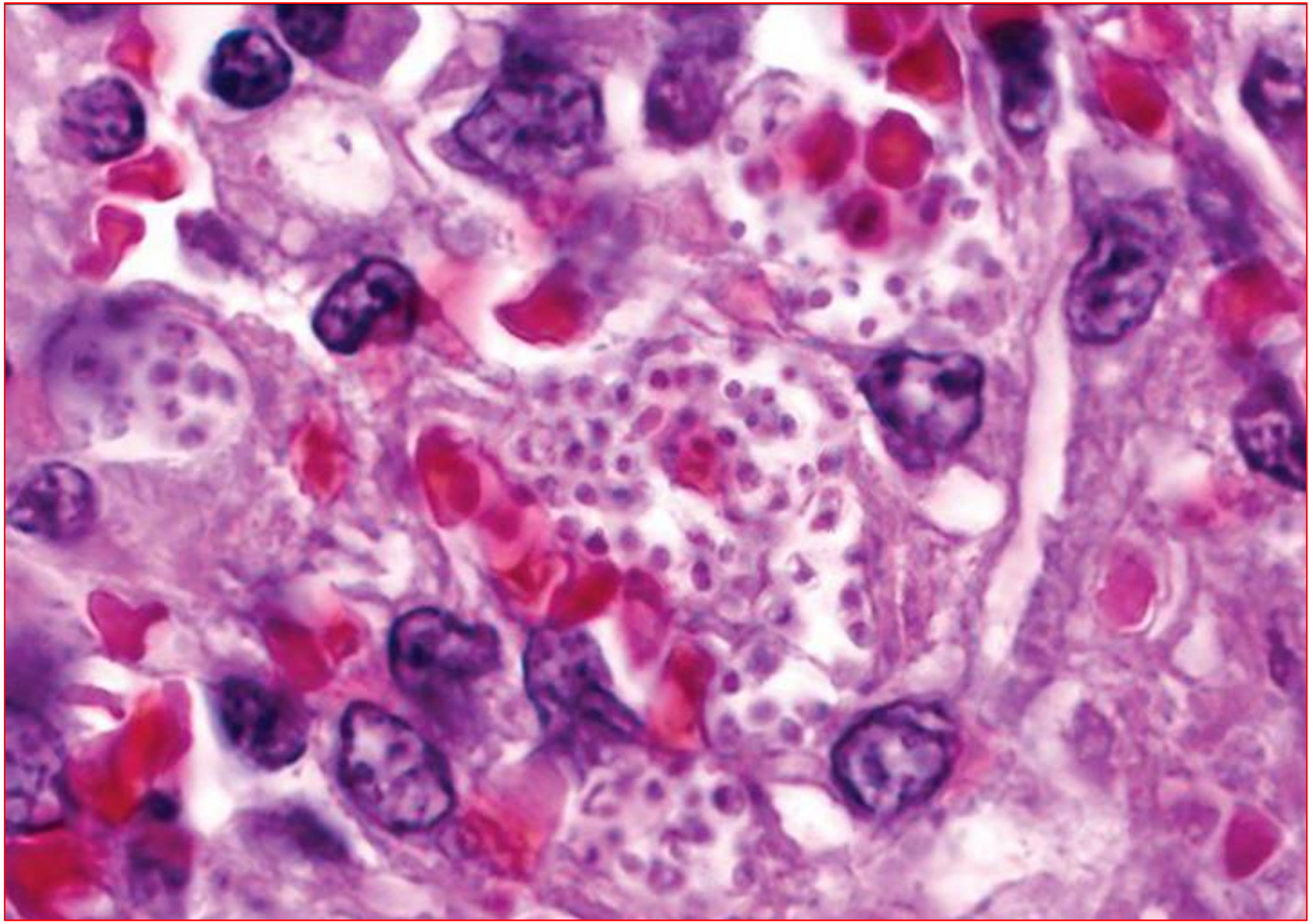




Paracoccidiomycosis

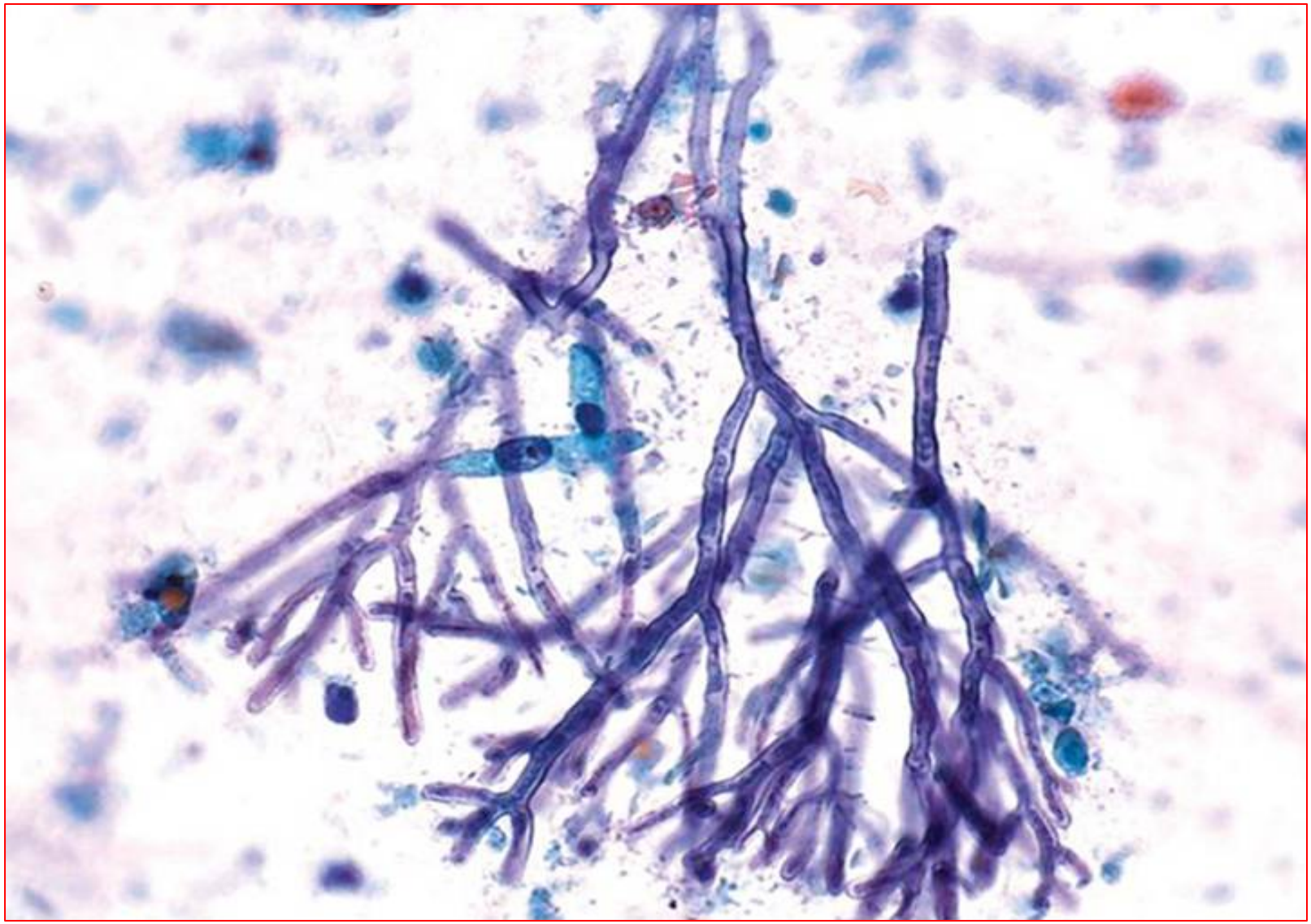


Histoplasmosis

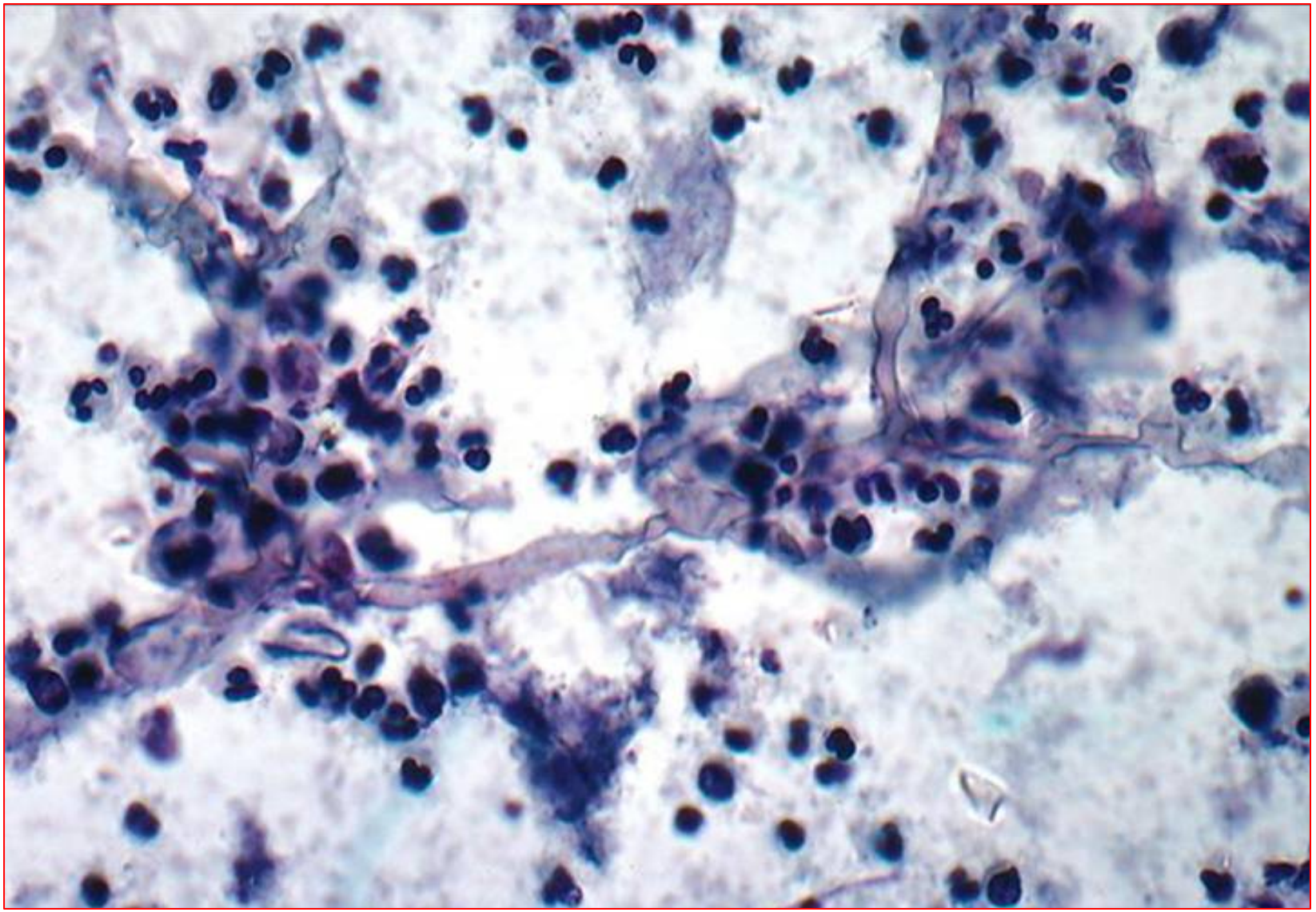


Candida

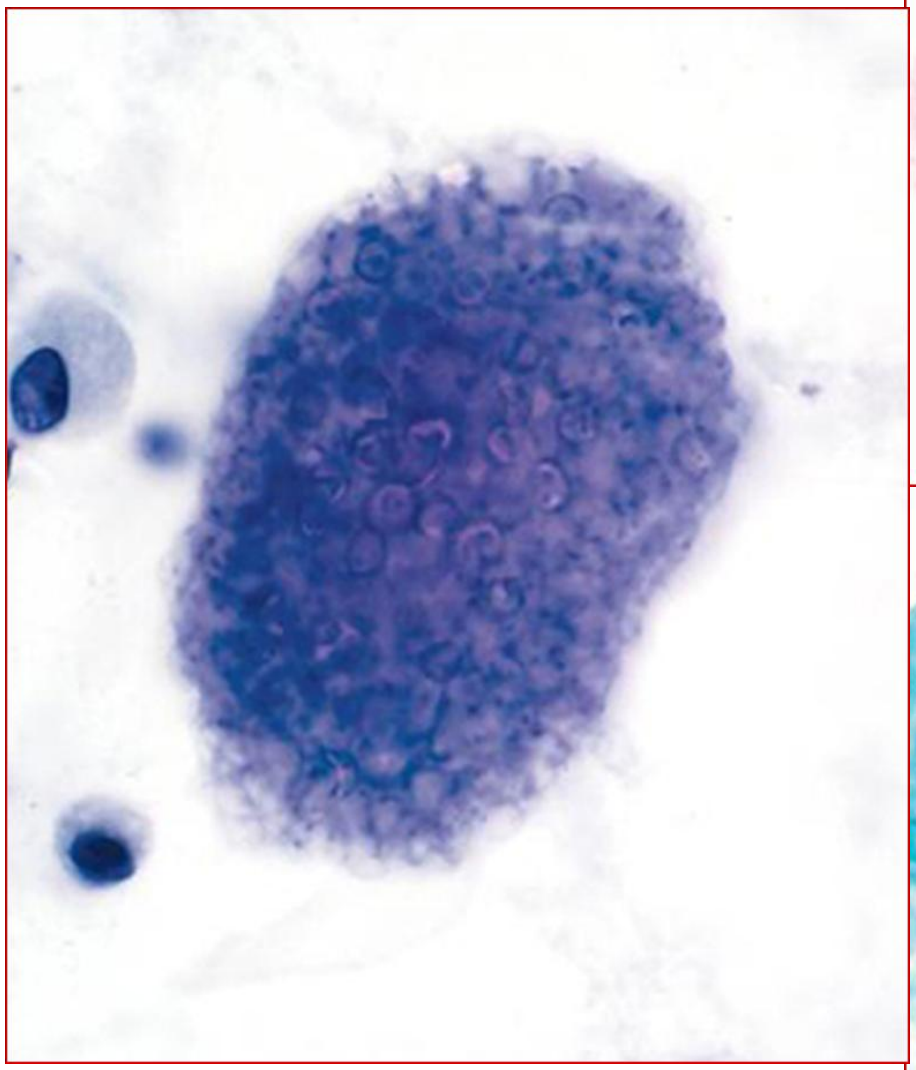
Aspergillus

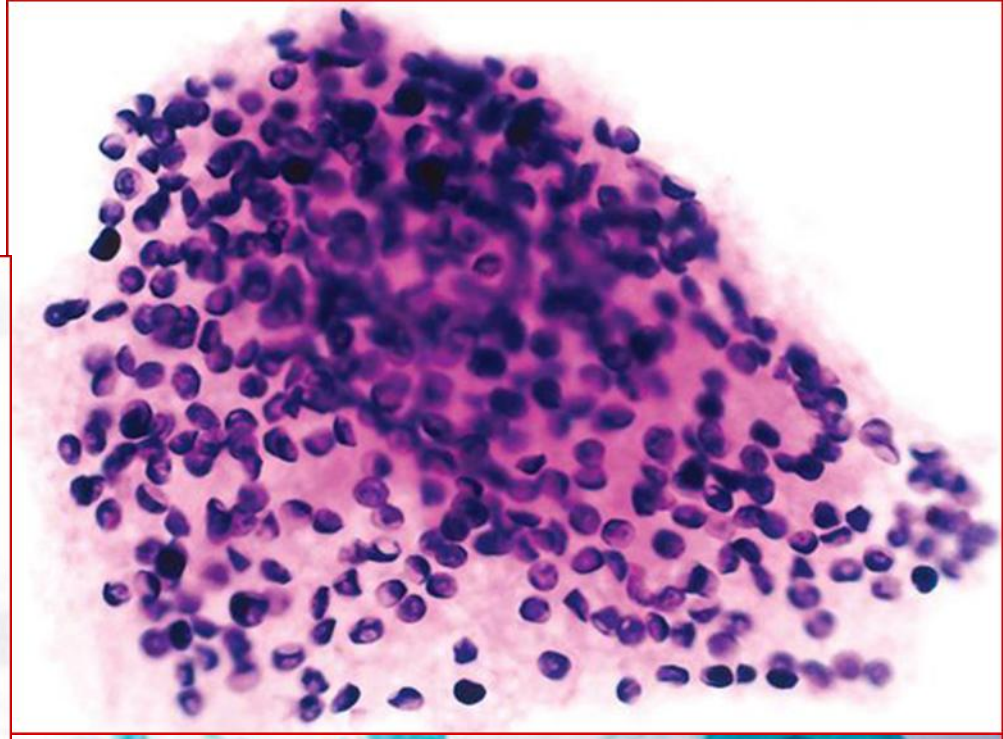


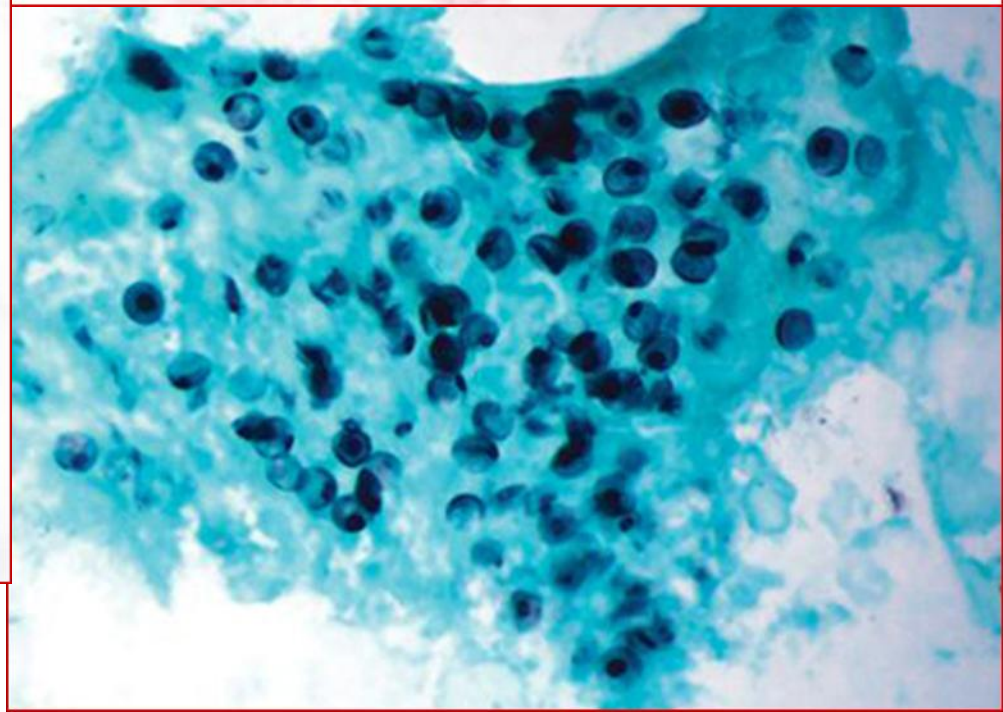
Mucormycosis



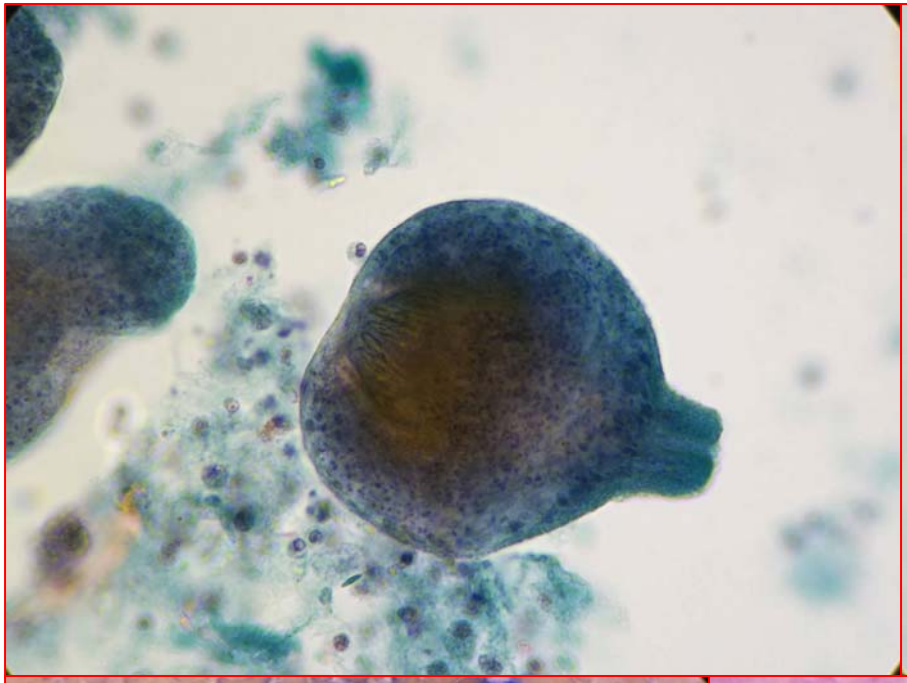
Pneumocystis carinii

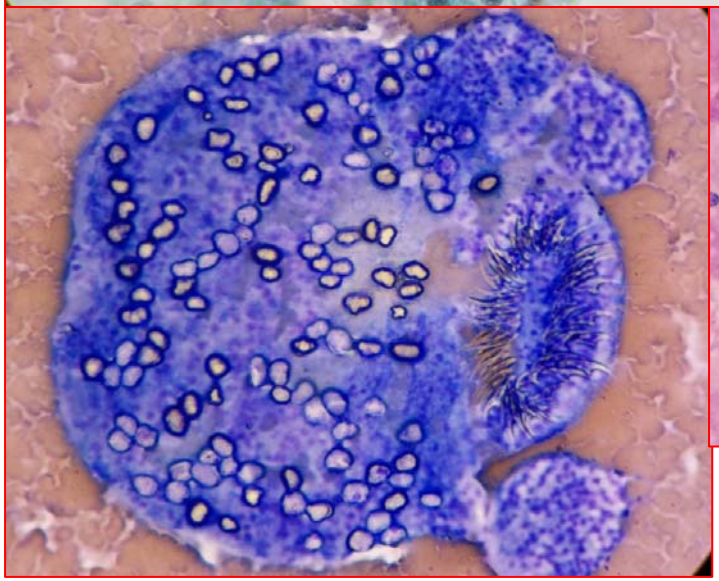


