Descriptive Cytology

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Advantages of Cytology

1. Rapid
2. Inexpensive
3. Relatively non-invasive
4. Establish diagnosis and or treatment plan
5. Anesthesia not necessary for skin lumps
6. Basic interpretation is performed in-clinic

Limitations of Cytology

• Samples not always representative
• Architecture of lesion cannot be determined
• May not be able to exclude malignancy
• Skill and experience of cytologist
Great Uses for Cytology

1. Diagnosis of mast cell tumors
2. Evaluation of lymphadenopathy
3. Bone marrow aspirates
4. Evaluation of fluids
5. Vaginal smears
6. Ultrasound-guided aspirates of “hard to get to” locations
7. Detection of infectious agents

Cytological Diagnoses

Inflammation
- Septic
- Nonseptic
- Eosinophilic

Organisms
- Cryptococcus
- Blastomyces
- Histoplasma
- Fungal hyphae
- Leishmania
- Toxoplasma

Cytologic Diagnoses

Non-inflammatory, non-neoplastic
- Hematoma
- Epidermal cyst
- Sialocele
Cytologic Diagnoses

Neoplasms
- Round cell
  - Lymphoma
  - Histiocytoma
  - Plasma cell tumor
  - Transmissible venereal tumor
  - Mast cell tumor
- Epithelial
- Mesenchymal
- Melanoma

Types of Preparations
1. Fine needle aspirates
2. Touch preps
3. Scrapings

Impression Smears (Imprints)
- Ideal for biopsy or necropsy specimen
- Gently blot freshly cut surface and touch onto clean glass slide – do not rub on the slide!
- Good yield of cells from epithelial and round cell tumors
- May give some idea of architecture of lesion
Scrapings

- Requires cut surface of lesion
- Blot dry and scrape gently with scalpel blade – smear onto glass slide
- Best method for mesenchymal tumors
- Also useful for shallow ulcerated skin lesions (e.g. squamous cell carcinoma)
  - Rarely does touching the surface of an ulcerated lesion yield diagnostic information

Swabs

- useful for the sampling of fistulous tracts, ear canals, exudates and for vaginal cytology
- use a swab moistened with 1-2 drops of saline if the lesion is dry
- after collection, gently roll the swab over a clean, glass slide
**Stains**

**Diff-Quik**

1. Excellent, general purpose stain
2. Gives cytoplasmic detail
3. May not stain mast cell granules
4. Bacteria can grow in solns

**Stains**

**New Methylene Blue**

1. Good for nuclear detail
2. Be careful of overdiagnosing malignancy

**Stains**

**Gram stain**

**Acid-fast stains**

**Immunocytochemistry**
Staining

If stained poorly, diagnostic cells may not be visible

Diff Quik type stains lose potency over time

Note the “ghost” cells in the background.

Staining

Note the “ghost” cells

Same smear dipped a few more times in the polychrome (blue) stain.

Slide Examination

1. Scan ENTIRE slide on low power (4 or 10x)
2. Ensure staining is adequate
3. Find areas of cellularity
4. Examine these areas on high power (40X)

OIL RARELY NEEDED
Use coverslip on dry slide
Which image do you prefer?

Both are High Dry – NO OIL!!

Artifacts and Contaminants
Blue-Green Hazy Cells

1. Formalin
   – Avoid exposure to fumes
   – Ship cytologic preps separately from tissue in formalin

2. Wet prep slide not adequately dried before being stained
   – Ensure adequate drying before fixation
   – Can use a hair dryer to speed drying time

Formalin Exposure

Ruptured cells and nuclear streaming
Example of a lymph node aspirate that is too thick and too lightly stained. Nucleoli are dark blue and nuclei are light blue.

Evaluation of the Slide

Always start by assessing quality of the slide and cellularity

Cellularity

- Adequate
- Hypocellular
- Hypercellular

"Numerous nucleated cells"
"Paucity of cells"
"Densely cellular"
"Poorly cellular"
Cytologic Evaluation of a “Lump”

1. First question to ask, “Are there neutrophils?”
2. If yes, then lesion is inflammatory.
3. If no, then lesion is a cyst or a neoplasm.
Inflammatory Lesions

- Next question is, “Do neutrophils predominate?”

