I. Definitions and Terminology

Disease: (2 definitions)
1. A disorder of structure or function, especially one that produces specific symptoms.
2. Any deviation from, or interruption of, the normal structure or function of any part, organ, or system of the body; which may be clinical (characteristic set of symptoms and signs) or subclinical and whose etiology, pathology and prognosis may be known or unknown.

Pathology: (2 definitions)
1. The study of disease; literally, the study (logos) of suffering (pathos).
2. The study of the functional, biochemical and morphological alterations in cells, tissues and organs that underlie disease.

General Pathology: The study of the basic reactions of cells and tissues to abnormal stimuli that underlie all diseases.

Systemic Pathology: The study of the specific responses of specialized organs and tissues to more or less well defined stimuli.

Four aspects of a disease form the core of pathology:

- **Etiology** - The cause of disease. Can be intrinsic, eg genetic – or - extrinsic, eg infectious, chemical, physical, etc.

- **Pathogenesis** - The mechanisms or sequence of events leading from initiation of cell or tissue injury to development of disease.

- **Morphologic Changes** - The structural alterations in cells or tissues that are often characteristic of the disease process.

- **Functional Derangements / Clinical significance**
  The nature of the morphologic changes and their distribution in organs / tissues influence normal function and determine the clinical features (symptoms and signs), course and prognosis of the disease.

Lesion: A circumscribed structural or functional abnormality. The change may involve an organ or tissue, cell or a subcellular organelle.

Pathognomonic: A lesion or sign that is specifically distinctive or characteristic of a disease or pathological condition.
Necropsy/Autopsy:  
C Postmortem examination of the body to determine the nature of pathological processes that contributed to death or disease.
   C Autopsy is usually defined as examination of a human body.
   C Necropsy is the postmortem examination of any other animal.

Biopsy:  
The removal and examination of tissue from the living body to establish a precise diagnosis.

Diagnosis:  
A concise statement or conclusion concerning the nature, cause, or name of a disease.

Differential Diagnosis:  
A list of diagnoses that could account for the clinical signs or lesions in a case.

Clinical Diagnosis:  
A diagnosis based on the data obtained from the case history, clinical signs, and physical examination.

Morphologic Diagnosis:  
A diagnosis based on predominant lesion(s) in the tissue(s).
   Clt may be macroscopic (gross) or microscopic and describes the severity, duration, distribution, nature of the lesion and location (eg severe, acute, locally-extensive, fibrinous bronchopneumonia).
   C Also known as a lesion diagnosis.

Etiologic Diagnosis:  
A definitive diagnosis that names the specific cause of the disease.

Disease Diagnosis or "Name the Disease":  
A specific diagnosis that states the common name of the disease.

C An 8-week old puppy presented to the veterinary clinic with severe bloody diarrhea of 2 days duration. The puppy died prior to complete clinical work up. A necropsy was performed.

1. Clinical Diagnosis.............................. Hemorrhagic diarrhoea
2. Morphologic Diagnosis....................... Severe, acute, diffuse, necrohemorrhagic enteritis
3. Etiologic Diagnosis............................ Parvoviral enteritis
4. Disease Diagnosis............................. Canine Parvovirus
II. Who are Pathologists?

**Morphologic (anatomic) Pathologists vs Clinical Pathologists**
- **Morphologic** study morphologic manifestations of disease (gross, LM, EM, etc).
- **Clinical** laboratory analysis of disease in living patients (cytology, hematology, chemistry, etc).

**Veterinary vs Medical vs Comparative Pathology**
- **Veterinary** mammalian, avian, zoo & wildlife, lab animals / primates, fish, etc.
- **Medical** human beings
- **Comparative** animal models of human disease.

- **Diagnostic Pathology vs Experimental/Molecular Pathology vs Toxicologic Pathology**
  - **Diagnostic** necropsy and surgical biopsies.
  - **Experimental** infectious, oncology, toxicologic, etc.
  - **Molecular** Study the molecular / genetic basis of disease (PCR, RFLP, DNA sequencing, etc).
  - **Toxicologic** Study changes elicited by pharmacological, chemical and environmental agents.