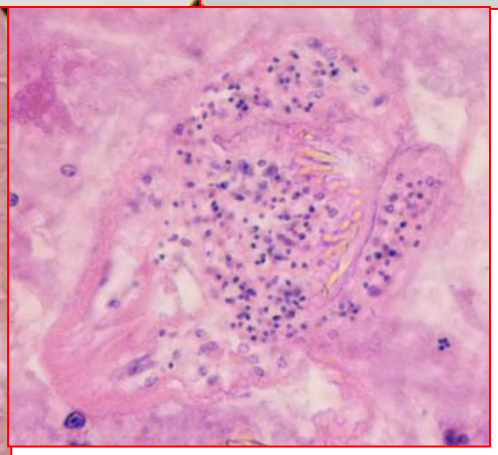




Strongyloides stercoralis

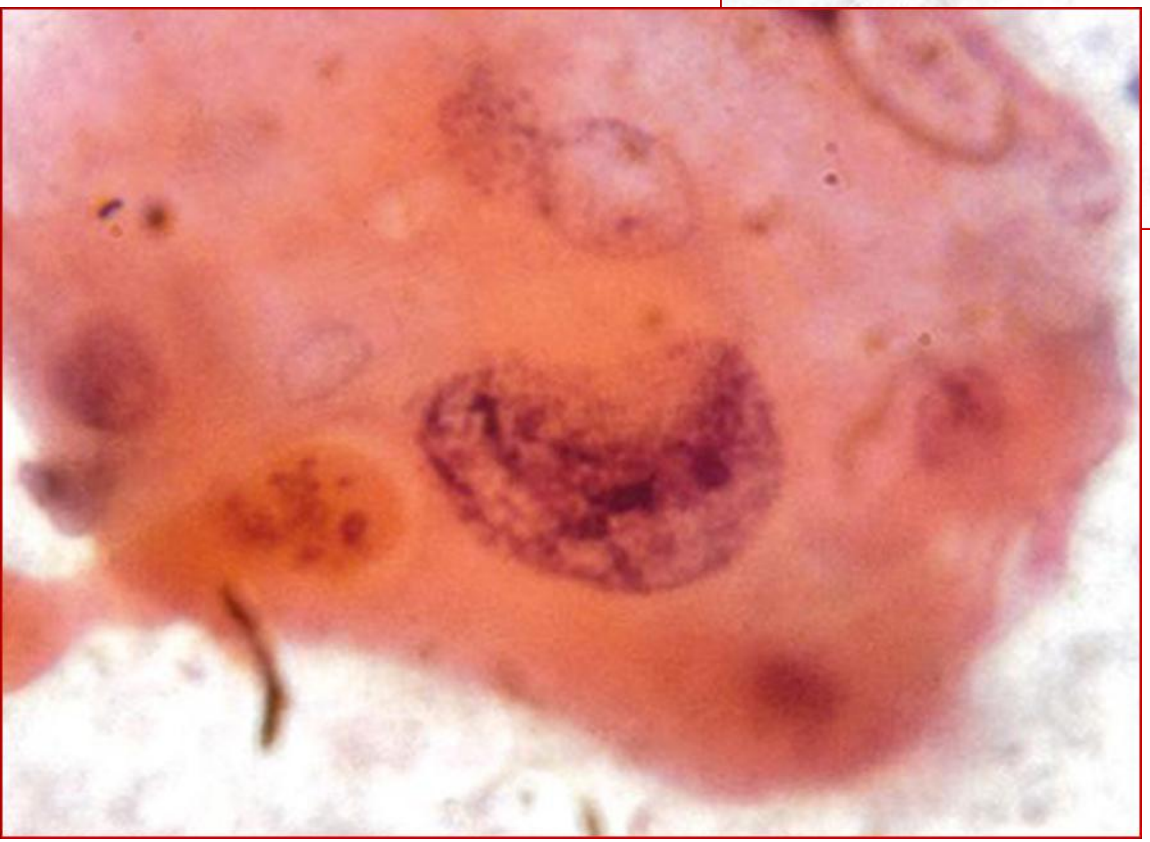






Echinococcus protoscolex (Hydatid Cyst) with hooklets and calcareous corpuscles

Acute irradiation effect on bronchial Cells



Acute irradiation effect on squamous cells

II. Tumor Pulmonary Cytology

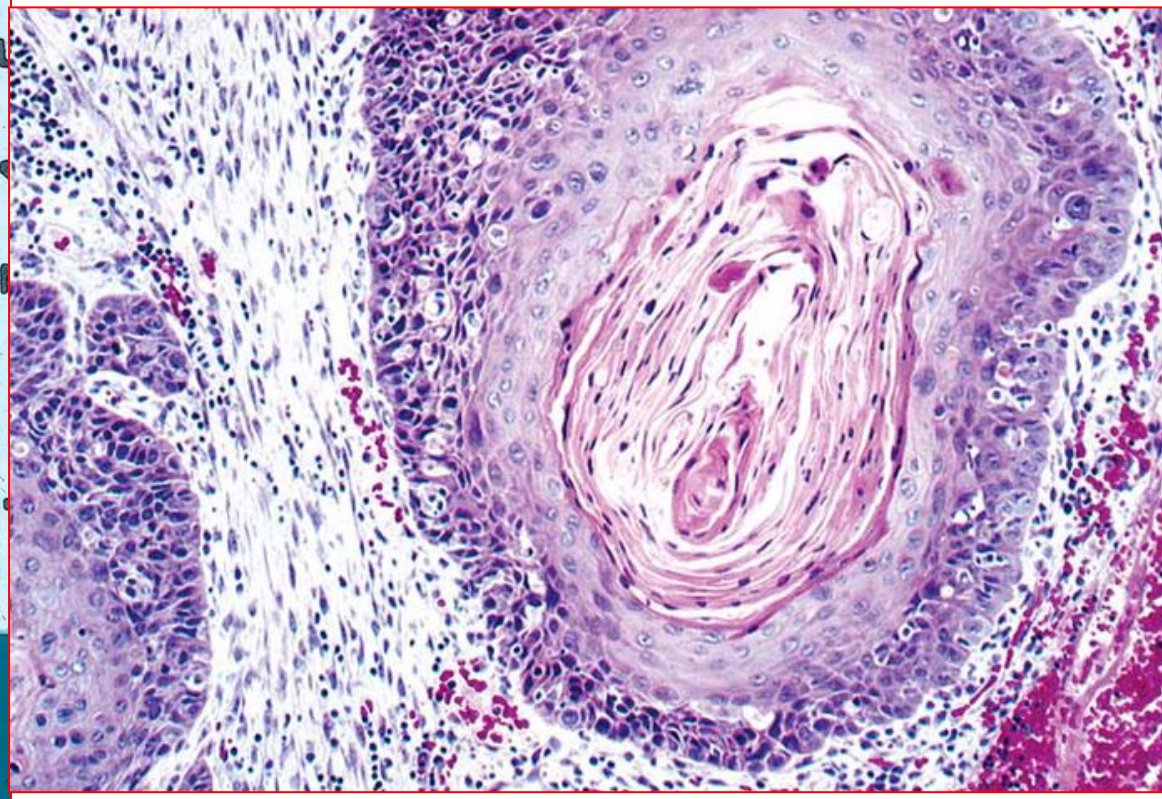
Squamous Cell Carcinoma

- Hypercellular
- Dyshesive
- Keratin Formation
- Angulated nuclei
- Dark smudgy chromatin