- If yes, consider:
  - Abscess
  - Bacterial infection
  - Foreign body

Inflammatory Lesions

1. “Do neutrophils predominate?”
2. If there is a mix of neutrophils and other inflammatory cells, consider:
   - Foreign body
   - Fungal infection
   - Mycobacterium
   - Parasite

Etiologies—Size and location are key

<table>
<thead>
<tr>
<th>RBC &amp; smaller</th>
<th>Neutrophil &amp; bigger</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBC = 7 μm</td>
<td>Cryptococcus</td>
</tr>
<tr>
<td>PMN = 15 μm</td>
<td>Blastomyces</td>
</tr>
<tr>
<td></td>
<td>Rhinosporidium</td>
</tr>
<tr>
<td>- Histoplasma</td>
<td>- Coccidioides</td>
</tr>
<tr>
<td>- Toxoplasma</td>
<td>- Hyphae</td>
</tr>
<tr>
<td>- Leishmania</td>
<td>- Parasites</td>
</tr>
<tr>
<td>- Trypanosomes</td>
<td></td>
</tr>
<tr>
<td>- Malassezia</td>
<td>- Aspergillus</td>
</tr>
<tr>
<td>- Sporothrix</td>
<td>- Mucor</td>
</tr>
</tbody>
</table>

RBC = 7 μm
PMN = 15 μm
Case Study

- Adult cat
- Swelling over bridge of the nose
- Fine needle aspirate
- What’s the first question?

Are there neutrophils?

Do neutrophils predominate?

- Mixed population of inflammatory cells
- Neutrophils and macrophages primarily

Macrophages contain oval organisms with a non-staining capsule
Cryptococcus neoformans

Six-year-old dog
- Foot ulcer
- Labored breathing
- Thoracic radiographs: Interstitial pneumonia
- Aspiration of foot lesion
- Transtracheal wash

Are there neutrophils?
Blastomycosis

Organisms appear as blue blobs, extracellular and larger than neutrophils

Multinucleated giant cell suggests fungal infection. Intracellular blue colored yeasts

Blastomycosis—Pyogranulomatous Inflammation

Histoplasmosis

- Numerous small oval organisms
- Intracellular (intrahistiocytic)
- Eccentric nucleus surrounded by a halo
**Histoplasma capsulatum**

Fungal Hyphae

- Often don’t stain and appear as ghosts or tracks

Fungal Hyphae

- Nasal mass or osteolysis
- Bone
- Lung
- Stomach
- Eye, especially in horses
Fungal Keratitis--
GMS

Lymph node aspirate from a cat
1. Ulcerated lesion on the pinna of the ear
2. Enlarged lymph node
Histoplasma or ???

Leishmania

- Diagnostic key is the presence of the small rod-shaped kinetoplast near the nucleus in each organism
- *Histoplasma capsulatum* lacks a kinetoplast
- *Leishmania* usually present in large numbers.

Toxoplasmosis

*Toxoplasma gondii* organisms in macrophages (above) and free tachyzoites (right) in a tracheobronchial wash from a cat

Elongated; banana shaped
Low numbers
Hard to find!
**Malassezia pachydermatis**

- Small budding yeasts shaped like “footprints” or “peanuts”
- Present in small numbers in ear swabs from clinically normal dogs and cats
- When present in large numbers (>10 per high power field), they are likely to be significant
- Also involved in some exudative skin conditions of dogs, as a primary or a secondary etiologic agent.

**Transtracheal Wash from a Horse**

- Cell types: Eosinophils, mast cells, large foamy macrophages, and lymphocytes
- The presence of mast cells and eosinophils strongly suggests an **allergic etiology**
- Most likely diagnosis: Allergic bronchitis

**Eosinophils in Cytologic Preps**

1. If greater than 20% of nucleated cells, suspect:
   - Parasite
   - Immune-mediated/allergic
   - Neoplasia
   - Mast cell tumor
   - Lymphoma
   - Collagenolytic disorders (cats and horses)
2. Eosinophils in cytologic preps DO NOT ALWAYS have brilliant red granules
Eosinophils

Feline eosinophils have rust-brown granules

Non-Inflammatory Lesions

Cytologic Evaluation of a “Lump”
If there are few to no neutrophils:
  – Cyst
    ■ Seroma/Hygroma
    ■ Epithelial cyst
    ■ Sialocele
    ■ Hematoma
  – Neoplasm
Epidermal Inclusion Cyst