--- Special systems – Study a particular body organ or system.
- Neuropathologists, dermatopathologists, immunopathologists, etc.

III. Descriptions in Gross Pathology

1. No interpretation should appear in descriptions. (It is possible for any person with a command of the language to describe perfectly a necropsy specimen, although she/he knows nothing of its significance).

2. Description should be
   - **Concise**
   - **Grammatically correct**
   - **Anatomically Precise**

3. No comparative reference to food or sports equipment is necessary.

4. Avoid making a description based on a preconceived diagnosis (3 Steps Useful in Veterinary Medicine)
   - **OBSERVE** carefully
   - **DESCRIBE** completely
   - **DIAGNOSE** (DEDUCE or INTERPRET) confidently
5. Points you need to describe (not all are applicable in every case).
   - TISSUE........Identify the organ or structure.
   - NUMBER ..........How many lesions are present?
   / DISTRIBUTION......Focal, multifocal, locally-extensive, diffuse
   € SHAPE......spherical, approximately rectangular, symmetrical, etc
   < COLOUR ..........Please - no unusual color terms.
   > SIZE......metric length, area, weight, % of organ involved
   fi PATTERN .........centrolobular, reticulated, cobblestone
   fl CONSISTENCY ....... soft, firm, hard, fluctuant, fluid
   ‡ SPECIAL FEATURES ...Attached, pedunculated
   · Other
     COlor: significant and distinctive odors, eg: sweet, foul, sulphur-like, etc
     CLumen of tubular organs: patent, dilated, narrowed, obstructed, obliterated, branched, etc
     CSurface: smooth, rough, nodular, shiny, dull, pitted, ulcerated, elevated, depressed, glistening, etc

6. You must know the NORMAL before you can recognize the ABNORMAL!

7. Avoid using the word "lesion" in your description. A lesion is any abnormal structural or functional change in organ, tissues, or cells. Therefore, it is an imprecise word to describe a focus, nodule, etc.

8. Morphologic Diagnoses: include the following modifiers/qualifiers,
   - Severity - mild, moderate, marked/severe
   - Duration - peracute, acute, subacute, chronic, chronic-active
   / Distribution - focal, multifocal, coalescing, locally extensive, diffuse, bilateral/unilateral, symmetric.
   € Nature of the lesion – If inflammatory type of exudate - (purulent, fibrinous, necrotizing).
     If degenerative – type of degeneration.
     If neoplastic – type of neoplasia.
   < Organ +/- anatomic modifiers
     (eg, nephritis, interstitial nephritis, glomerulonephritis, pyelonephritis)

**Anatomic Terminology**

ORGAN + OPATHY (any disease of the organ).
   eg, Hepatopathy - Any disease of the liver (usually refers to a non-inflammatory condition).
   Endocrine Dermatopathy - disease of the skin resulting from an endocrine disorder.

ORGAN + OSIS (any disease of an organ, especially one not characterized by inflammation).
   eg, Nephrosis - Any disease of the kidney; especially when degeneration and/or necrosis of renal tubules.

ORGAN + ITIS (an inflammatory disease of the organ).
eg, *Tracheitis* - inflammation of the trachea.