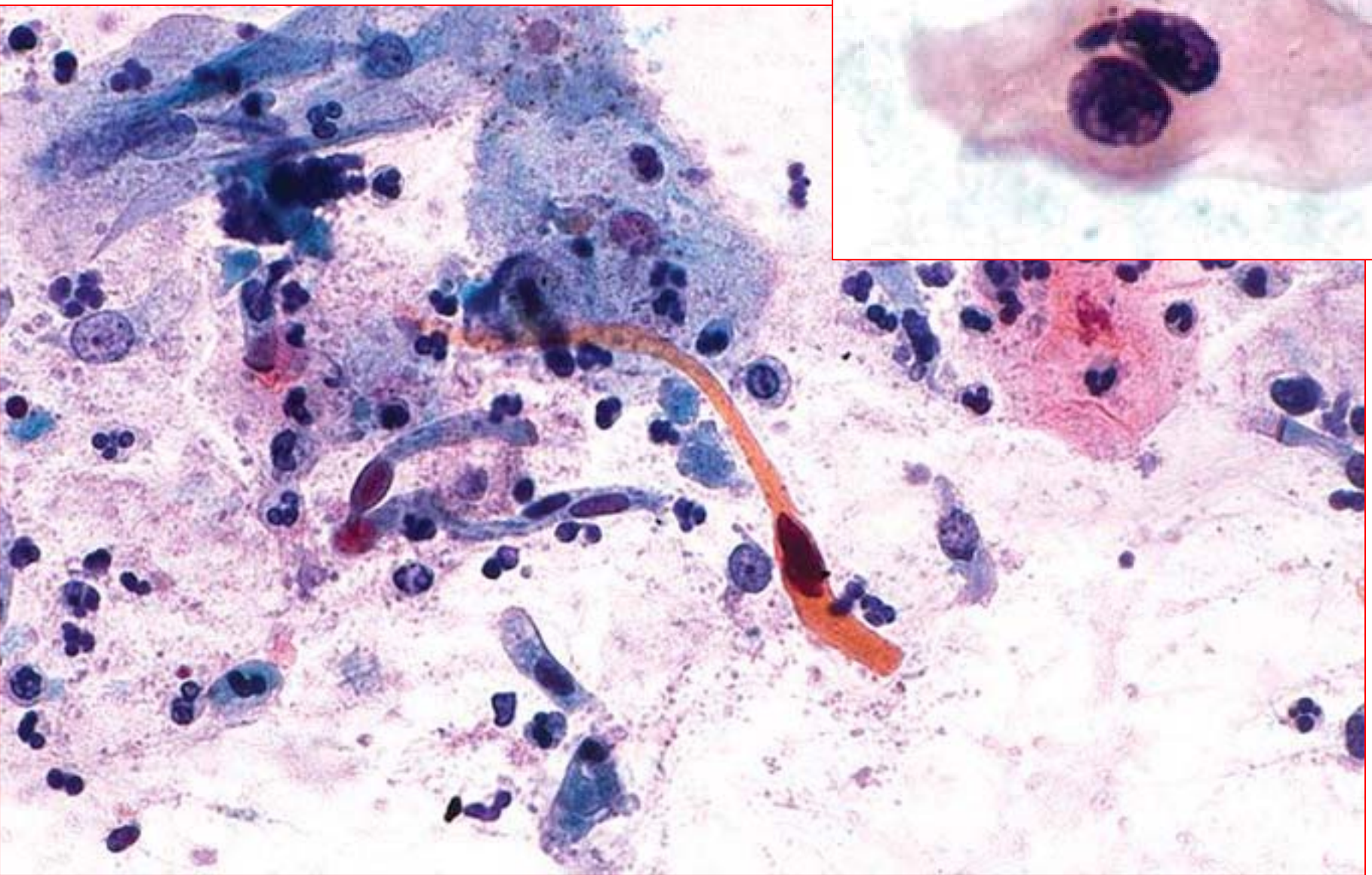
- Mass on CXR

- p63+
- TTF-1+/-

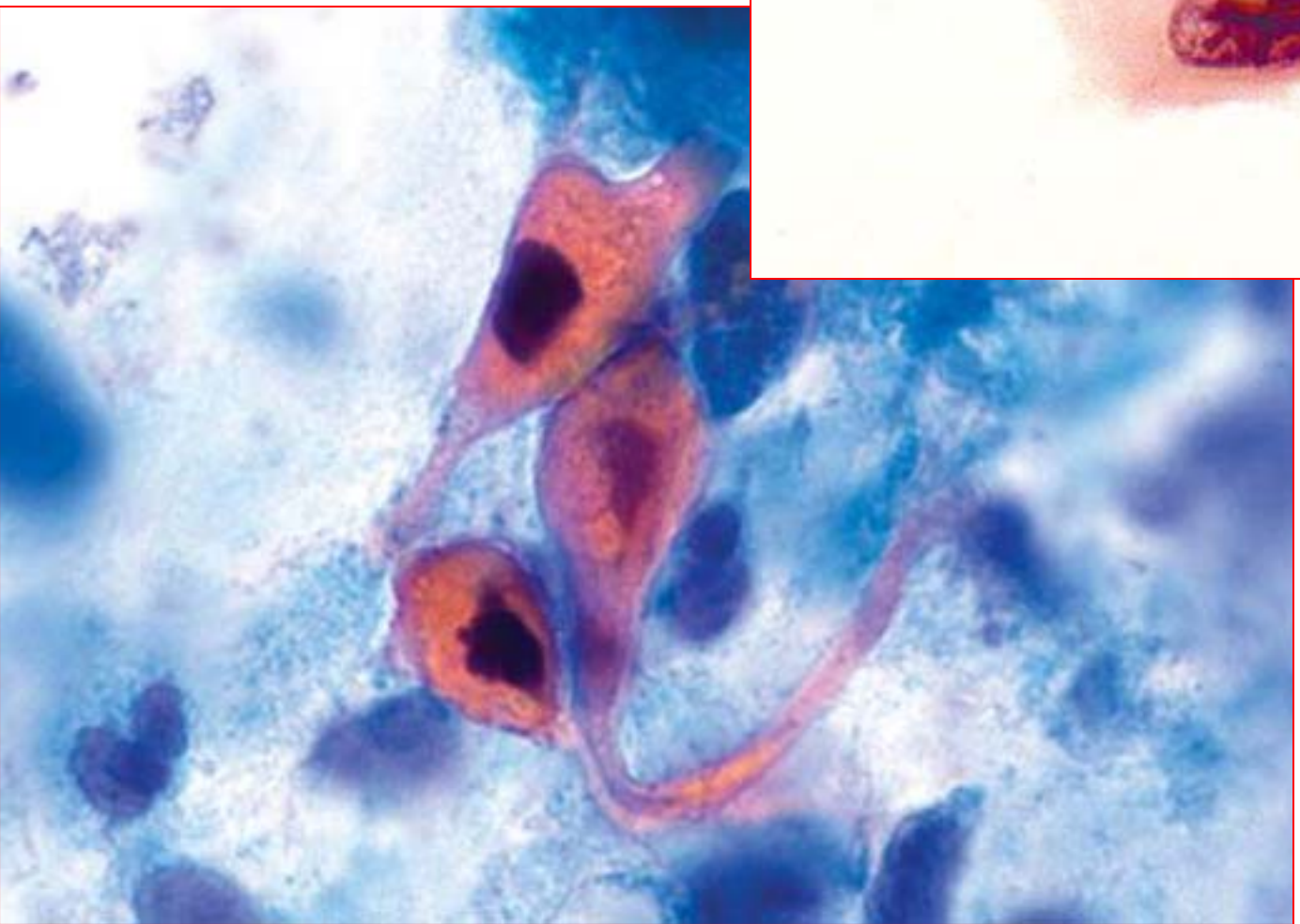
Squamous cell carcinoma

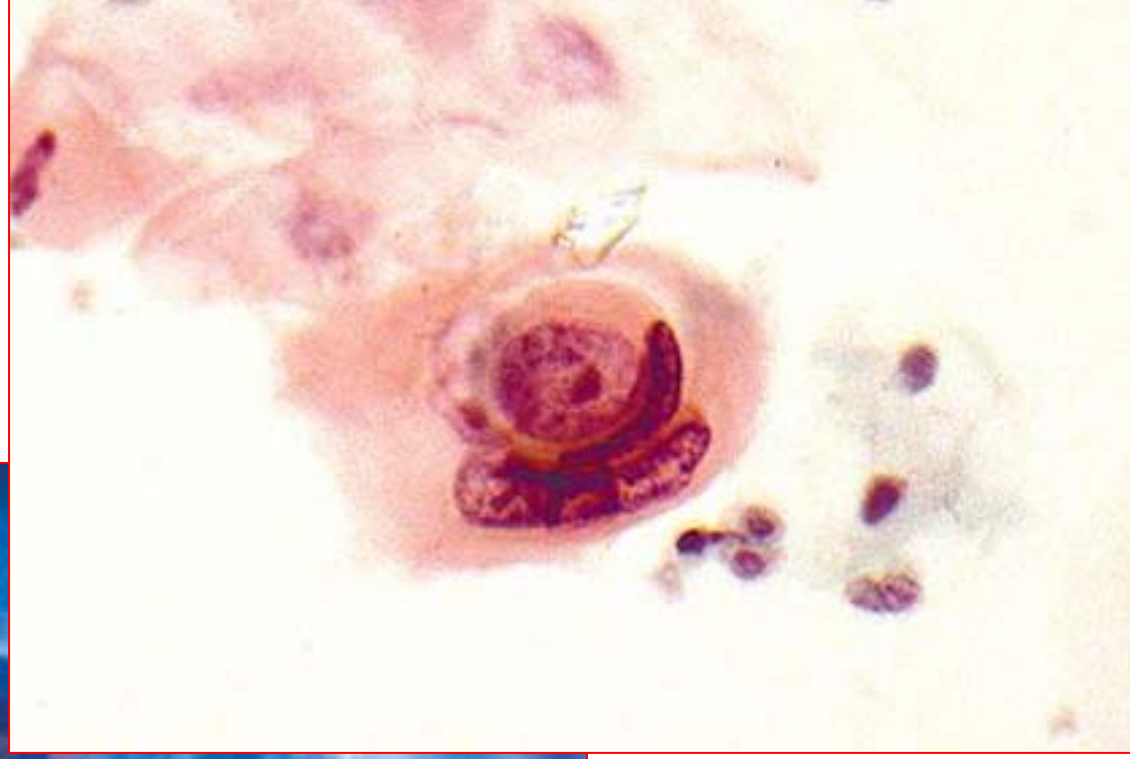


Squamous cell carcinoma

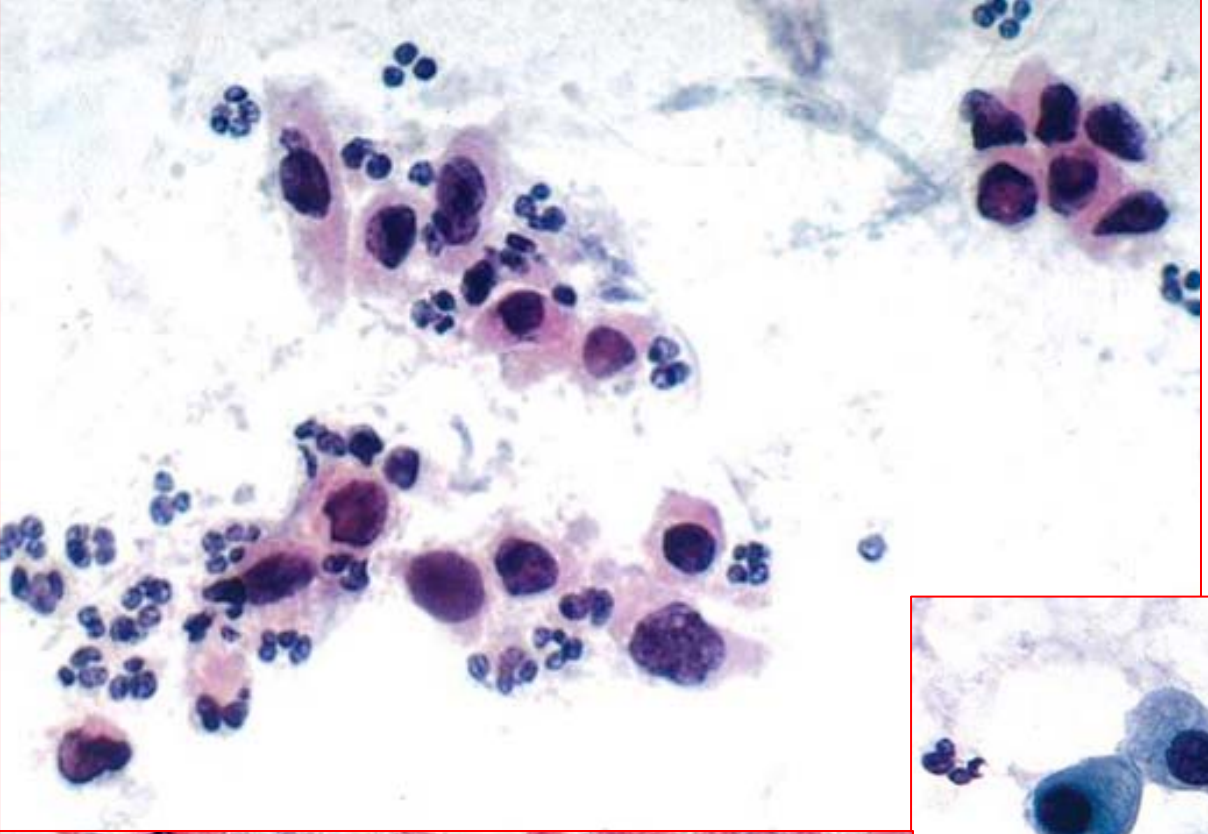


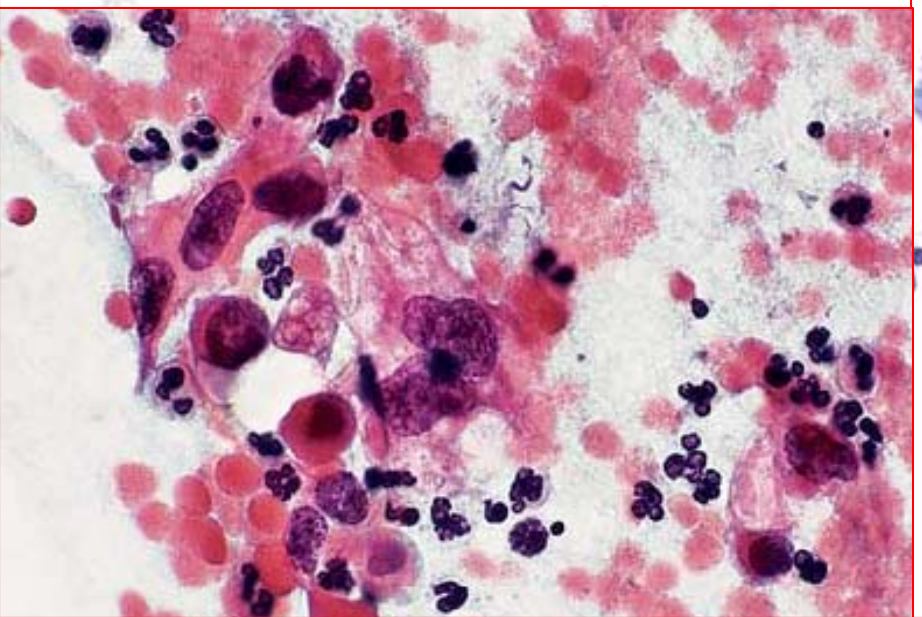
Squamous cell carcinoma

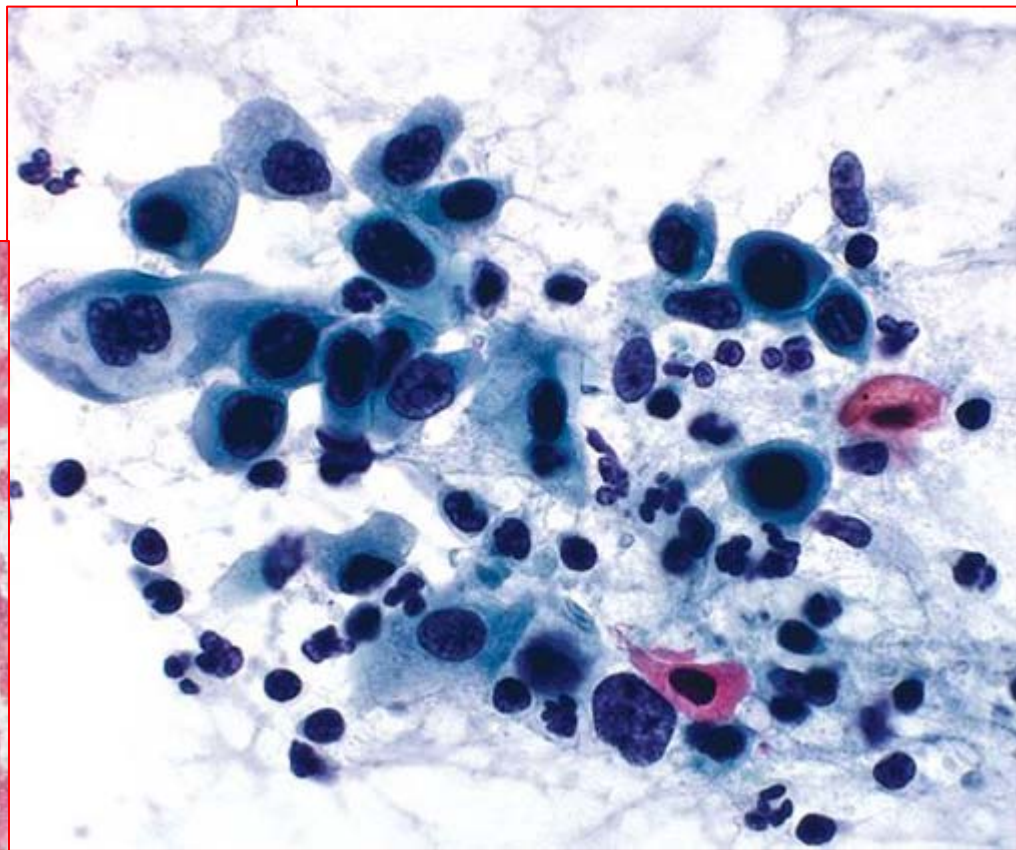




Squamous cell carcinoma



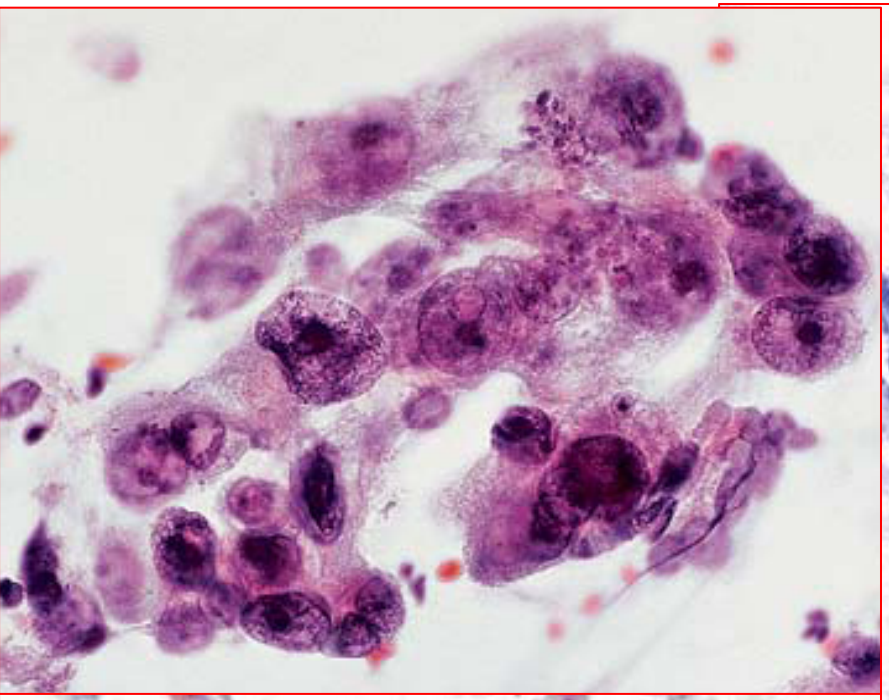


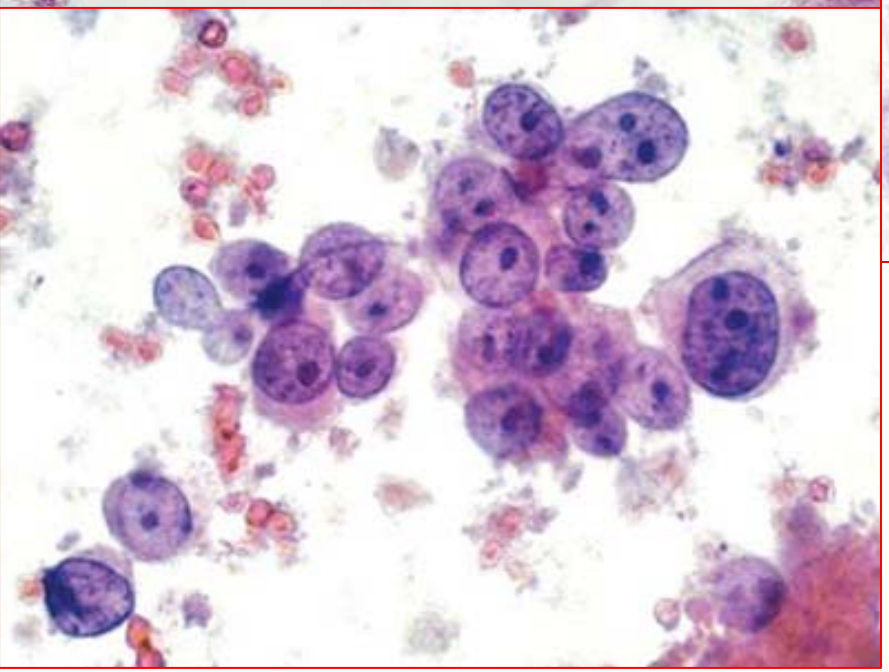


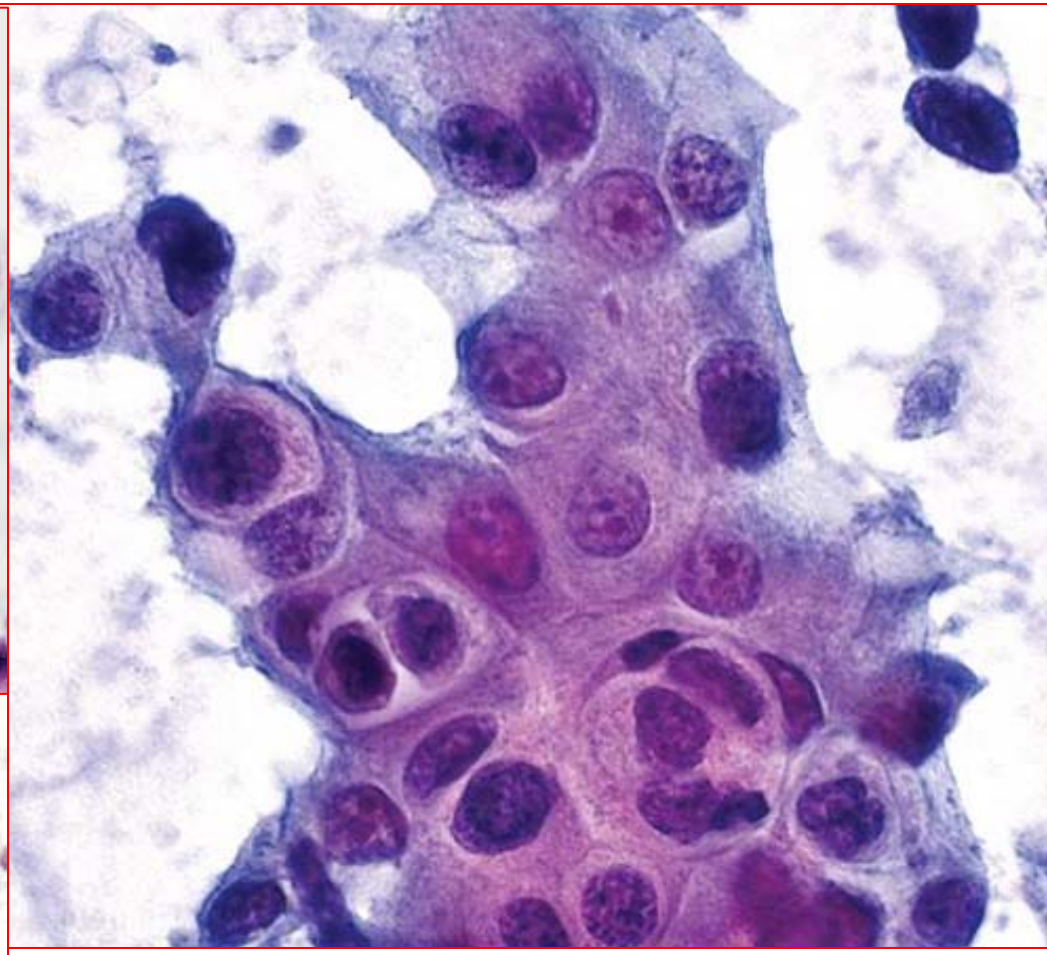
Undifferentiated large cell Carcinoma

- Hypercellular
- Large groups
- Large cells
- Single cells

- TTF-1+
- CK7+
- CEA+
- B72.3+