- Common benign neoplasm of dogs
- Lined by stratified squamous epithelium
- Filled with squames and keratin debris
- Rectangular cholesterol crystals are common
  - Crystalization of cholesterol from dead cells

Epidermal inclusion cyst

The sample may look like a vaginal preparation because of the keratinized squames and amorphous cellular debris.
Hematoma vs. Hemorrhage

Varying amounts of blood

Hematomas are generally soft, fluctuant swellings
Aspirate, and evaluate grossly and microscopically
Gross: Red suggests hematoma or blood contamination
Microscopically:
  Platelets = blood contamination
  Erythrophagocytosis = hematoma
  Hemosiderin = hematoma

Hematoma

40 X
Mixed inflammation
Note cytophagia

Erythrophagocytosis + hemosiderin pigment

Presence of platelets indicates blood contamination, rather than hematoma (or hemoabdomen/hemothorax, etc.)
Neoplasia
1. Mass lesion
2. Predominate nucleated cell is NOT a neutrophil
3. Generally, no neutrophils
   - Squamous cell carcinoma may have marked inflammation
4. If cells are:
   - Round and individual = round cell tumor
   - Spindle and individual = mesenchymal tumor
   - Large and held together = epithelial tumor

Cytologic Evaluation of Suspected Neoplasms
• Granules
  - Mast cell tumor
  - Melanoma
• Round cell
• Mesenchymal
  - Spindle cells
• Epithelial
  - Large cells
  - Clusters of cells

Cytologic Evaluation of Suspected Neoplasms
• First ascertain that there are rare/no neutrophils
• Then determine if cells are individualized or organized
• Cell shape
• Nuclear shape
• Degree of variability of the cells
• Evaluate all of these parameters every time.
Nuclear Criteria of Malignancy
(these are better than cellular features)
• Increased nuclear size
• Variation in nuclear size 
• Large, irregularly-shaped nucleoli
• Coarse chromatin pattern
• Multinucleation (especially if variable size)
• Increased mitotic figures

At least 3 nuclear criteria of malignancy should be present for a confident diagnosis of malignancy….unless you know the biologic behavior of the tumor in question e.g. if it is an oral melanoma, you don’t need any of the above.

General Features of Malignancy
• Hypercellularity of smears
• Pleomorphism of cells within same cell line - variable size, shape, nucleus:cytoplasmic ratio
• Disorganization of cells within clusters
• Occasional very large cells, large nuclei and nucleoli

• VARIABILITY

Characteristics of Malignancy
• Fine needle aspirate from the lung of a dog with histiocytic sarcoma
• Note the huge binucleate cell with massive nuclei and multiple, irregular shaped nucleoli.
Round cell vs. Epithelial vs. Mesenchymal

<table>
<thead>
<tr>
<th>Neoplasm Cell Types</th>
<th>Round Cell</th>
<th>Epithelial Cell</th>
<th>Spindle Cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellularity</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Cells</td>
<td>Individual</td>
<td>Clusters</td>
<td>Individual</td>
</tr>
<tr>
<td>Shape</td>
<td>Round</td>
<td>Cuboidal/ Polygonal</td>
<td>Spindle</td>
</tr>
</tbody>
</table>

Round Cell Neoplasms

1. Lymphoma
2. Plasma cell tumor
3. Mast cell tumor
4. Histiocytoma
5. Transmissible venereal tumor
Neoplasms with Cytoplasmic Granules

**Mast cell tumor**
- Round cell
- Purple granules
- Variable numbers of granules  
  From many to none

**Neoplasms with Cytoplasmic Granules**

**Melanoma**
- Black, green, blackish-green granules
- Variable numbers of granules
- Pleomorphic cells
  - Round
  - Epithelial
  - Spindle
  - Mixture of shapes

**Melanoma**
Just like with histopathology, often difficult to classify as round, epithelial or spindle
"Amelanotic"

Fontana-Masson

Bring what you know to the cytology specimen

Round Cell Tumors

- Mast cell tumor: granules, eosinophils
- Histiocytoma: abundant cytoplasm, signalment
- TVT: looks like histiocytoma, location
- Lymphoma: small amount of cytoplasm, blast cells
- Plasma cell: eccentric nuclei, Golgi zone, abundant cytoplasm

Round Cell Tumors

1. Cells are usually individual, but sometimes are close together and appear to be in small aggregates and mimic epithelial tumors
2. Usually many cells are present.
3. Round cells with round nuclei
4. Distinct cytoplasmic borders
5. Cells may be well differentiated, e.g., mast cell tumors
Mast Cell Tumor from an 11-year-old Labrador Retriever

- Fine needle aspirate from a mass on the lip
- Numerous large round cells with round nuclei
- Variable numbers of metachromatic (purple) granules typical of neoplastic mast cells.