**Classification of Inflammatory Lesions**
*(modified from *Mechanisms of Disease, Slauson & Cooper, 2002, p149)*

<table>
<thead>
<tr>
<th>Severity</th>
<th>Duration</th>
<th>Distribution</th>
<th>Exudate</th>
<th>Anatomic Modifiers</th>
<th>Organ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal</td>
<td>Peracute</td>
<td>Focal</td>
<td>Suppurative / purulent</td>
<td>Interstitial</td>
<td>Nephritis</td>
</tr>
<tr>
<td>Mild</td>
<td>Acute</td>
<td>Multifocal</td>
<td>Fibrinous</td>
<td>Broncho-</td>
<td>Hepatitis</td>
</tr>
<tr>
<td>Moderate</td>
<td>Subacute</td>
<td>Locally extensive</td>
<td>Necrotizing</td>
<td>Glomerulo-</td>
<td>Enteritis</td>
</tr>
<tr>
<td>Marked or Severe</td>
<td>Chronic</td>
<td>Diffuse</td>
<td>Fibrinopurulent</td>
<td></td>
<td>Pneumonia</td>
</tr>
<tr>
<td></td>
<td>Chronic-active</td>
<td></td>
<td>Granulomatous</td>
<td></td>
<td>Encephalitis</td>
</tr>
</tbody>
</table>

Cexamples of morphologic diagnoses
- Multiple compound (open) fractures of the left femur
- Moderate, diffuse, bilateral, adrenal cortical hyperplasia
- Mild left ventricular hypertrophy (heart)
- Squamous cell carcinoma of the ear
- Moderate, acute, multifocal, necrotizing, hepatitis
- Subacute, locally extensive, ulcerative, dermatitis
- Severe diffuse bilateral nephrosis
- Uterine rupture, locally-extensive, severe
- Hypertrophic cardiomyopathy, severe
## Frequently Used Terminology Used in Pathology