- BerEp4+
- MOC31+





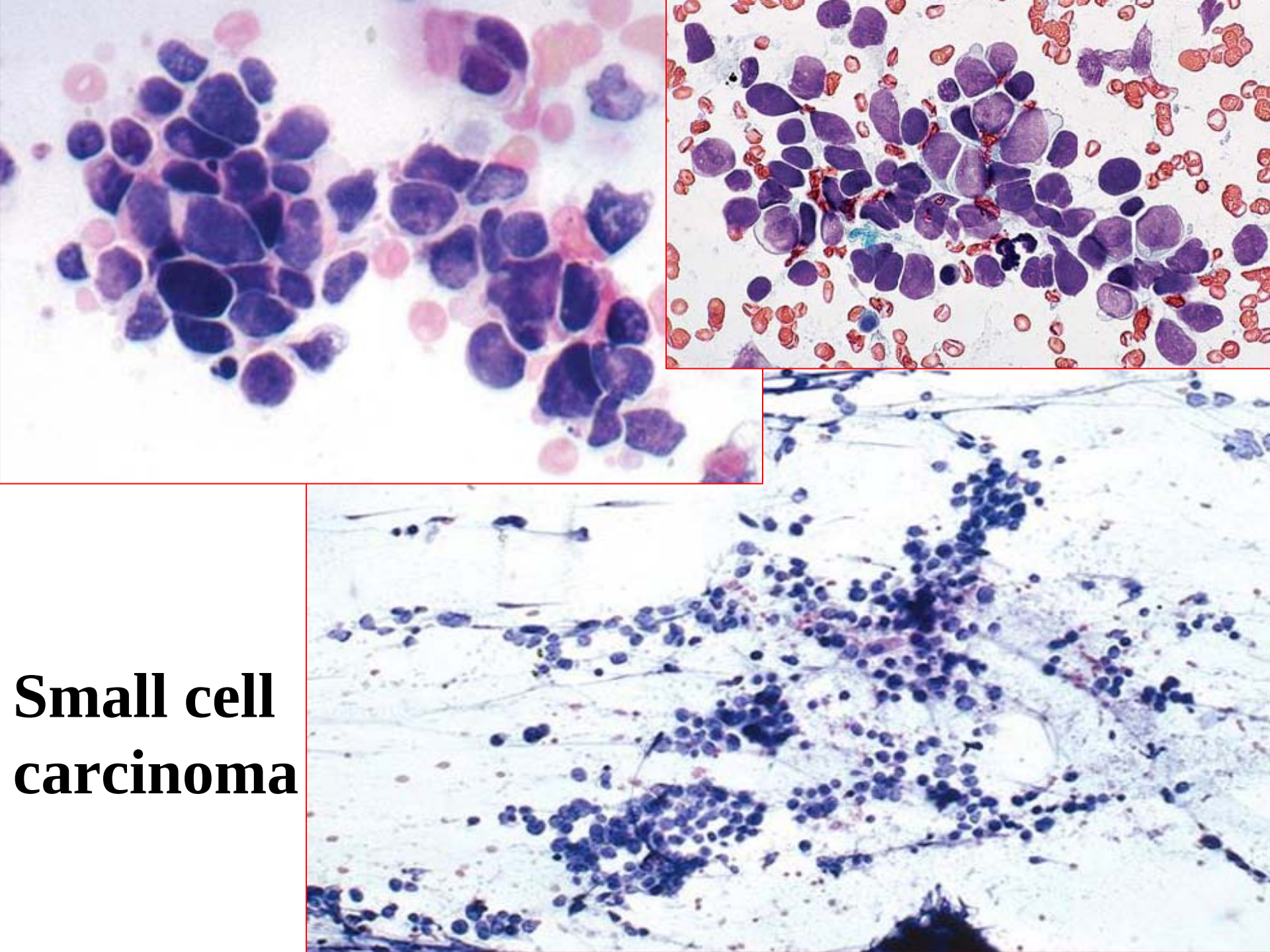


Undifferentiated large cell carcinoma

Small Cell Carcinoma

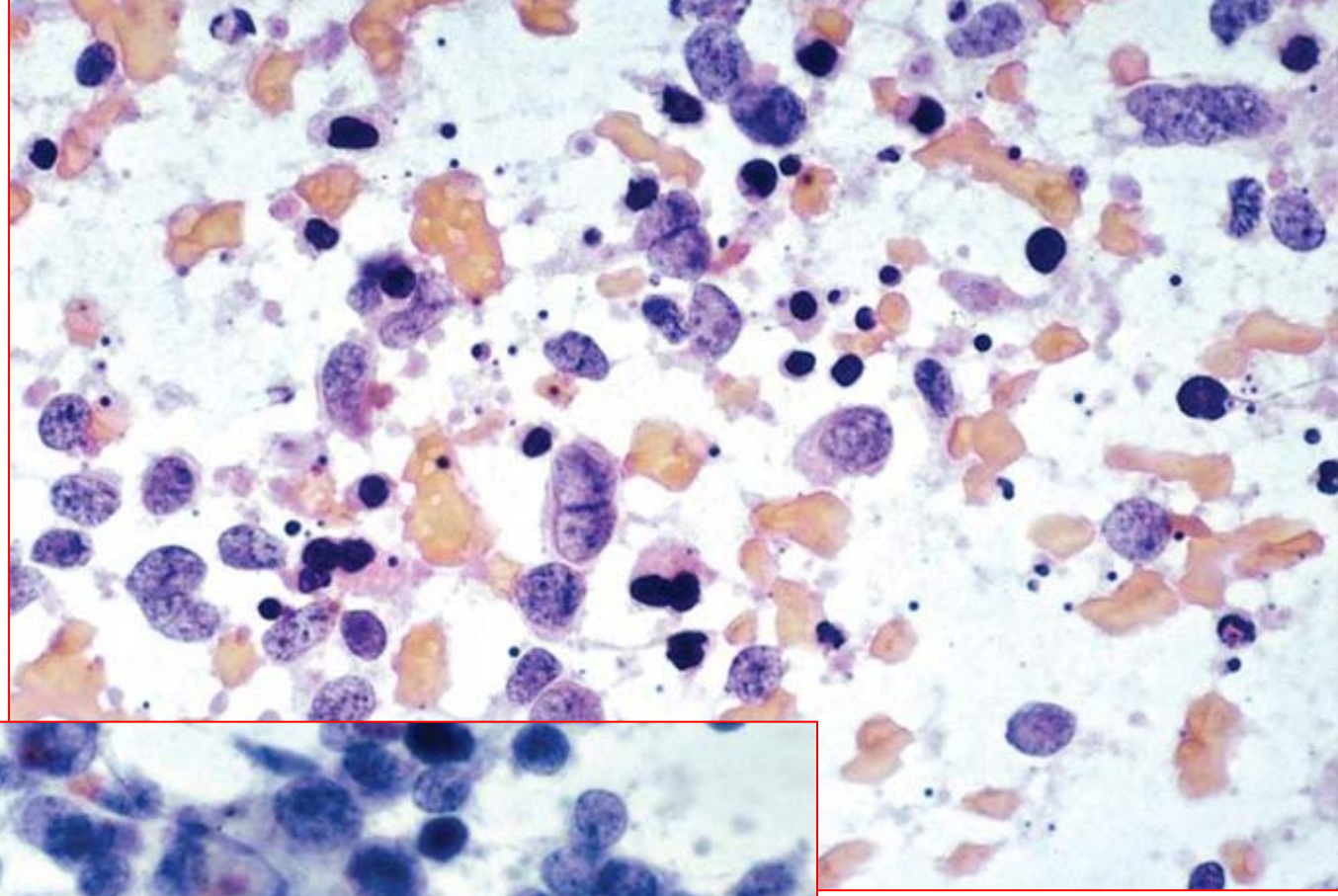
- Salt and pepper chromatin
- No or small nucleoli
- Molding
- Mitoses
- Necrosis

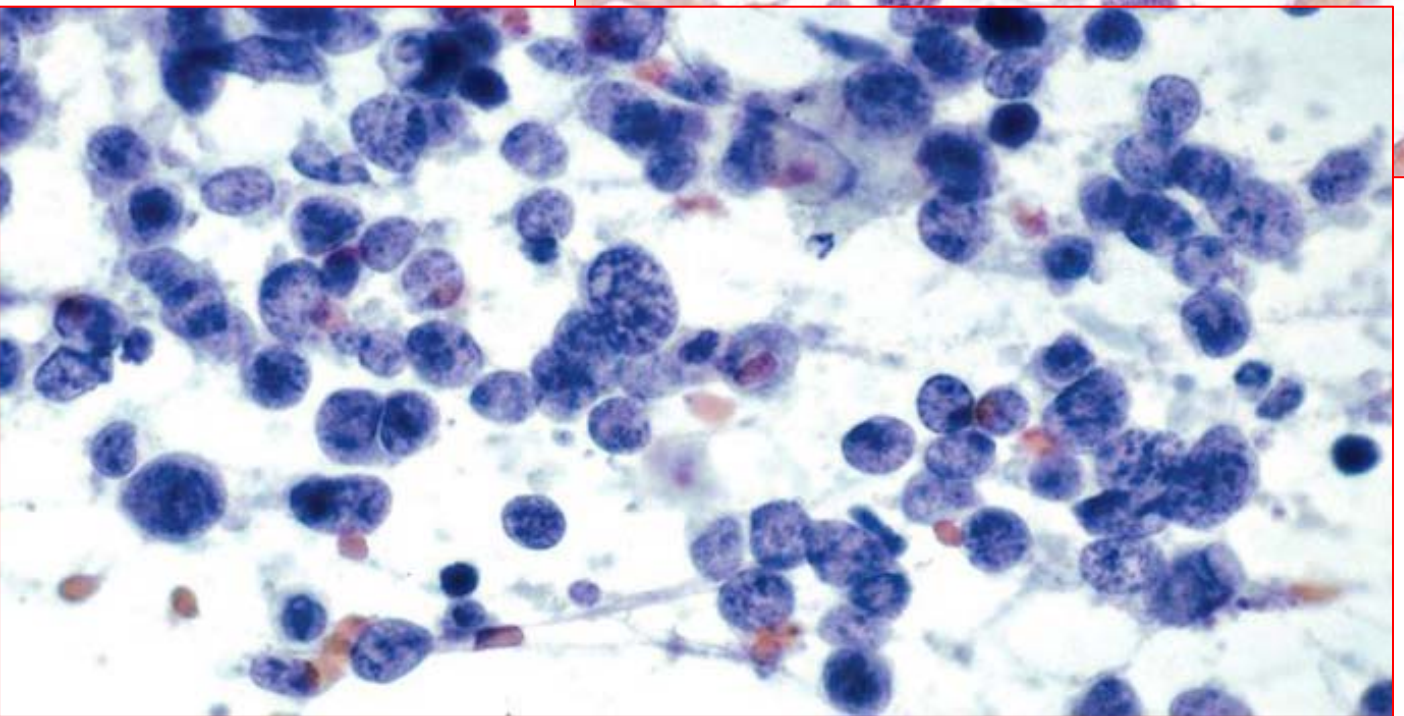
- CK+
- Chromogranin+
- NSE+/-
- Synaptophysin+/-
- TTF-1+



Small cell carcinoma

Small cell carcinoma

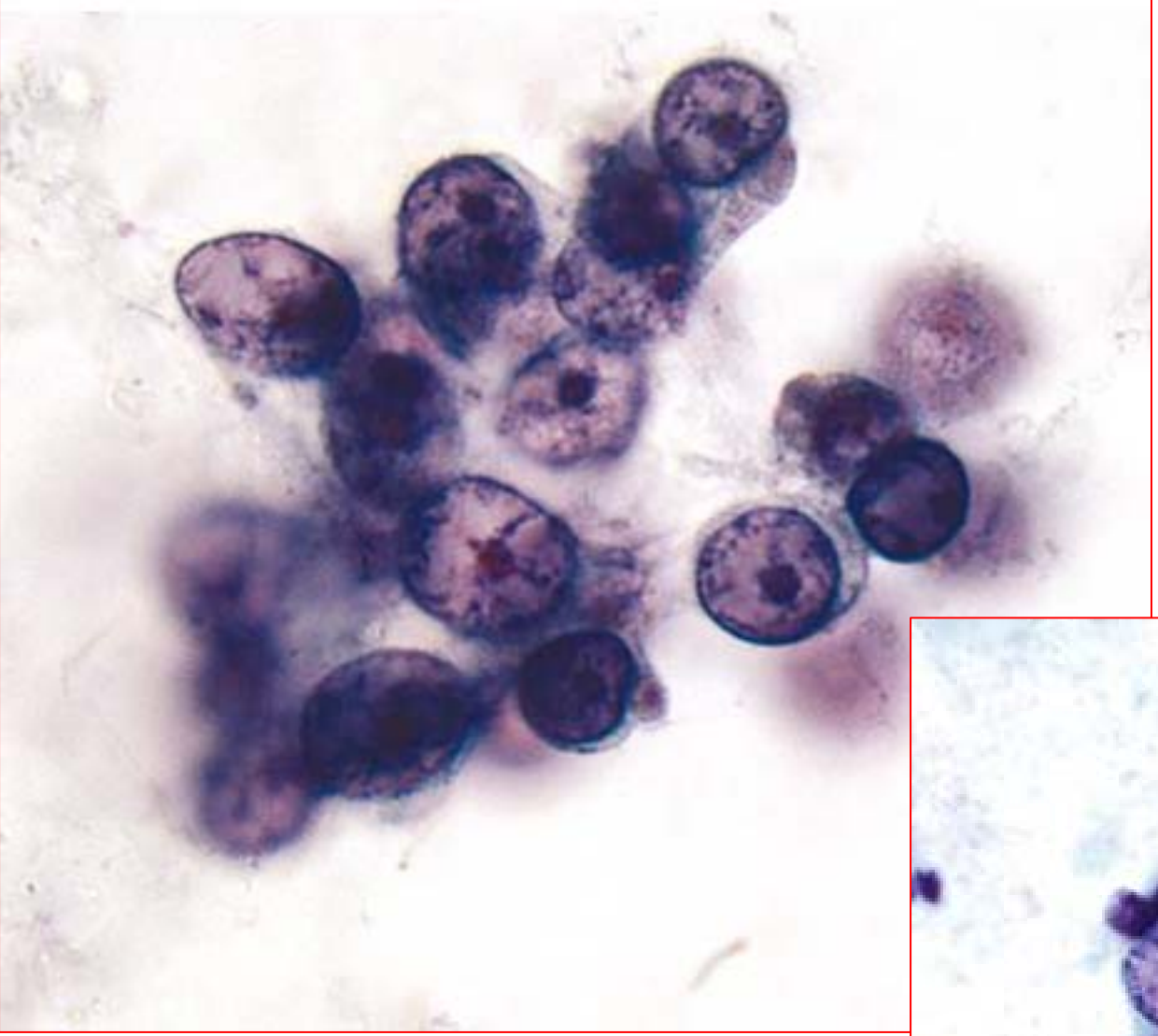


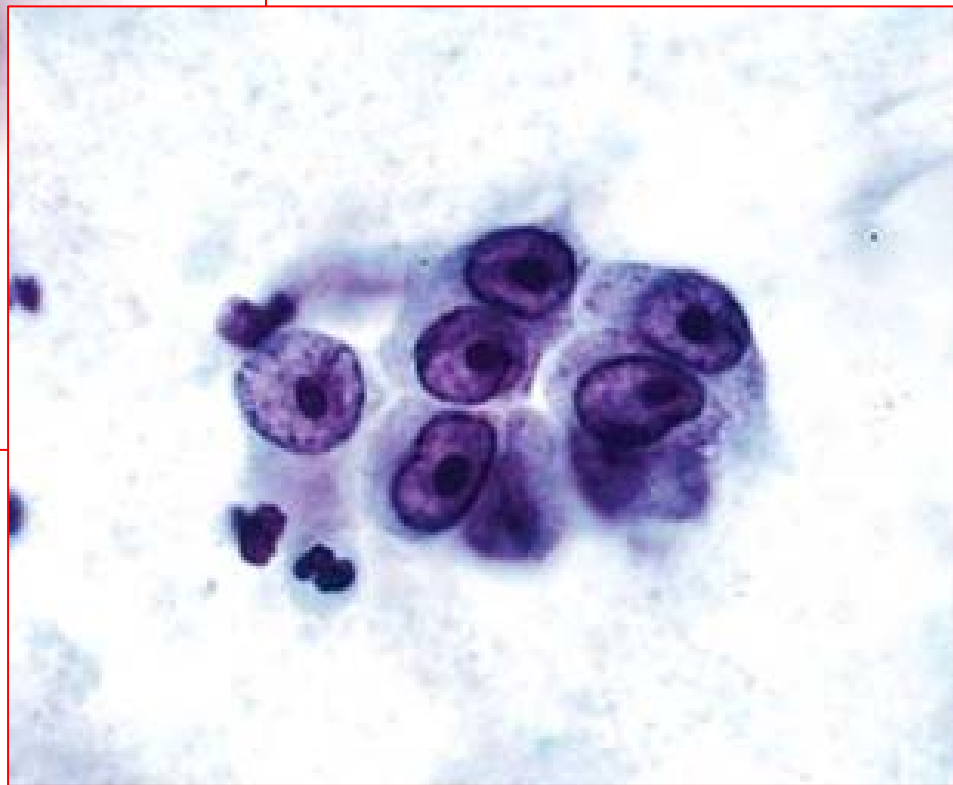


Adenocarcinoma

- **Hypercellular**
- **Often crowded with scant or vacuolated cytoplasm**
- **Pale chromatin**
- **Nuclear irregularity**
- **Prominent nucleoli**