Variability of Mast Cell Staining

- Giemsa – can be technically difficult
- Toluidine Blue
- Immunohistochemistry

URINE--Male dog
Lymphoma

Aspirate from an enlarged lymph node.

The predominate nucleated cell is a large blast form, which is much larger than the small lymphocytes. Erythrocytes are about 7μm; mature lymphocytes are slightly larger than this.

Lymphoglandular bodies: the small blue droplets in the background that are fragments of cytoplasm and common in lymphoid hyperplasia and neoplasia.

Fine needle aspirate from the left ear of a two-year-old female dog

- Inflammatory or neoplastic?
- Predominant nucleated cell type?

The primary nucleated cell is not the neutrophil, so non-inflammatory. Round to oval nuclei, fairly uniform, moderate amount of cytoplasm. Round cell tumor = mast cell tumor, lymphoma, histiocytoma, TVT, plasma cell tumor. Most likely diagnosis: Histiocytoma based on species, age, location and cytology.
Transmissible Venereal Tumor

- Fine needle aspirate from a mass on the penis of a dog
- Uniform population of round cells with variable nuclear size, coarse chromatin pattern and discrete cytoplasmic vacuoles.
- The large cell is a non-keratinized squame from the penile or preputial mucosa.

TVT: Round cells, more cytoplasm than in lymphoma, looks just like histiocytoma
Location is KEY!

Plasma Cell Tumor

- round, discrete cell
- eccentric nuclei
- abundant blue cytoplasm
- pale Golgi zone
Plasma cells resemble osteoblasts and vice versa
Plasma cell tumor: Most are behaviorally benign. More aggressive forms have increased variability.

Malignant Plasma Cell Tumor

Mesenchymal (Spindle) Cell Tumors
- ‘oma vs. sarcoma
- Fibroma/Fibrosarcoma
- Osteoma/Osteosarcoma
- Hemangioma/Hemangiosarcoma
- Peripheral nerve sheath tumor (hemangiopericytoma)
Epithelial Cell Tumors

- Adenoma vs. carcinoma
- Sebaceous gland tumors
- Mammary neoplasms
- Prostatic neoplasms
- Nasal tumors
- Transitional (urinary) cell tumors
- Perianal neoplasms

Epithelial tumors

- Cells in sheets or clusters
- Usually many cells present
- Cytoplasmic borders usually distinct
- Often large cells with abundant cytoplasm
- May show signs of differentiation

Adenoma: Uniform cells
Acinar formation on far right

Benign Epithelial Neoplasms

Mammary adenoma in a bitch
Uniform nuclear size and consistent N:C ratio.

Perianal (hepatoid) gland adenoma in a dog
Diagnosis?

Circumanal adenoma/perianal adenoma (not anal sac adenocarcinoma)

Apocrine Gland Carcinoma of the Anal Sac
- Females
- Hypercalcemia
- This tumor had already advanced into the pelvic inlet and metastasized
Apocrine Gland Adenocarcinoma of the Anal Sac

- Cells from this tumor often look benign.
- Knowing the biologic behavior of certain tumors is a better predictor of malignancy than looking at the cytology or histology in this case.
- These tumors tend to produce naked nuclei.

Mass on the Prepuce of a Dog

Abdominal Metastasis
• Inflammatory or neoplastic?
• Shape of cells and nuclei?
• Variability?

Transitional Cell Carcinoma
• Generally few cells
• Elongate nuclei
• Cytoplasmic tails
• Usually individual cells
• May see clusters with matrix
• Active fibroblasts can be mistaken as malignant cells
FNA – Dog: Firm, cutaneous mass

• A few fusiform cells
• Mostly individual
• Suggestive of either mesenchymal tumor or granulation tissue

Firm, cutaneous mass

Diagnosis: Peripheral nerve sheath tumor (hemangiopericytoma) made with histopathology evaluation.

