Veterinary Pathology in Animal Biomedical Research

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Bottom Line Up Front (BLUF)

• If you are using animals for a study ...your best friends should be a LAB ANIMAL VETERINARIAN and A VETERINARY PATHOLOGIST

Outline

• What is a Board Certified Veterinary Pathologist
• Asset to the research team and animal facility
• Common Pathology Issues
Veterinary pathologists

• Sole veterinary medical specialist trained to bridge the gap between cellular changes and clinical disease
• Provide gross, microscopic, ultra structural and molecular analysis of tissue changes resulting from disease state, and thus are the keystone of biomedical research and animal medicine

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Veterinary pathologists

• Pathologists provide essential macroscopic, microscopic, ultrastructure and molecular studies necessary to develop animal models of human disease; provide expert diagnostic pathology support; and lead or support animal studies with predictive value for human conditions

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Pre-Requisites

• Biology I & II
• Inorganic Chemistry I & II
• Organic Chemistry I & II
• Physics
• Microbiology
• Biochemistry
• Calculus I
• Statistics

Veterinary School

Basic Sciences
• Anatomy (Gross, Micro)
• Physiology
• Immunology
• Virology
• Microbiology
• Parasitology
• Anatomic Pathology
• Clinical pathology
• Neuroanatomy
• Endocrinology

Clinical Science
• Surgery
• Internal medicine
• Infectious Disease
• Laboratory animal medicine
• Food animal medicine
• Public health
• Epidemiology
Veterinary Pathologists

- Types
  - Anatomic
  - Clinical
- Anatomic: 3 year Residency Diagnostic Lab, Research Institute, Zoo/Wildlife Center
- Successful completion of a certifying exam
- **ACVP:** American College of Veterinary Pathology
- **ECVP:** European College of Veterinary Pathology
- **JCVP:** Japanese College of Veterinary Pathology

General Pathology

- Cellular adaptations, Cell degeneration, Cell death
- Inflammation:
  - Acute
  - Chronic
- Tissue renewal and Repair:
  - regeneration
  - healing
  - Fibrosis
- Hemodynamic disorders, Thromboembolic disease, Shock
- Genetic disorders
- Diseases of Immunity
- Neoplasia
- Infectious Diseases
- Environmental and Nutritional Pathology
Systemic Pathology

- Large, Small, Livestock, Domestic, Zoo, Laboratory, Wildlife, Aquatic
- Bacterial
- Fungal
- Viral
- Parasitic
- Neoplastic
- Metabolic
- Degenerate
- Toxic
- Experimental
- Zoonotic
- Emerging

Clinical Pathology

- Interpretation of
  - Complete Blood Count
  - Blood Chemistry
  - Urine analysis
  - Endocrine and Blood function/Evaluation test
- Cytology: Smears (impression, blood, fluid), Fine needle aspirates, Centesis
Fundamentals

- Gross Anatomy Differences
- Postmortem Examination
- Histology (ultra structural)
- Microscopic Imaging
- Animal Model Selection
- Pathogenesis / Pathophysiology
- Cause of Death

ASSET TO THE RESEARCH TEAM AND ANIMAL FACILITY
Veterinary Pathologist

- Member of research team
- Help Develop protocol from the ground up
- Advises animal model and process
- Selects appropriate tissues, histo stains and preservation technique
- Analyzes and interprets ("path data") observations

Research support

- Consultation with a veterinary pathologist at the conception of a protocol
- Animal model selection
- Tissue/Lesion sampling (training)
- Proper tissue preservation
- Ancillary diagnostic and imaging techniques
Contact

• FIRST: Study/Protocol development stage
  – Development
  – Time Line
  – End of Study
  – Days before report is due
• Animal selection
• Unscheduled deaths
• Study timeline changes

Research Support

• Diagnostic pathology for unscheduled deaths of any animal
• Semi-quantitative and quantitative pathology data
• Customizable pathology report
• Publication-quality images
• Formulation of data, material, and methods for publication
QA/QS

• Monitoring of laboratory animals and their environment for infectious and noninfectious factors that can interfere with research and testing
• Quality Assurance
  – Approved Vendors (no quarantine needed)
  – Unapproved sources (quarantine required)
• Quality Surveillance
  – Quarterly/annually

Sentinels

• Certain populations cannot be directly sampled, due to study or housing limitations, and require a sentinel monitoring program.
• Sentinels are animals housed in direct or indirect association with the population of animals to be surveyed.
• After sufficient association to allow transmission of infectious agents and presumed development of the disease or serologic titers, the sentinel animals are screened to detect the agents in question
Deaths

• Scheduled/ End of Study
• Unscheduled
• Receipt
• Beginning of study
• Entrance in facility
• Study room

Necropsy/Tissue Harvest

• Difference
• Training
• Gross lesion Recognition
• Selection of tissues
• Sample Submission
**Microscopic Interpretation**

- Hematoxylin & Eosin
- Special stains (Masson’s, PAS)
- Immunohistochemistry (Vimentin, CD3)
- Immunofluorescence Antibody
- Selection of IHC/Special stains
- Electron Microscopy

**Microscopic Imaging**

- Journal/ Education Photos
- Study Update
- Label
- Interpretation
## COMMON PATHOLOGY ISSUES

## STUDY PERSONNEL AND QUALIFICATIONS

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<th>Name</th>
<th>Education</th>
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• NO PATHOLOGY NEEDED
Histopath Samples Submission

- Tissue samples for hisopath evaluation, placed in 10% neutral buffered formalin
- Not more than 0.5 cm thick
- 10:1 Formalin to Tissue ratio
- Labels
- Sample selection
  - 1) Lesion
  - 2) Healthy Tissue & lesion
  - 3) Samples are relative to animal size
**Reporting**

- Only what we see
- Stand alone report
- Pathology Summary
- Customizable
- Photos
- Scoring/Incidence chart

**Essential Information**

- Time line of study
- Labels/Numbering
- Key study personnel
- Study type
  - Drug Efficacy
  - Drug Safety
  - Model Development
  - Experimental Design
Correlation of Data

• Qualitative/ Quantitative
• Proteomics
• Clinical pathology
• Organ Weights

Off-Site Pathology Services

• Training
  – Veterinary Techs
  – Vets
  – Histo Tech
• Data
• Samples
• Chain of custody
Questions