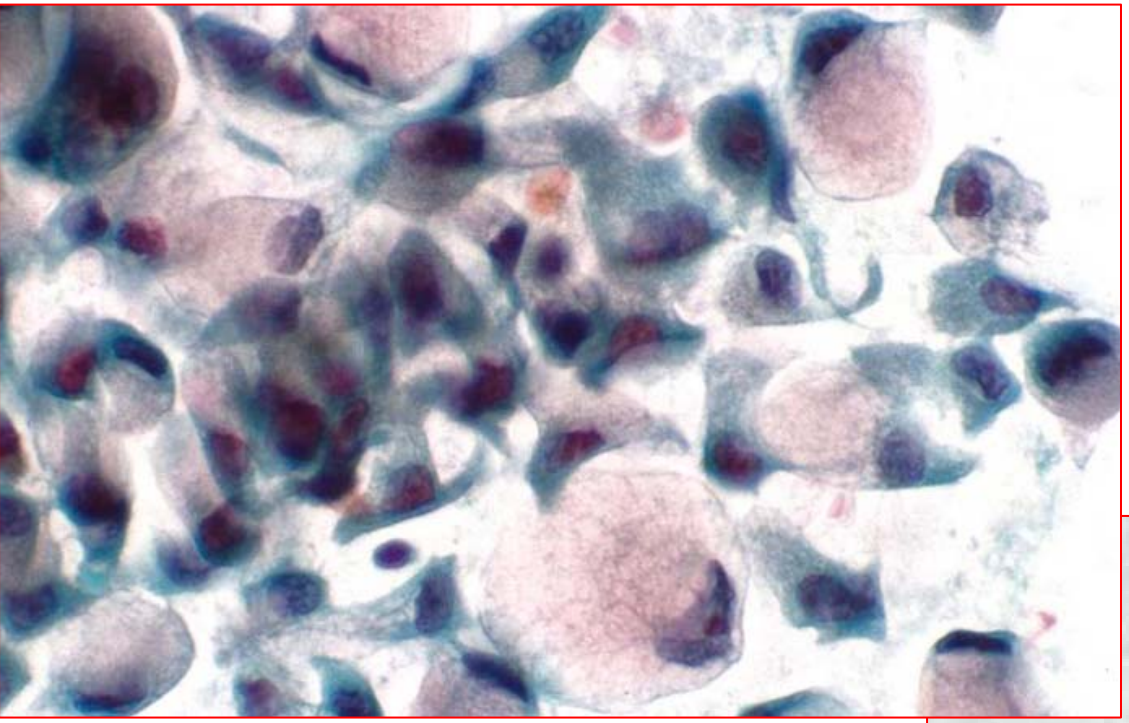
- **TTF-1+**
- **CK7+**
- **CK20-**
- **CEA+**
- **B72.3+**
- **BerEp4+**
- **MOC31+**

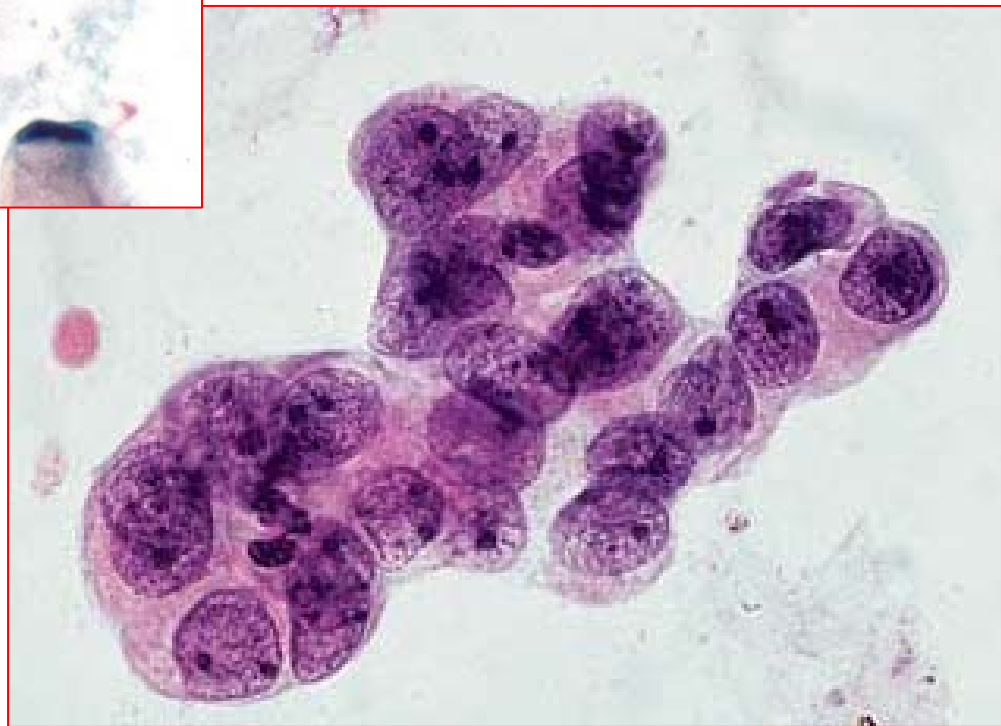




Adenocarcinoma

Adenocarcinoma



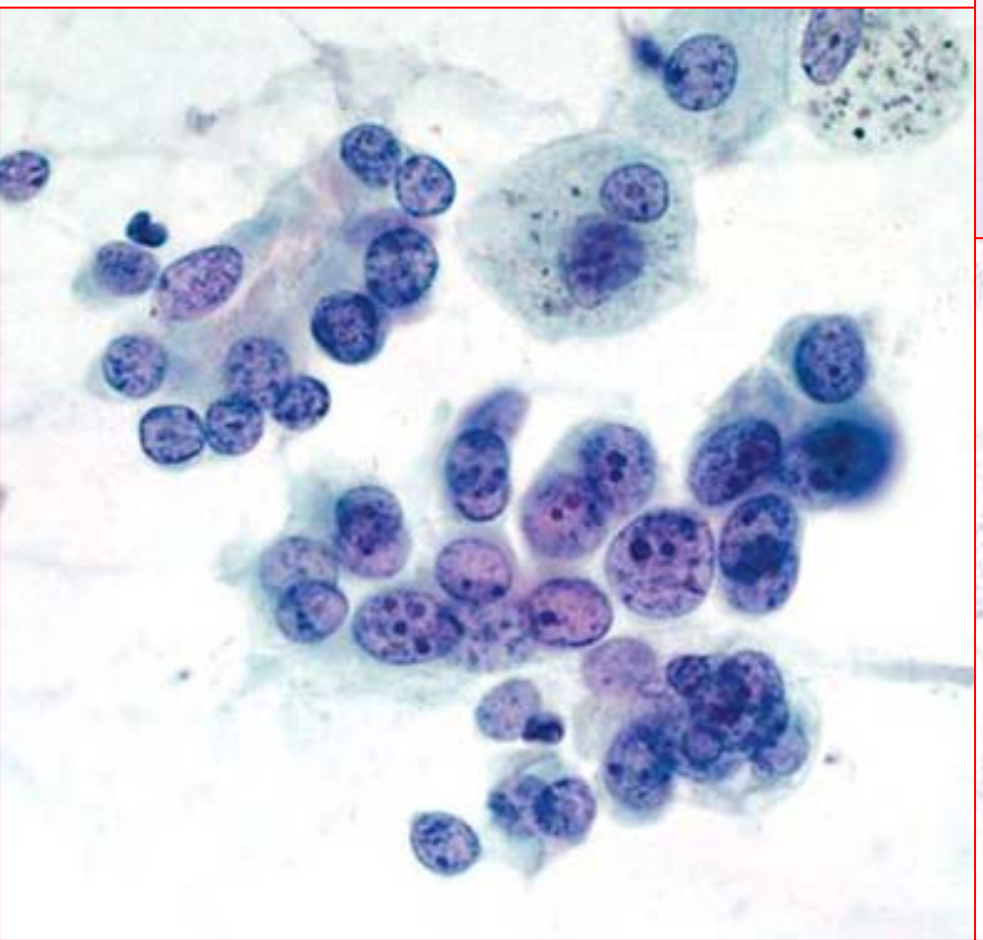


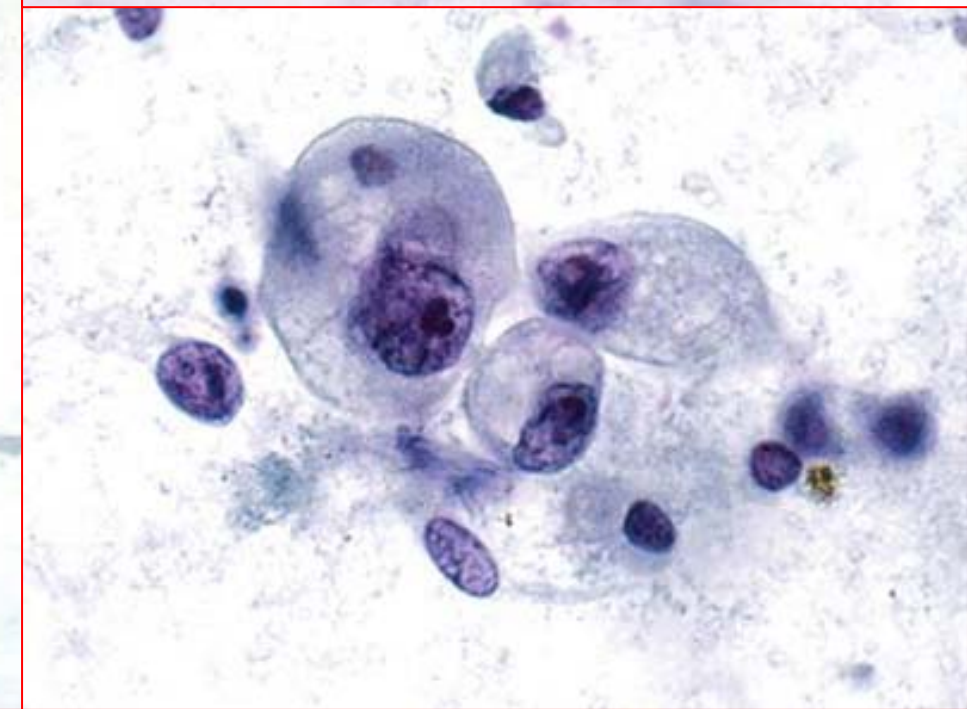
Bronchioloalveolar Carcinoma (BAC)

- Cohesive group of small tumor cells (1.5 to 2.5 times of bronchial basal cell nuclei)
- Less cytoplasm
- Uniform hyperchromatic nuclei

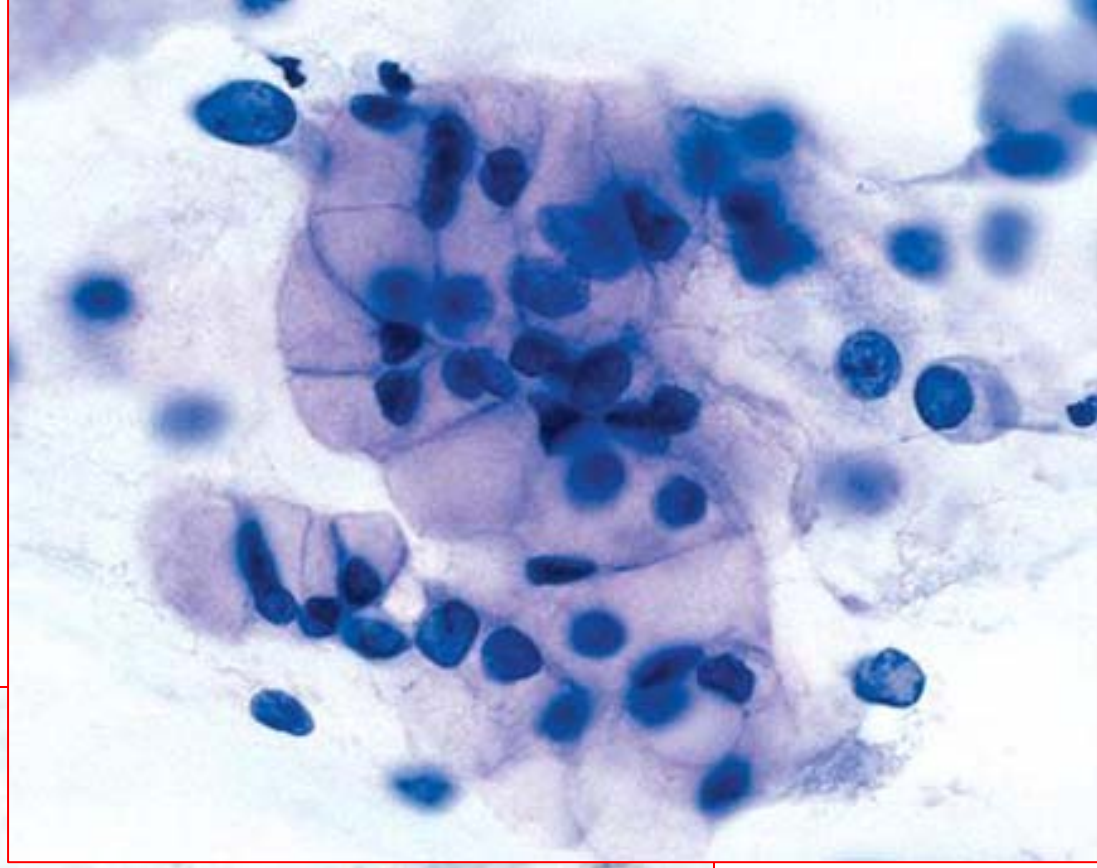
- TTF-1+
- CK7+
- CEA+
- B72.3+
- BerEp4+
- MOC31+

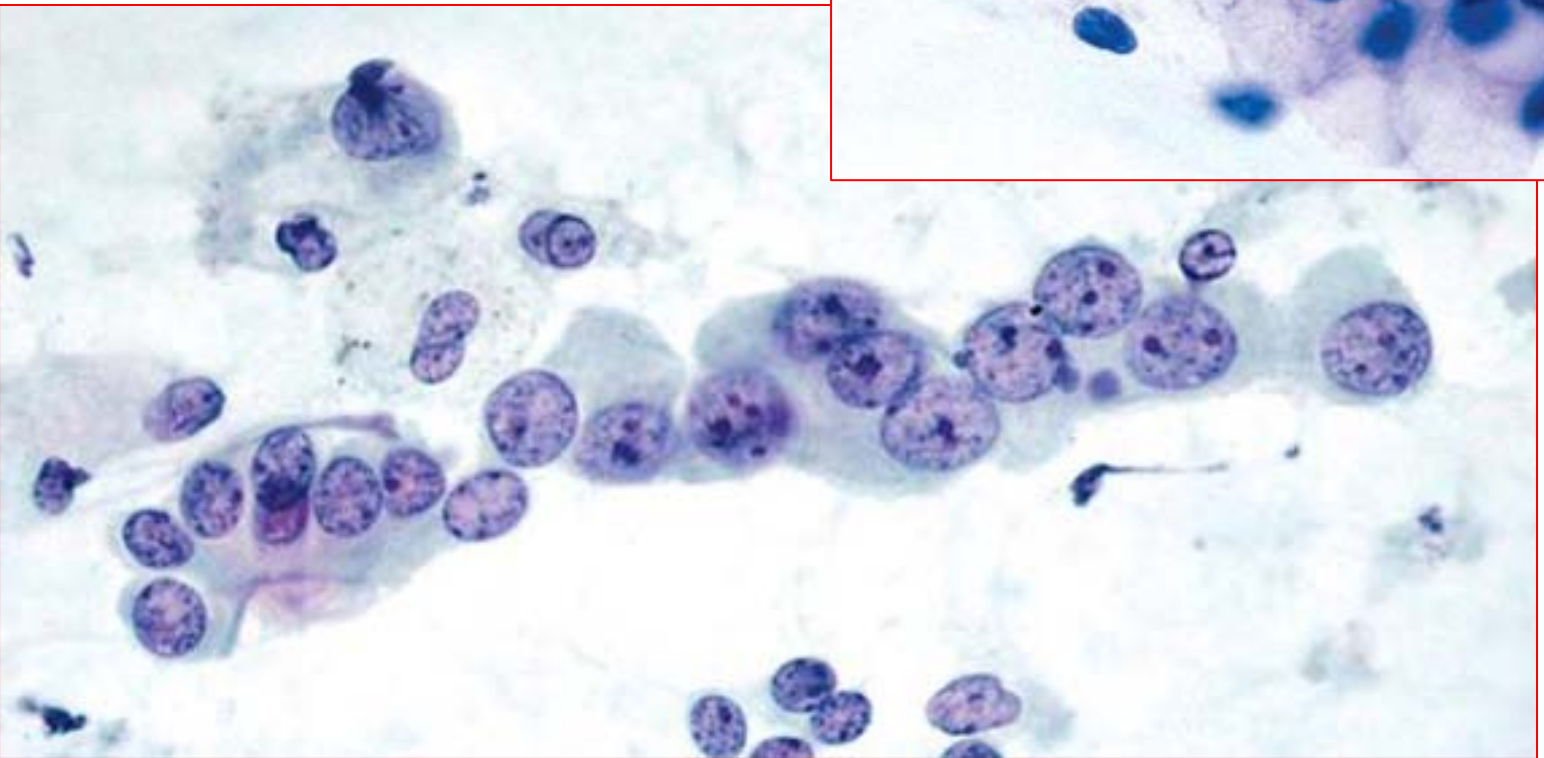
Bronchioloalveolar carcinoma (type I and II)