Ten cm diameter, non-ulcerated mass; hind leg of a dog

• Signalment is key. Mesenchymal tumor is more likely here than granulation tissue.
• Cell variability indicates malignancy.
• Recommend excision with wide surgical margins and histopathological evaluation as these types of tumors often infiltrate and recur.
Cytology vs. Histopathology Diagnosis?

Radiograph From a Cat

• Intramedullary pin
• Mass
• Bone lysis--the femur is GONE
• Differential diagnoses: Osteomyelitis, osteosarcoma, other cancer
• Plan – Aspirate for cytology and bacterial culture
• This is not osteomyelitis, as there are no neutrophils.

• Osteosarcoma most likely

Lytic Bone Lesion From a Dog
Diagnosis: Osteosarcoma

The key to the diagnosis is:
1. **LOCATION:** bone with lysis
2. **Morphology:** spindle cells
3. **Product:** Osteoid (very useful diagnostically)

Lytic Bone Lesion

Differentials and how do you decide?

Lytic bone lesion Differentials?

Osteosarcoma vs. Multiple myeloma
Differentiate the two by knowing the characteristics of each neoplasm.
### Osteosarcoma vs. Multiple Myeloma

<table>
<thead>
<tr>
<th>OSTEOSARCOMA</th>
<th>MULTIPLE MYELOMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lame, thin, sick</td>
<td>Lame, thin, sick</td>
</tr>
<tr>
<td>One bone, one lesion</td>
<td>Multiple bones; multiple lesions per bone</td>
</tr>
<tr>
<td>Giant breeds (dog)</td>
<td>Radiographs: Multiple foci of osteolysis; discrete lytic areas</td>
</tr>
<tr>
<td>Characteristic locations</td>
<td>10% are hypercalcemic</td>
</tr>
<tr>
<td>Radiographic pattern: Osteolysis and osteoproduction</td>
<td>Monoclonal gammopathy</td>
</tr>
<tr>
<td>Normocalcemia &amp; protein</td>
<td>Round cells with a distinct Golgi zone</td>
</tr>
<tr>
<td>Osteoid; variability; giant cells</td>
<td></td>
</tr>
</tbody>
</table>

#### 6-year-old cat
- Mass at the base of the neck.
- Diagnosis: Injection site sarcoma; fibrosarcoma with giant cells; giant cell tumor of soft parts
Lymph Node Cytology

Cytology of Lymph Nodes

• Indications
  – Lymph node enlargement
  – Suspect metastasis

• Normal sized lymph nodes are Normal – Do NOT aspirate

Normal Lymph Nodes: DON’T Aspirate

• Small lymphocytes are 75-90% of nucleated cells
• Slightly larger than a canine erythrocyte and smaller than a neutrophil
• Dense chromatin
Normal Lymph Nodes:

Lymphoblasts:
- < 20% - (2 in this photo)
- Larger than a neutrophil
- Often up to 4x size of a RBC
- Chromatin less dark
- Nucleoli often visible
- More cytoplasm (blue)

Causes of Lymphadenopathy

- Hyperplasia/ Reactive (Antigenic stimulation)
- Inflamed (Lymphadenitis)
- Primary neoplasia (Lymphoma)
- Metastatic neoplasia

Lymph Node Aspirate
Reactive lymph node

Plasma cells (small arrows), lymphoblast (large arrow), small lymphocytes (small arrowhead), and Mott cell (large arrowhead).

Reactive Lymph Nodes: (Lymphoid Hyperplasia)

- Enlarged lymph node because of increased proliferation of lymphoid cells
- Predominately small lymphocytes (>50%)
- Plasma cells increased to 5-250% of nucleated cells—this is KEY
- Medium and large lymphocytes are increased, but lymphoblasts are < 20%
- Macrophages, neutrophils, mast cells variable
- Common in lymph nodes draining the mouth and the gastrointestinal tract.

Fine Needle Aspirate from an Enlarged Lymph Node--- Interpretation?
**Lymphoblasts** are the predominate cell type (arrowheads) and small lymphocytes (arrow) are decreased. Note lymphoglandular bodies in the background that resemble platelets.

