Introduction to Cytology

Michael M. Fry, DVM, MS, Dipl. ACVP (Clinical Pathology)  
Department of Biomedical and Diagnostic Sciences  
College of Veterinary Medicine  
University of Tennessee  
mfry@utk.edu
Learning objectives

Be able to explain:
• Pros and cons of cytology v. histology, and the inherent limitations of cytology
• Basic principles of sample acquisition, slide preparation, and staining
• How to become proficient at basic diagnostic cytology
Recommended resources


Outline

• Basic proficiency at cytology – why & how?
• Indications for cytology
• Cytology v. histology
• Sample acquisition & preparation
• Microscopy
• Basic algorithmic approach to cytology
Why do cytology yourself?

• Elevate level of practice
  ▫ Faster information → better case management

• Increase profitability
  ▫ Low-cost → high profit margin

• Enjoyment
Cytology v. histology

<table>
<thead>
<tr>
<th></th>
<th>Cytology</th>
<th>Histology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turnaround</td>
<td>Faster</td>
<td>Slower</td>
</tr>
<tr>
<td>Cost</td>
<td>Lower</td>
<td>Higher</td>
</tr>
<tr>
<td>Cellular detail</td>
<td>Excellent</td>
<td>Fair</td>
</tr>
<tr>
<td>Tissue architecture</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Indications for cytology

• Characterize a detected abnormality:
  ▫ Mass/infiltrative lesion
  ▫ Organomegaly
  ▫ Ulcerated or exudative lesion
  ▫ Cavity effusion

• Cancer staging

• “Fishing” (e.g., FUO)
Sample acquisition & preparation

Main factors determining diagnostic value:

• **Cellularity** – depends on type of lesion and sampling technique

• **Quality** –
  - Intact cells (be gentle with acquisition & slide prep)
  - Monolayer on slide
Other pitfalls

Besides lack of sufficient intact cells:
• Non-representative
• Excess blood
• Too dense
Sample acquisition & slide prep

- **Sample acquisition:**
  - Aspiration v. “pincushion”
  - 22 gauge needle
  - 6 or 12 mL syringe
  - Imprints of biopsy specimens (blot off excess blood/tissue fluid)

- **Slide prep:**
  - Minimal pressure
  - Air-dry quickly
  - Avoid formalin!
Sample acquisition

- Usually under **ultrasound guidance**
- Technique: aspiration v. non-aspiration


- **Non-aspiration technique was superior:** less blood, higher cellularity, equal cell morphology
- **Same is likely to be true for liver samples** – study is underway
Concentration Techniques

• Methods for concentrating fluids:
  ▫ Sedimentation (like for urinalysis)
  ▫ Cytocentrifugation (special equipment)

• If you just have one drop of fluid, make a direct smear
Romanowsky-type stains

- Practice setting: manual aqueous-based rapid stain such as Diff-Quik or Camco
- Reference labs: automated staining with aqueous- or alcohol based Wright’s stain
Microscopy

• For more technical info about microcopy, check out *Microscope: Basics and Beyond* – downloadable as a PDF file from the Olympus website:

Basic classification

• Normal v. abnormal – understand what you should expect to see normally (e.g. lymph node)

• Lesions:
  ▫ Inflammatory
  ▫ Neoplastic
  ▫ Non-inflammatory/Non-neoplastic
  ▫ Sub-categories within each
Improving your cytology skills

• Look at everything & compare with published resources
• If uncertain, send it to a specialist (preferably ACVP-boarded in Clinical Pathology)
• **Write down your findings first!**
  ▫ Observations & interpretation
  ▫ Questions/Comments
• Compare with the expert interpretation
• Keep a collection (glass slides or digital images) for future reference
Questions?