Bronchioloalveolar Carcinoma, Type II



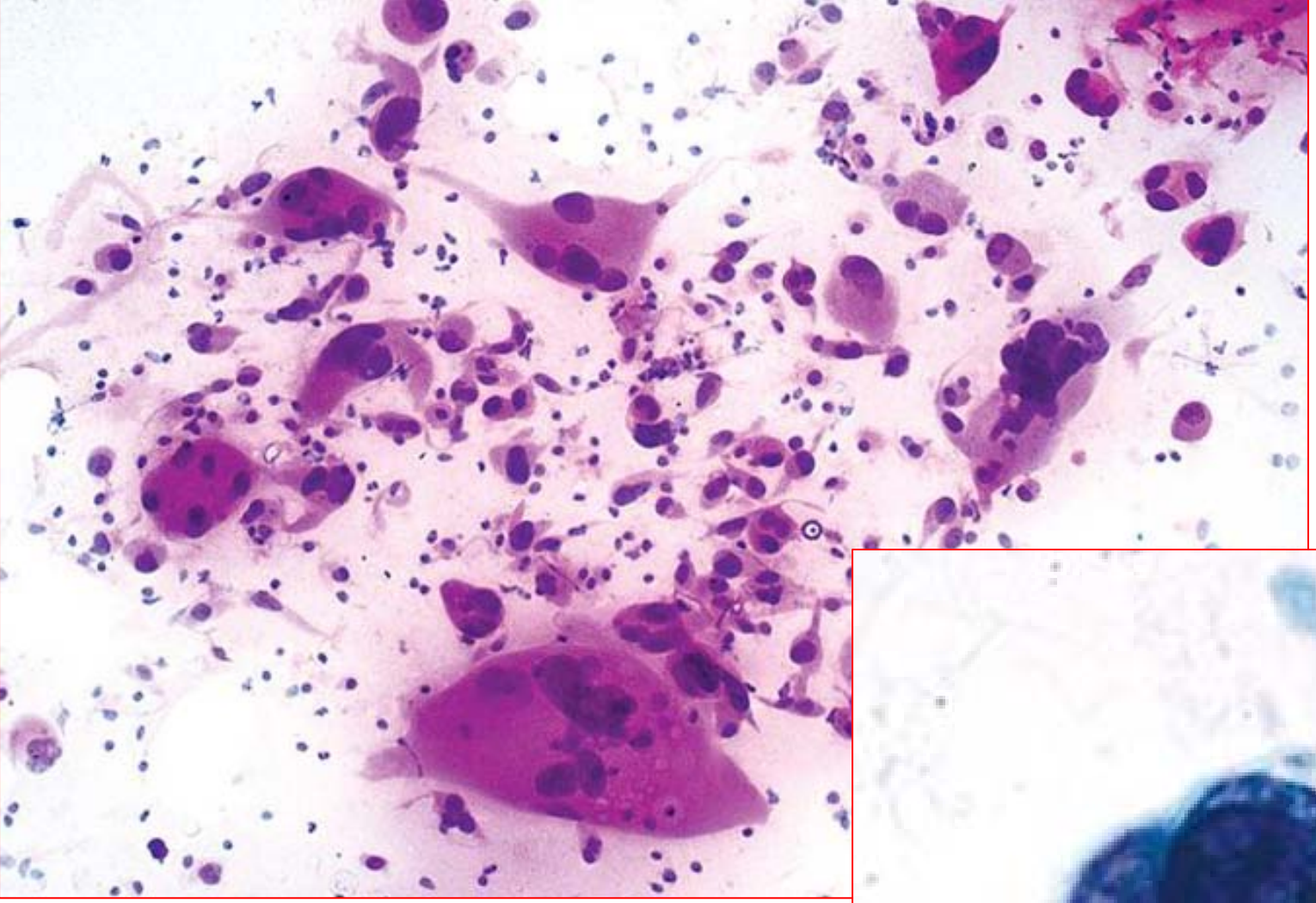


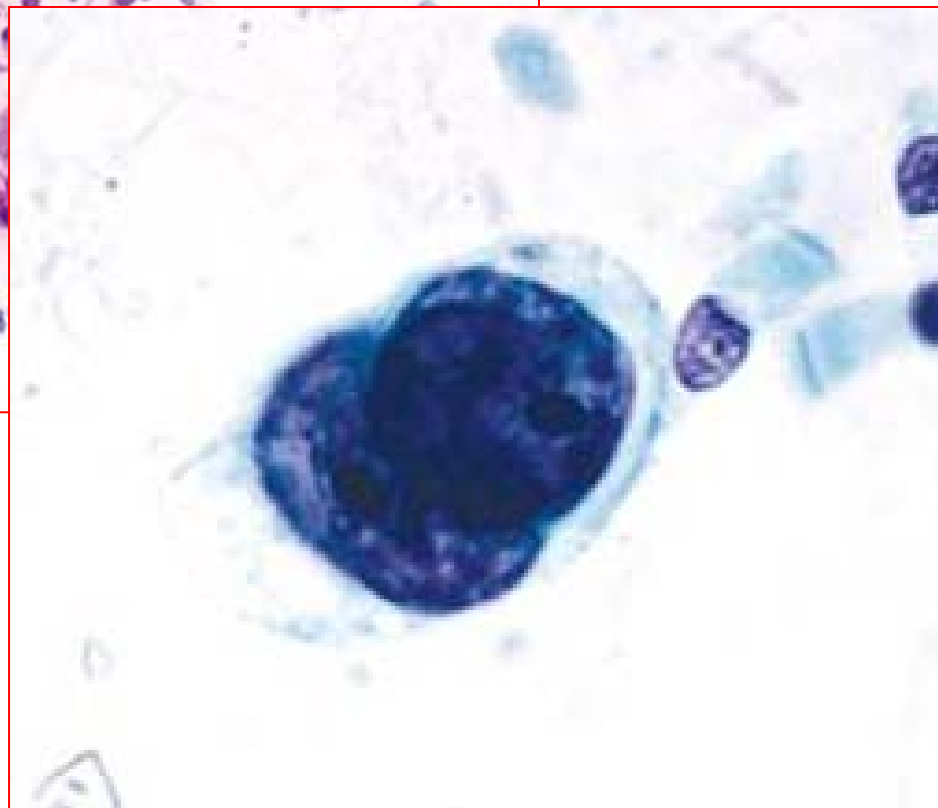
Type I

Giant cell Carcinoma

- **Pleomorphic cells**
- **Giant cells**
- **Spindle cells**

- **CK+**
- **EMA+**
- **LCA-**
- **CD30-**
- **S-100-**
- **HMB45-**



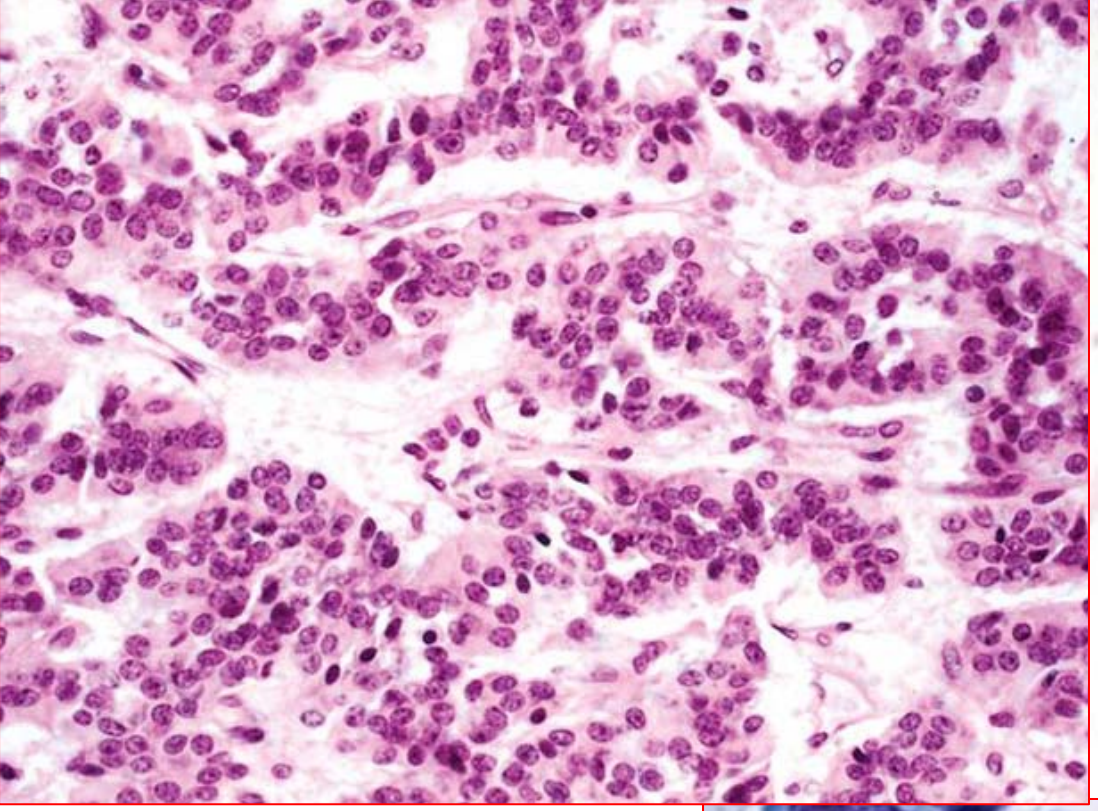


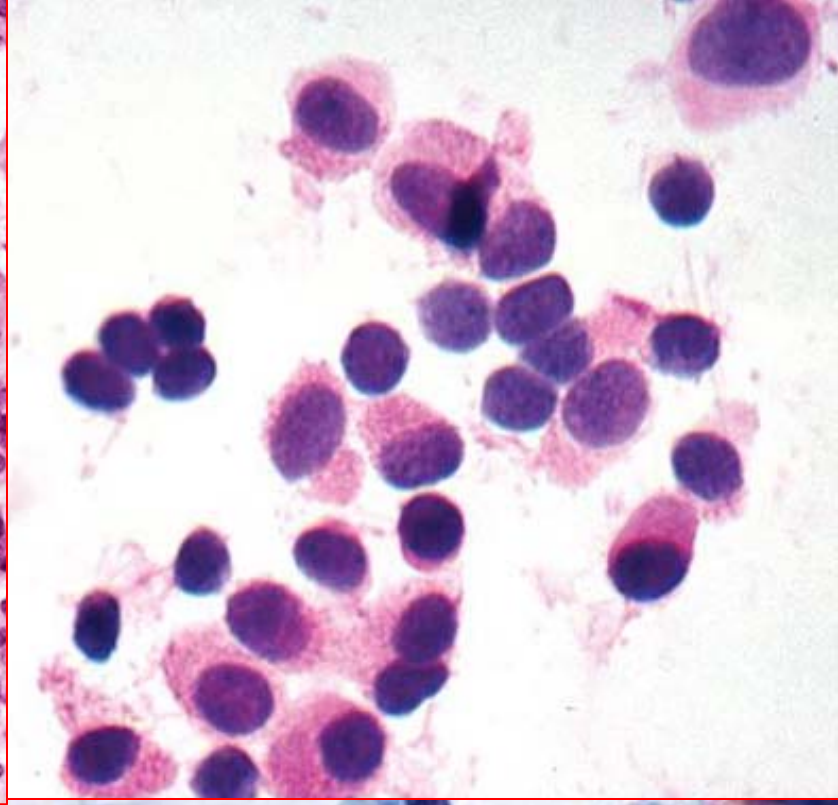
Giant Cell Carcinoma

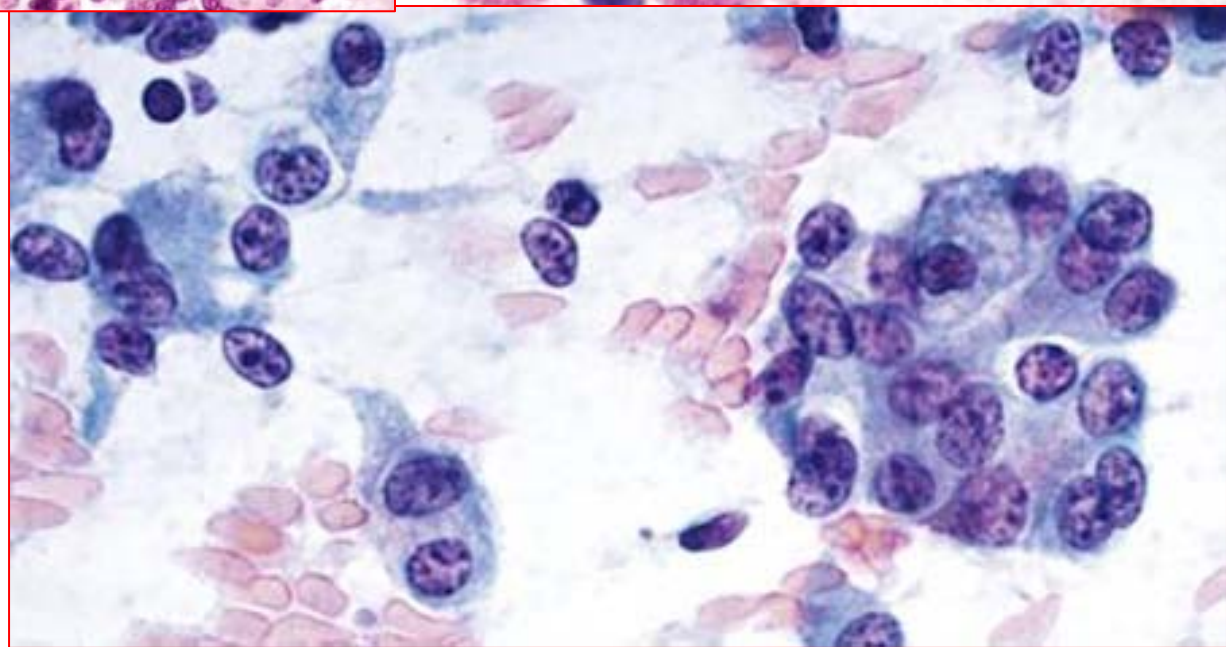
Carcinoid Tumor

- Dyshesive
- Round cells
- Salt and pepper chromatin
- No to rare mitosis
- No necrosis
- No molding

- Chromogranin+
- NSE+
- Synaptophysin+
- CK+
- TTF-1+





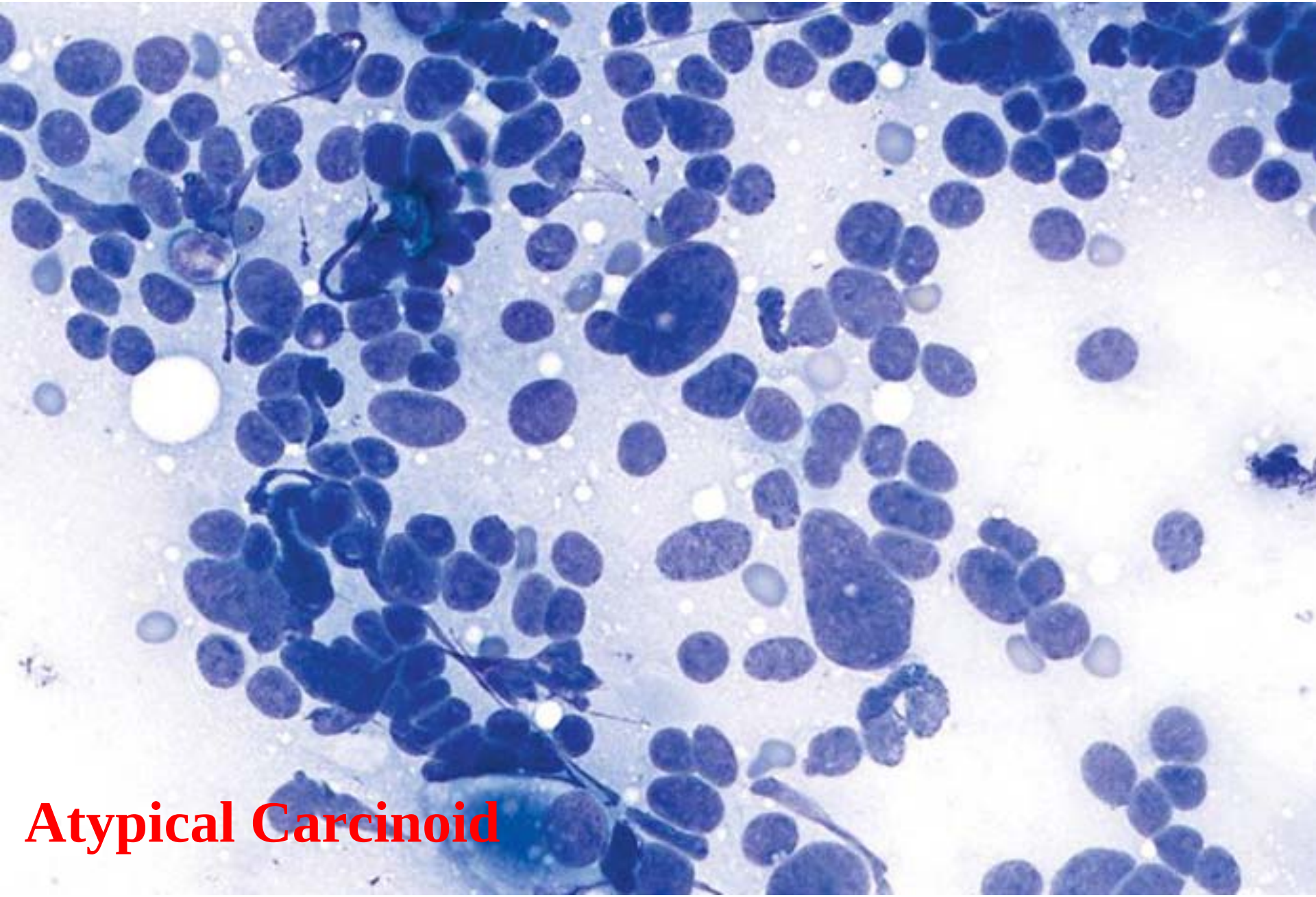


Carcinoid Tumor

Atypical Carcinoid Tumor

- Dyshesive
- Atypical nuclei
- Salt and pepper chromatin
- Rare mitosis
- No necrosis
- No molding

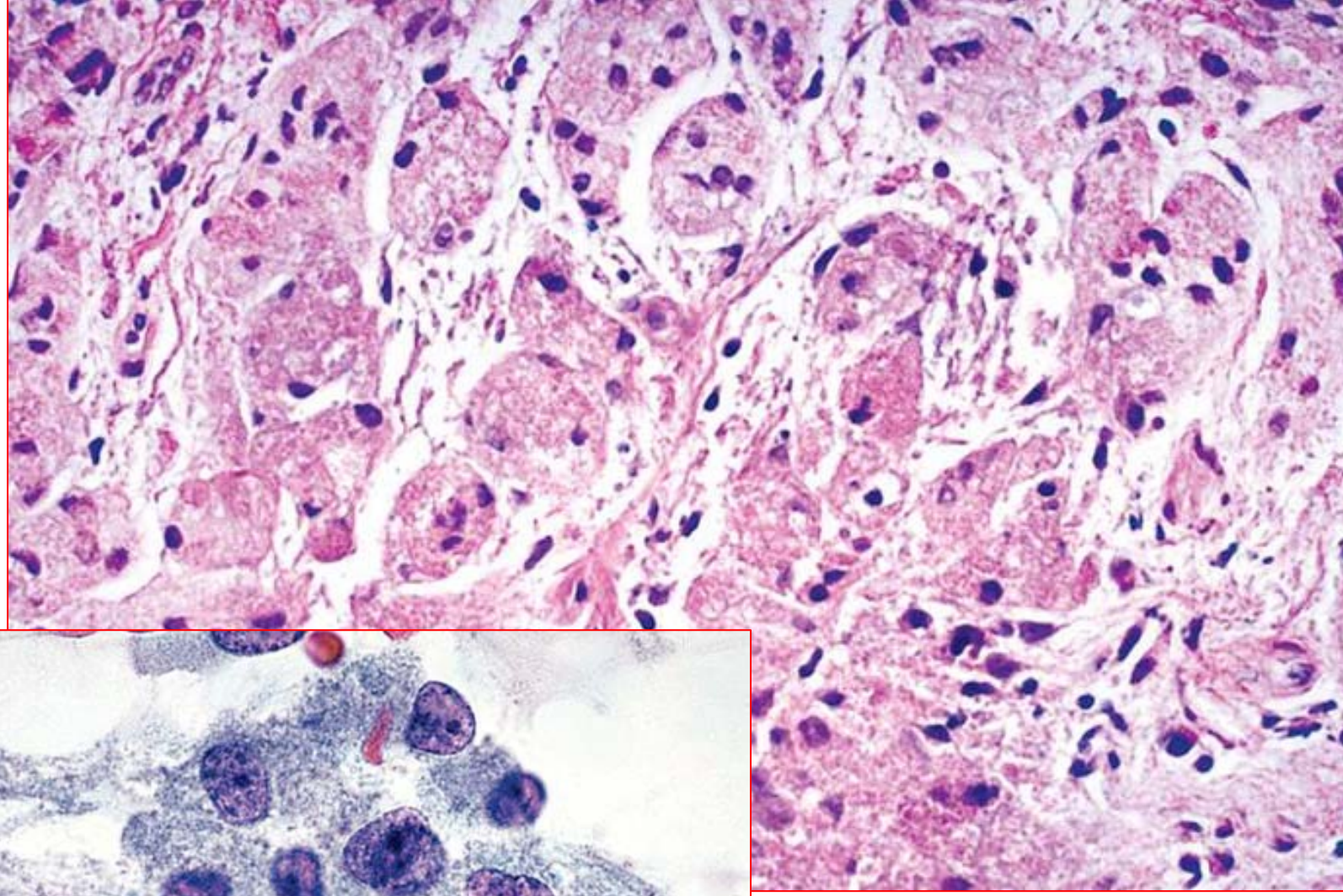
- Chromogranin+
- NSE+
- Synaptophysin+
- CK+
- TTF-1+