**Diagnosis:**
**Lymphoma**

**Lymphoma**
- May have numerous lymphoglandular bodies (cytoplasmic remnants)
- Presence of mitotic figures variable
- Increased lymphoblasts (>50% of cells); decreased small lymphocytes; rare plasma cells

**Reactive vs. Lymphoma**
- Small lymphocytes
- Lymphoblasts < 20%
- Numerous plasma cells
- Other cells present
- Lymphocytes < 50%
- Few to no plasma cells
- Few or no other cells
Fine Needle Aspirate of a Lymph Node—Interpretation?

- Aspirate contains only fat
- Lymph node was missed
- Must re-aspirate

Lymphadenitis:

- Suppurative lymphadenitis: Increased neutrophils, which may be degenerate if bacteria are in the node
- Eosinophilic lymphadenitis
- Granulomatous lymphadenitis: Increased macrophages
- Specific etiologic agents may be present.
Granulomatous Lymphadenitis. Macrophages (arrows) and neutrophils (arrowheads) with few lymphocytes.

Lymph Node with Metastatic Carcinoma: Note clusters of large epithelial cells (large arrows) that resemble macrophages, small lymphocytes (large arrowheads), erythrocytes and vacuolated macrophage (small arrowhead).

Aspirate of Submandibular Lymph Node with Metastatic Fibrosarcoma. Note the spindle shaped fibroblasts (arrows), and small lymphocyte (arrowhead).
Metastasis to Lymph Nodes

- Metastasis of any malignant tumor is a possibility
- Epithelial cells – Easy to confuse with macrophages or accidental aspiration of submandibular salivary gland
- Cytology is as accurate as histopathology in predicting presence or absence of metastasis

Metastatic Mast Cell Tumor in a Lymph Node. Mast cells are indicated by arrows, and small lymphocytes by arrowheads.

Mast Cell Tumor Metastasis to Lymph Node

- More than 5% mast cells in specimen is suggestive of metastasis
- Beware of false negatives
Metastatic Mast Cell Tumor stained with Diff-Quik. Poorly staining mast cells are indicated by large arrows, plasma cell by large arrowhead, small lymphocytes by small arrow, and eosinophil.

Aspirate of same lymph node but now stained with a traditional Wright's stain.

Lymph Node Aspirate from a Dog
Almost all of the cells present are macrophages (large arrows) that are filled with clear, non-staining organisms (small arrows). A few small lymphocytes are present (arrowhead).
Same lymph node as last slide stained with an Acid Fast Stain. The mycobacteria are pink and within macrophages (large arrow). Note few small lymphocytes (arrowhead) and neutrophils (small arrow).

Cytology of Fluids

Cell Types

- Mesothelial cells
  - Readily exfoliate into fluids
  - Hypertrophy and hyperplasia are common
  - Round or oval nucleus, fine chromatin and single nucleolus
  - Individual or in clusters
  - Activated cells are difficult to differentiate from neoplastic mesothelial cells
Cell Types

• Macrophages
  • Normal component of peritoneal fluid
  • Round cells with reniform nucleus, fine chromatin, single nucleolus
  • Abundant, often vacuolated cytoplasm
  • May contain phagocytosed cells, debris and etiologic agents
  • Can be difficult to differentiate from activated mesothelial cells
Cell Types

- Neutrophils
  - Normal to see in peritoneal fluid and in most effusions
  - Predominant cell type in most effusions
  - Non-toxic resemble neutrophils in peripheral blood
  - Degenerate neutrophils indicate a toxic environment

Non-Degenerate Neutrophils

Degenerate Neutrophils

Cell Types

- Lymphocytes, plasma cells and mast cells less common
- Eosinophils in low numbers in effusions
  - However, can be up to 60% in normal peritoneal fluid
  - Increased with some parasite infections
Cytologic Description--
Inflammatory

- Quality and cellularity
- Significant artifacts
- Predominant cell type(s)
- Other cell types and their proportions
- Any notable changes (toxic neutrophils, erythrophagocytosis, etc.)
- Etiologic agents (size, shape, color, identifying characteristics)
- Background material (peripheral blood)

Cytologic Diagnosis--
Inflammatory

1. Site
2. Process
3. Characterize the process
4. Chronicity
5. Severity

Cytologic Diagnosis--
Inflammatory

CYTOLOGIC DIAGNOSIS: Liver: Hepatitis, suppurative, acute, mild.

CYTOLOGIC DIAGNOSIS: Skin: Dermatitis, pyogranulomatous, chronic, moderate with many intrahistiocytic fungal hyphae.