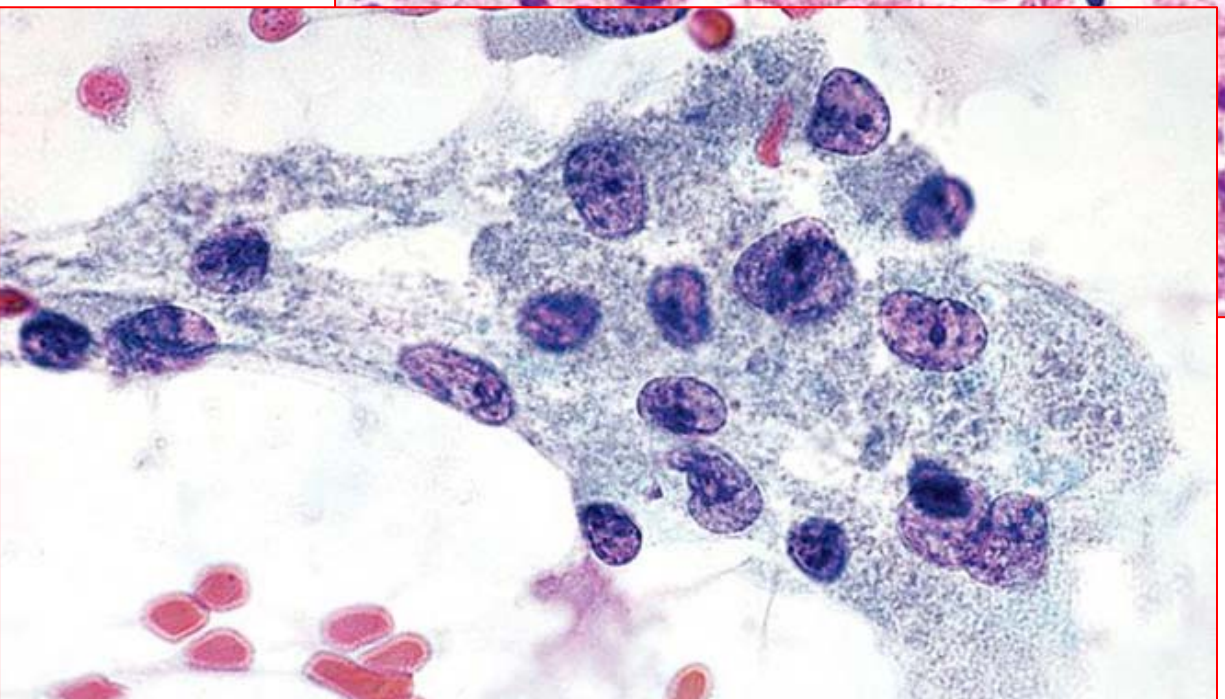

Atypical Carcinoid

Granular cell tumor

- Dyshesive
- Large cells
- Granular cytoplasm
- Round nuclei
- “Naked” nuclei

- CK+ (variable)
- S-100+
- CD68+
- HMB45-



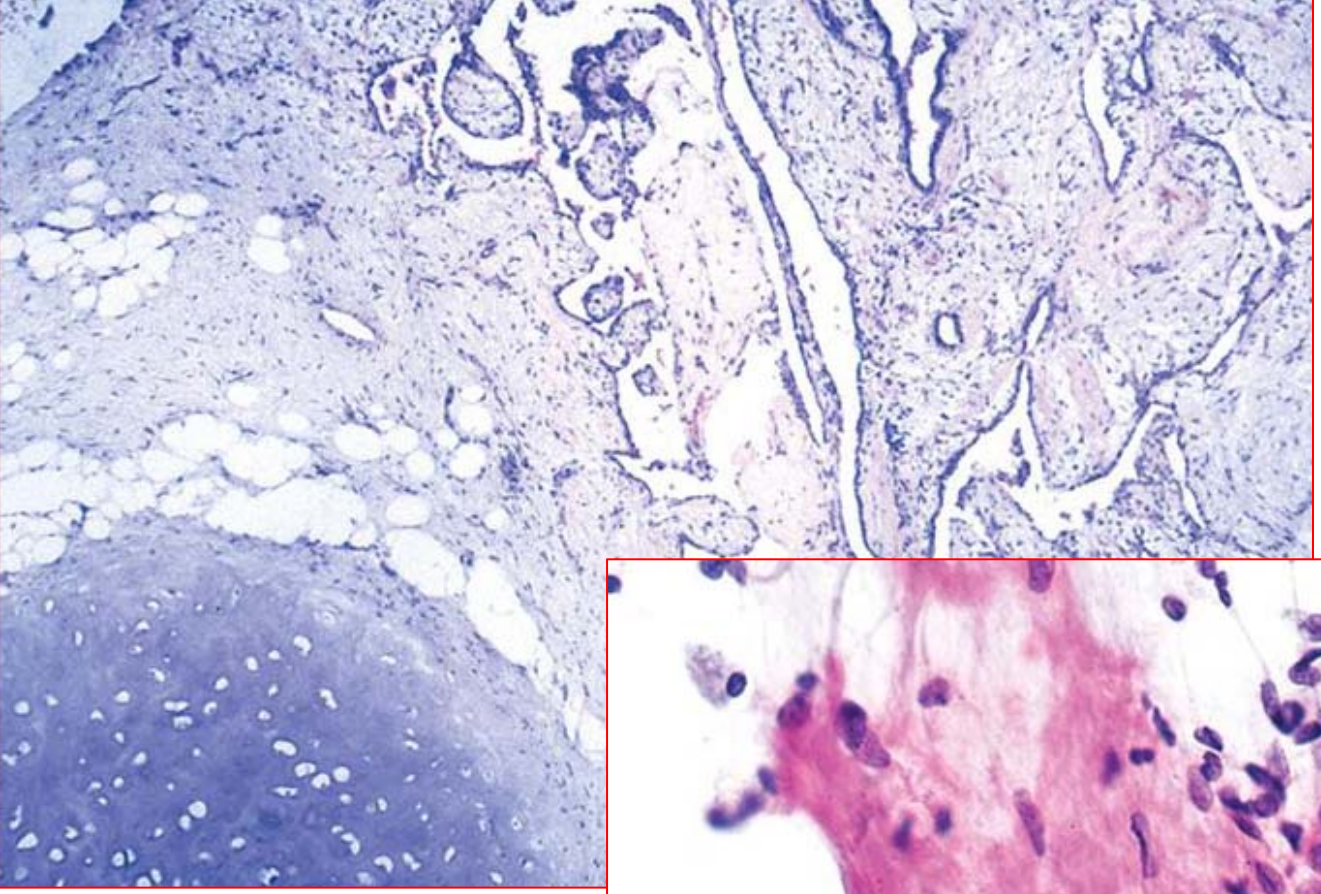


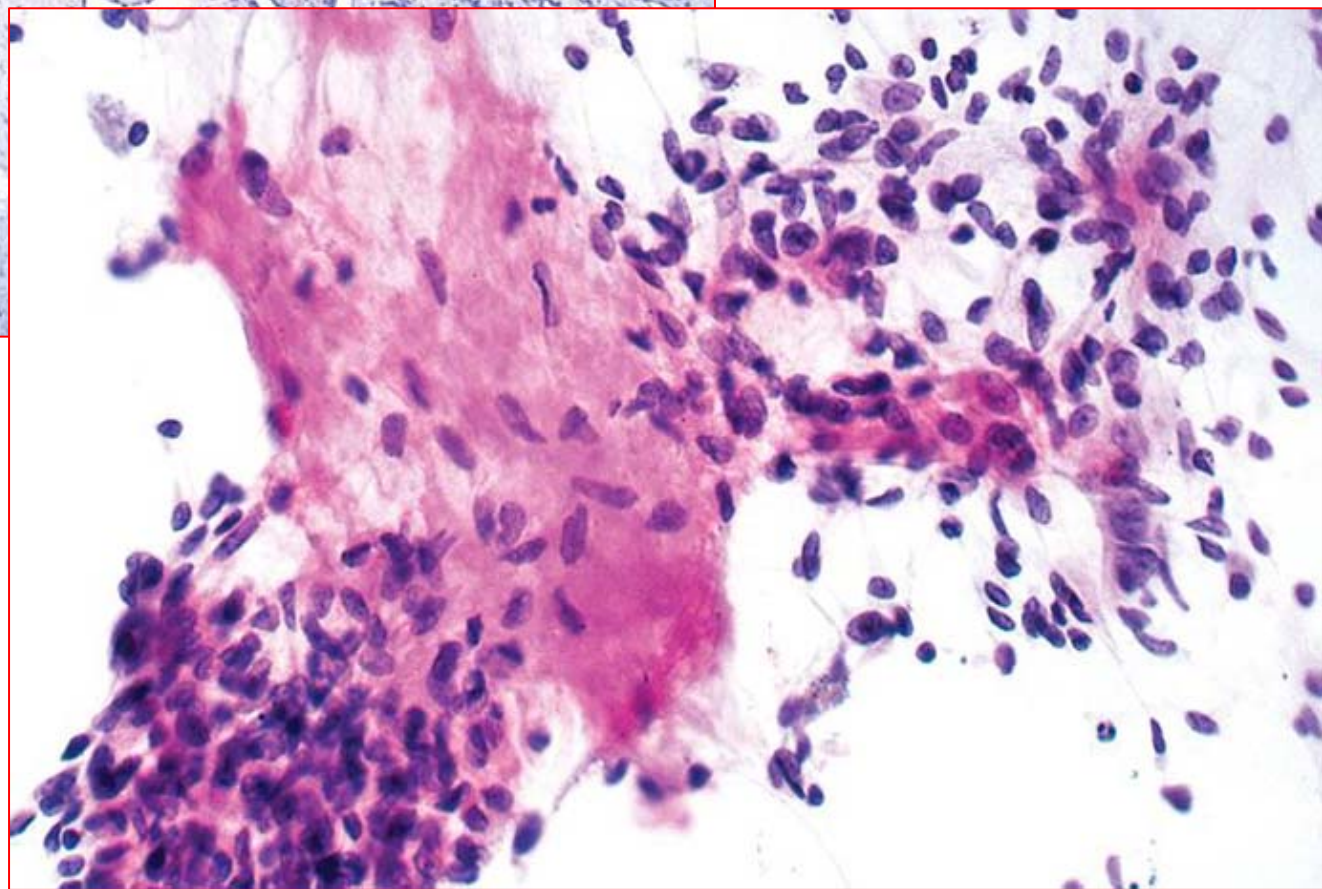
Granular Cell Tumor

Hamartoma

- **Myxohyaline material**
- **Small blue cells**
- **Scant cytoplasm**
- **No mitosis**
- **No necrosis**
- **No molding**

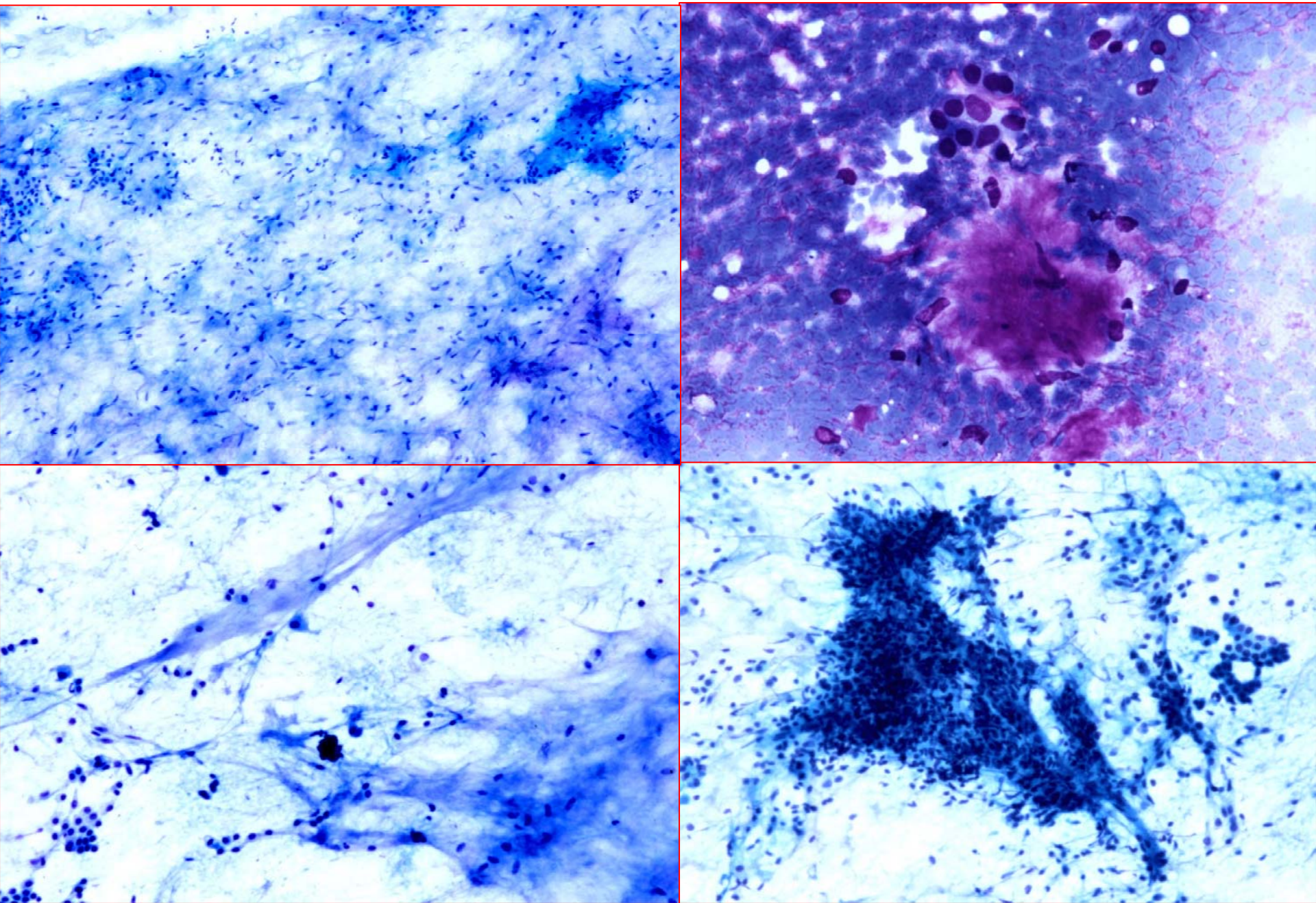
- CK+

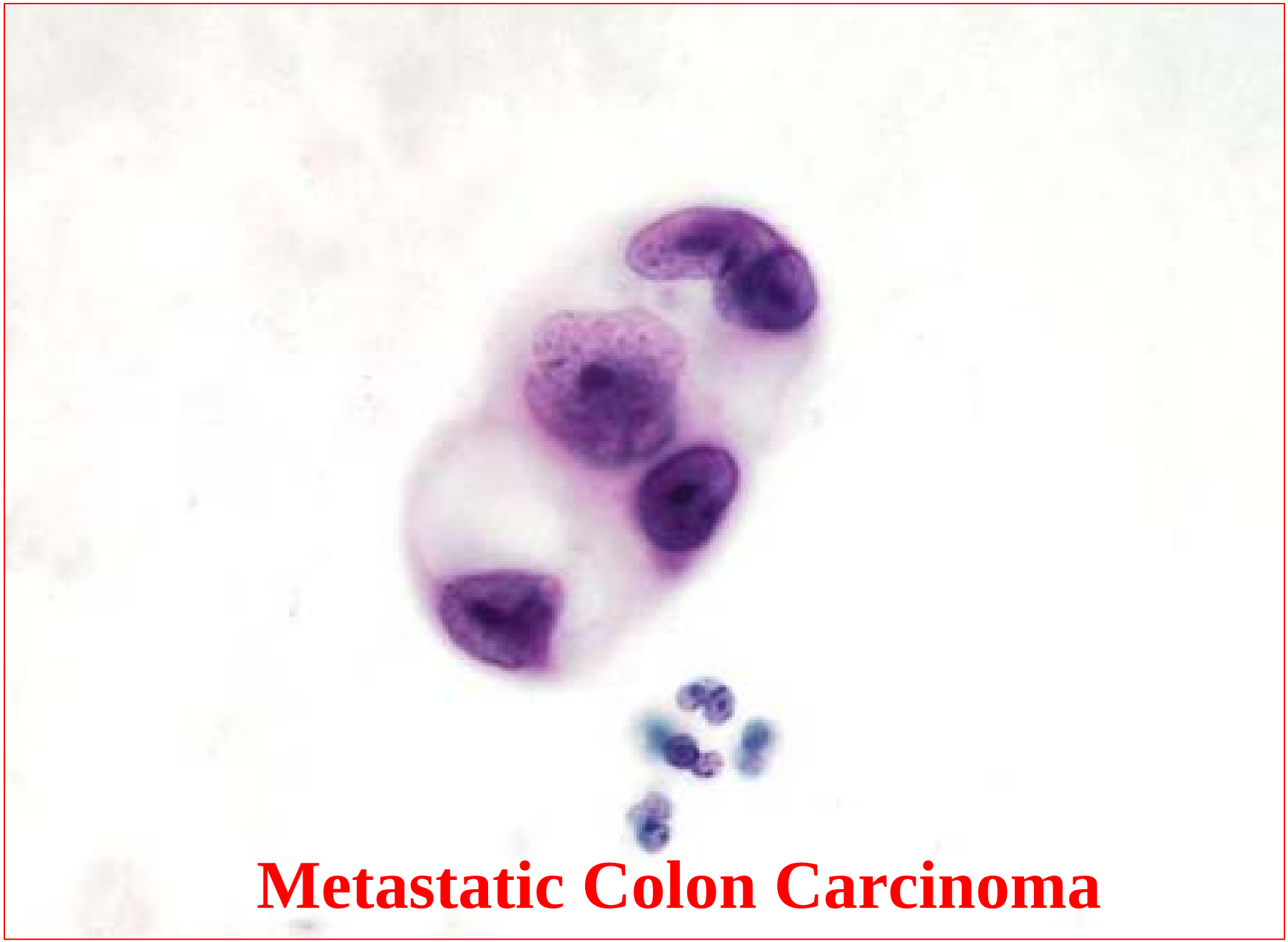




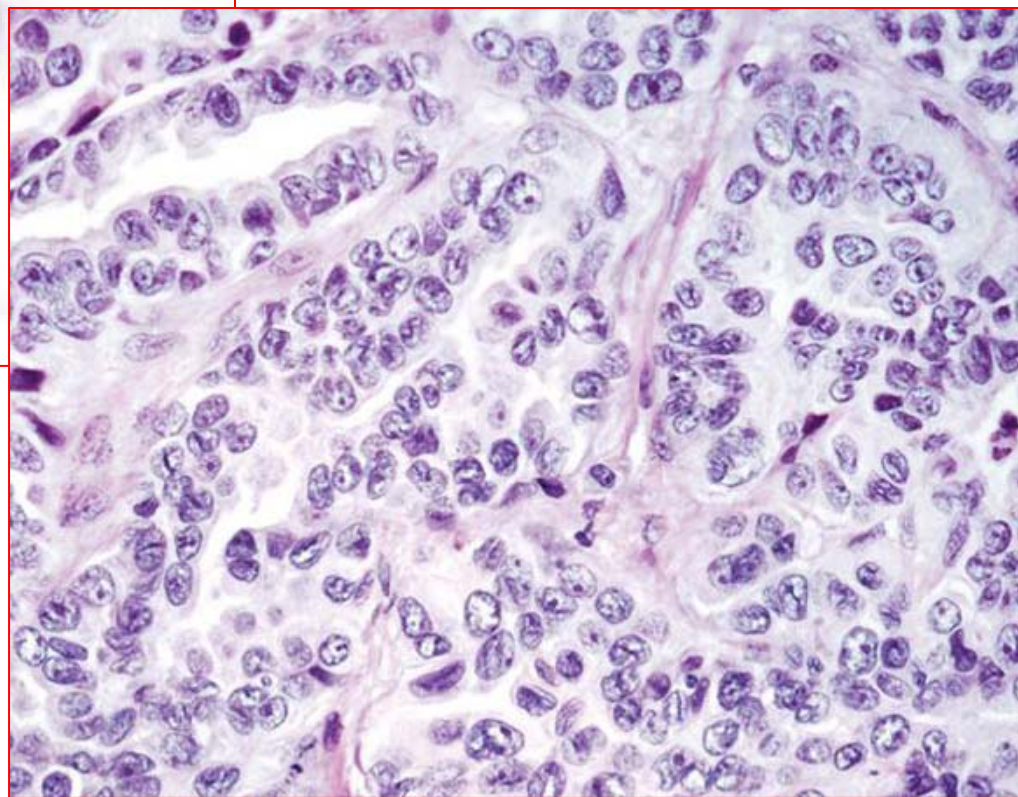
Hamartoma

Hamartoma



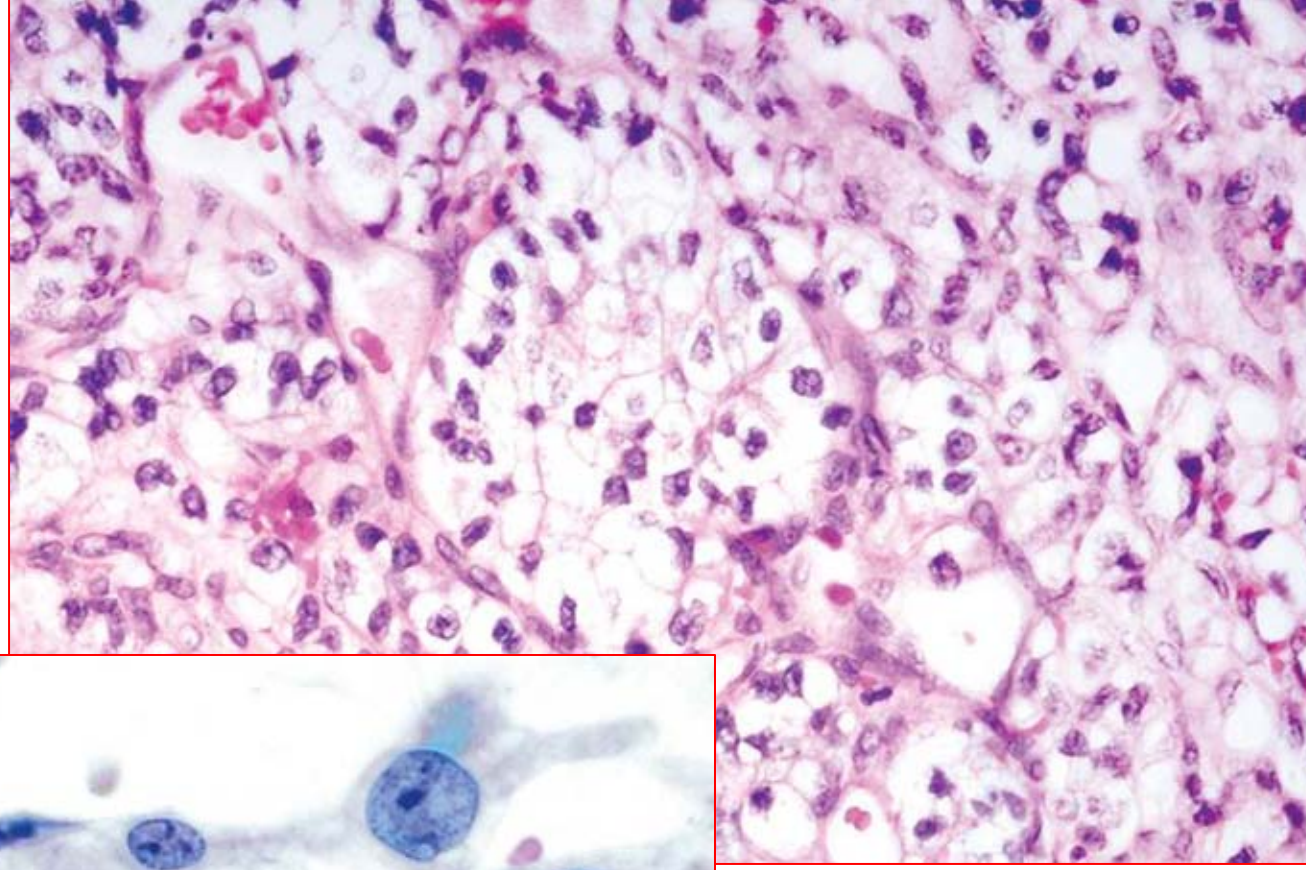


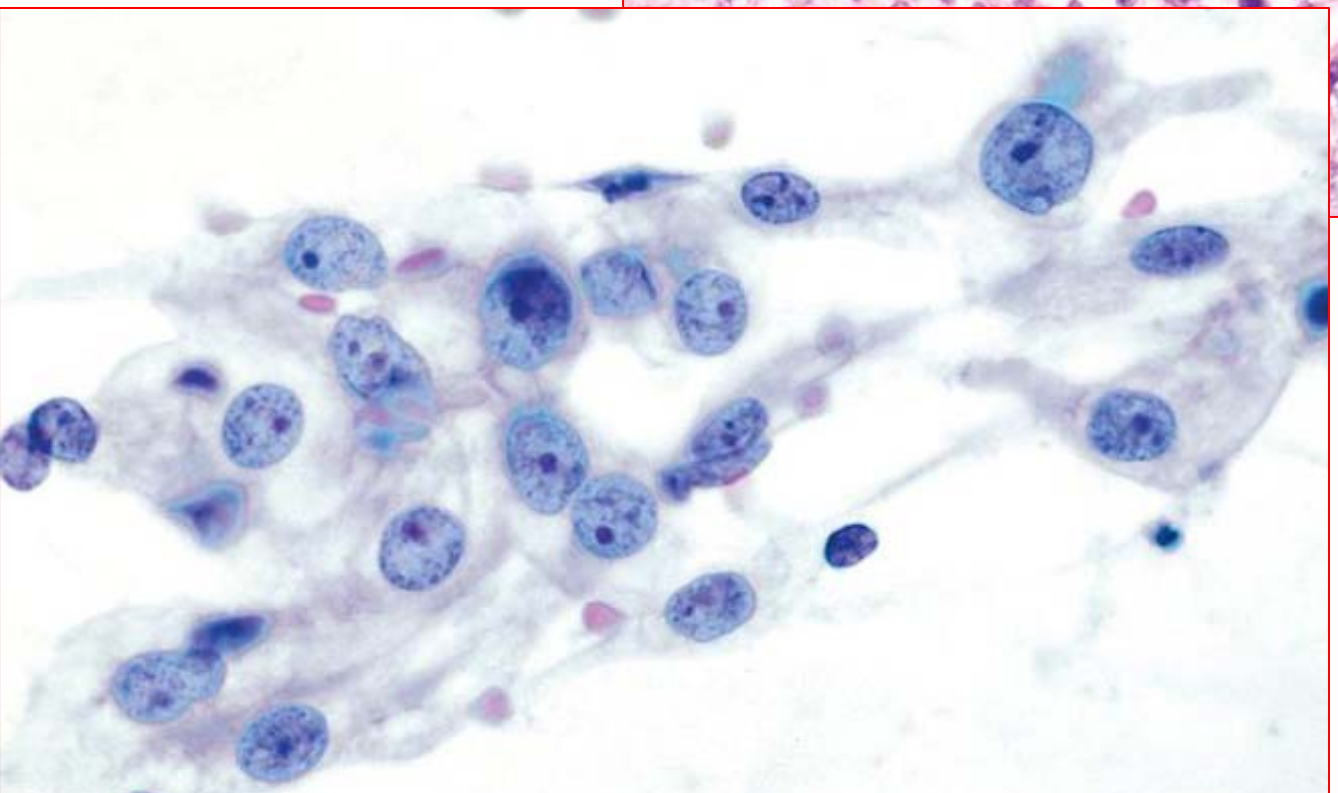
Metastatic Colon Carcinoma



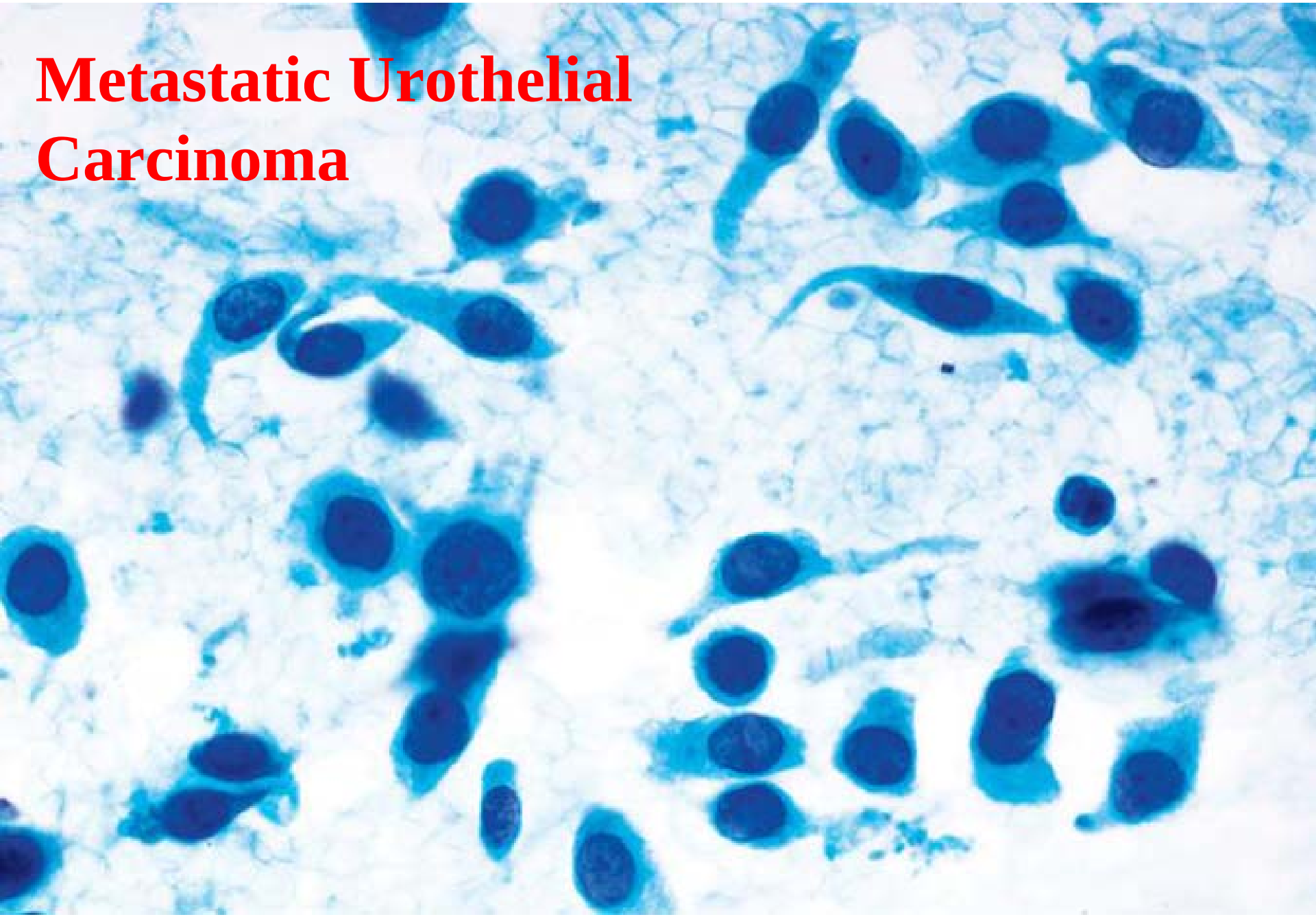
Metastatic Breast Carcinoma

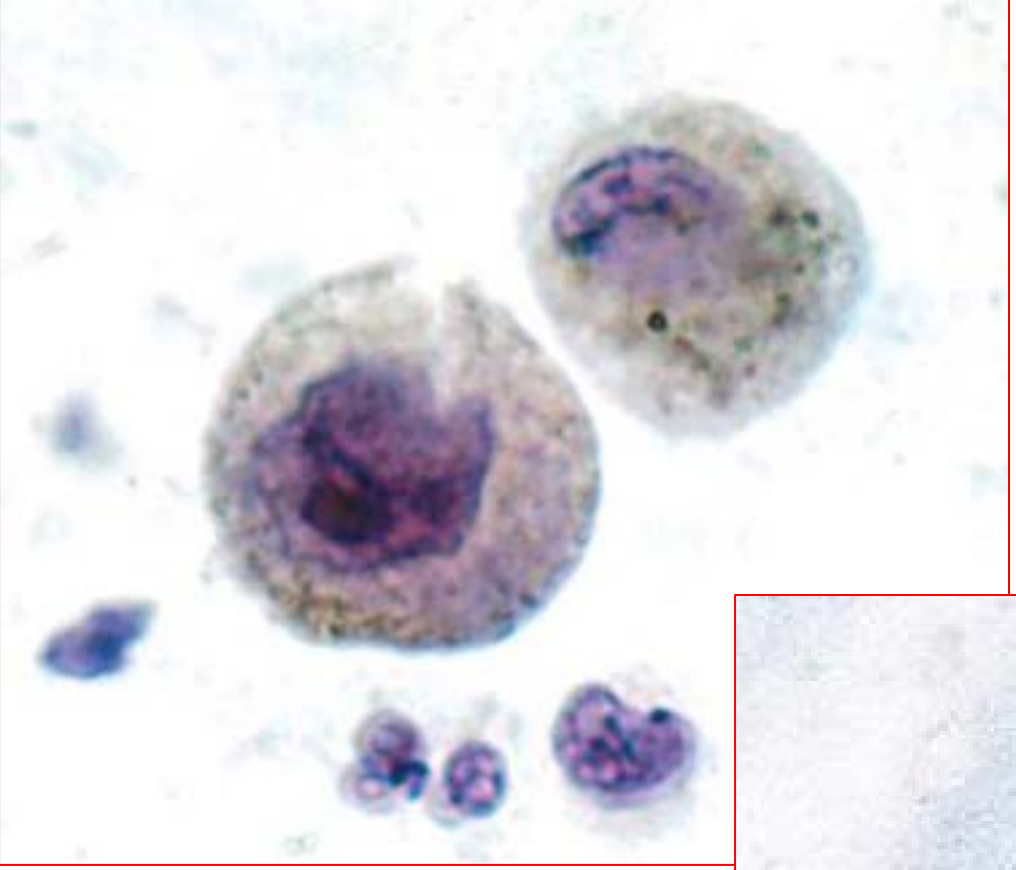
Metastatic Renal Carcinoma





Metastatic Urothelial Carcinoma





Metastatic Melanoma

Treatment --- SCLC

- **Patients with extensive-stage SCLC: Platinum-based chemotherapy, follow by PCI (prophylactic cranial irradiation)**
- **Relapsed or refractory SCLC: further chemotherapy**
- **Patients with limited-stage SCLC: Chemotherapy + radiation**
- **Patients with very limited-stage SCLC: surgical resection, follow by Chemotherapy**
- **Patients with Complete Remission: PCI**

Treatment --- NSCLC

- **Patients with EGFR mutation: medial survival time 31 months, others 7 months**
- **EGFR and KRAS mutation tend to mutually exclusive**
- **Limit staged NSCLC: surgical resection + chemotherapy**
- **Advanced NSCLC : initial treat with chemotherapy, follow by radiation**
- **EGFR mutations are present frequently in BACs, treat with Tarceva**