CYTOLOGIC DIAGNOSIS: Spleen: Hemosiderosis, chronic, diffuse, mild.
Cytologic Diagnosis—Non-Inflammatory

CYTOLOGIC DIAGNOSIS: Skin, fine need aspirate: Mast cell tumor.

CYTOLOGIC DIAGNOSIS: Lymph node, fine needle aspirate: Lymphoma.

CYTOLOGIC DIAGNOSIS: Humerus, fine needle aspirate: Osteosarcoma.

Cytologic Diagnosis—Noninflammatory

1. Site
2. If neoplastic, then the name of the neoplasm.

Cytologic Description—Noninflammatory

- Quality and cellularity
- Significant artifacts
- Predominant cell type(s)
- Description of the main cell type (shape, cytoplasm [color, vacuoles, granules], nuclei, nucleoli, mitoses)
- Degree of pleomorphism in the predominant cell type
- Matrix or other material (eosinophilic material, keratin, etc.)
- Other cell types and their proportions
- Background material (peripheral blood, etc.)
Cytology Case Studies

What is your diagnosis?

Mass in Perineum of a Female Adult Bull Terrier

The aspirate at right contains.....

Neutrophils? What cells?

Mass in Perineum of a Female Adult Bull Terrier

Mast cell tumor
Mass on the Ear of an 18-month-old Dog

- Not inflammatory
- Round cells with round nuclei
- No cytoplasmic granules
- Resemble TVT cells, but no discrete vacuoles or large nucleoli
- Location, location, location

- Diagnosis?

Canine Cutaneous Histiocytoma

Mass in the Ventral Neck of an Adult Dog

Inflammatory? What is the primary nucleated cell?
Malignant Melanoma

- Large cells
- Green to black intracytoplasmic granules
- Granules also in background
- Naked nuclei

Fine needle aspirate from the lytic lesion shown below right in the radius of a dog

Osteosarcoma

Multiple myeloma

Lytic foci
Increased serum protein
Monoclonal gammopathy
Hypercalcemia (10% of cases; poor prognosis)
Deep-seated, Focal Mass in the Neck of an Adult Dog

- Clusters of epithelial cells
- Associated eosinophilic secretion
- Form acini
- Bright turquoise cytoplasmic granules (tyrosine)
- Appears benign cytologically, but typical behavior in dogs is highly malignant

Thyroid Carcinoma

Fine Needle Aspirate from a Lump on the Face of a Dog

- Predominate cell type?
- Other cell types?
- Interpretation
Granulomatous inflammation with numerous neutrophils and moderate numbers of macrophages. No etiology is evident.

Aspirate of a Mass from the Nose of a Horse

Numerous macrophages and neutrophils (pyogranulomatous inflammation) with intra- and extracellular septate fungal hyphae.
Fine needle Aspirate from the Face of a dog

- Predominate cell type?
- Uniform population?
- Morphologic features?

Differential Dx:
- Histiocytoma
- Plasma cell tumor
- TVT
- Lymphoma
- Mast cell tumor

Round Cell Tumor

Differential Dx:
- Histiocytoma
- Plasma cell tumor
- TVT
- Lymphoma
- Mast cell tumor

Aspirate from a Mass on the Dorsal Neck of a Cat
• Clusters (rafts) of rather uniformly-sized and shaped epithelial cells
• Densely cellular, not much cytoplasm – suggestive of basal cell layer.

Epithelial cell proliferation or neoplasm

Aspirate from a mass on the Forelimb of a Dog

Peripheral Nerve Sheath Tumor

• Cell shape?
• Vacuoles
Abdominal Fluid from a Horse

Interpretation?

Septic Exudate with Bacteria
Numerous degenerate neutrophils and macrophages with intracellular bacteria

Abdominal Aspirate from a Dog with Ascites
• few small clusters and some individualized epithelial cells
• cells are molded or occasionally wrap each other
• Large variation in cellular and nuclear size and shape
• very prominent, large nucleoli.

Malignant neoplasm, consistent with carcinoma

Aspirate: Liver from a 12-year-old Dog

Interpretation?

Diagnosis: Malignant lymphoma
Splenic Aspirate from a Cat

- Merozoites in severely enlarged macrophages
- Piroplasms in erythrocytes

Cytauxzoonosis