<table>
<thead>
<tr>
<th>System</th>
<th>Inflammation</th>
<th>Non-Inflammatory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory</td>
<td>Bronchopneumonia, tracheitis, embolic pneumonia, bronchiolitis, laryngitis, rhinitis, sinusitis</td>
<td>Atelectasis, emphysema, pulmonary carcinoma, pulmonary hemorrhage</td>
</tr>
<tr>
<td>Digestive</td>
<td>Abomasitis, rumenitis, gastritis, esophagitis, stomatitis, enteritis, colitis, typhilitis, enterocolitis</td>
<td>Bloat, dental tartar, gastric torsion, gastric ulcer, intestinal carcinoma, intestinal infarction, intussusception</td>
</tr>
<tr>
<td>Urinary</td>
<td>Glomerulonephritis, cystitis, nephritis, pyelonephritis, urethritis</td>
<td>Glomerular amyloidosis, renal cysts, hydronephrosis, nephrosis, renal calculus, renal cortical necrosis, renal dysplasia, renal hypoplasia</td>
</tr>
<tr>
<td>Integument</td>
<td>Dermatitis, folliculitis, furunculosis, panniculitis, epidermitis, cellulitis</td>
<td>Acanthosis, alopecia, epitheliogenesis imperfecta, histiocytoma, hyperkeratosis, macule, seborrhoea, dermatopathy, dermatoses</td>
</tr>
<tr>
<td>Female Genital</td>
<td>Cervicitis, metritis, placentitis, salpingitis, vaginitis, pyometra, endometritis, mastitis</td>
<td>Cystic uterine hyperplasia, granulosa cell tumour, mammary dysplasia, parovarian cysts, uterine leiomyoma</td>
</tr>
<tr>
<td>Male Genital</td>
<td>Balanoposthitis, epididymitis, orchitis, prostatitis</td>
<td>Penile fibroma, seminoma, testicular degeneration, testicular hypoplasia</td>
</tr>
<tr>
<td>Liver</td>
<td>Cholangiohepatitis, hepatitis, cholangitis</td>
<td>Hepatic necrosis, hepatic lipidosis, massive necrosis, nodular hyperplasia, passive congestion, periaplar necrosis, hepatitis</td>
</tr>
<tr>
<td>Pancreas</td>
<td>Pancreatitits</td>
<td>Nodular hyperplasia, diabetes, pancreatic atrophy</td>
</tr>
<tr>
<td>Peritoneum</td>
<td>Peritonitis</td>
<td>Ascites, mesothelioma, abdominal fat necrosis</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>Arteritis, endocarditis, myocarditis, epicarditis, lymphangitis, phlebitis, omphalophlebitis, vasculitis</td>
<td>Atherosclerosis, atherosclerosis, cardiomyopathy, endocardiosis, fibrinoid necrosis, hemangioma, lymphangiectasia, myocardial degeneration, myocardial hypertrophy, thrombosis</td>
</tr>
<tr>
<td>Bone &amp; Joints</td>
<td>Arthritis, ostelitis, osteomyelitis, tenovaginitis, desmitis - ligament</td>
<td>Chondrodystrophy, osteodystrophia fibrosa, osteogenic sarcoma, osteomalacia, osteoporosis, osteosis, prolapsed intervertebral disc, skeletal dysplasia</td>
</tr>
<tr>
<td>Blood &amp; Lymph</td>
<td>Lymphadenitis, splenitis,</td>
<td>Anemia, hemorrhagic diathesis, marrow dysplasia, myelogenous leukemia, purpura, splenic nodular hyperplasia, splenic siderotic nodules, splenic torsion, splenomegaly, thymic atrophy</td>
</tr>
<tr>
<td>Endocrine</td>
<td>Pituitary abscess, adrenalitis, thyroiditis</td>
<td>Goiter, nodular hyperplasia, pheochromocytoma, pituitary adenoma</td>
</tr>
<tr>
<td>Muscle &amp; Fat</td>
<td>Myositis, fascitis, steatitis</td>
<td>Arthrogryposis, atrophy, mineralization, myodegeneration, muscle dystrophy</td>
</tr>
<tr>
<td>Nervous</td>
<td>Encephalitis, myelitis, encephalomyelitis, meningitis, meningoencephalitis, neurtis, radiculitis</td>
<td>Cerebellar hypoplasia, cerebral edema, demyelination, encephalomalacia, poliencephalomalacia, leukoencephalomalacia, hydranencephalus, hydrocephalus, neuronlipoidosis, syringomyelia</td>
</tr>
<tr>
<td>Eye</td>
<td>Chorioiditis, conjunctivitis, keratitis, retinitis, uveitis, anophthalmitis, blepharitis</td>
<td>Cataract, anophthalmia, corneal edema, glaucoma, hypoplasia of optic nerve, microophthalmia, retinal atrophy</td>
</tr>
<tr>
<td>Ear</td>
<td>Otitis externa, otitis media</td>
<td>Hypoplasia</td>
</tr>
</tbody>
</table>
IV. PRACTICAL INFORMATION ABOUT HISTOLOGIC STAINS

1. Classes of biologic stains:
   a. General tissue stains
      These differentially stain the nucleus and the cytoplasm of cells and permit
differentiation between the different tissue types, eg
      Ÿ Hematoxylin and Eosin
         Nucleus stains blue
         Cytoplasm stains red
      Ÿ Polychromatic stains, eg Wright's and Giemsa
         Provide good color range to differentiate between blood leucocytes.
   b. Special staining procedures
      For more refined identification of cell types, intracellular components and extracellular
materials (most of the stains described below fall in this category).

COMMONLY USED STAINS AT THE ATLANTIC VETERINARY COLLEGE

<table>
<thead>
<tr>
<th>TYPE OF STAIN</th>
<th>SPECIAL USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hematoxylin &amp; Eosin (H&amp;E)</td>
<td>General stain used in routine pathology</td>
</tr>
<tr>
<td>Oil-Red-O (on frozen sections)</td>
<td>Lipid</td>
</tr>
<tr>
<td>Toluidine Blue</td>
<td>Mast cell granules</td>
</tr>
<tr>
<td>Phosphotungstic acid-haematoxylin (PTAH)</td>
<td>Fibrin, cross striations of skeletal muscle fibres</td>
</tr>
<tr>
<td>Masson's trichrome</td>
<td>Connective tissue, collagen</td>
</tr>
<tr>
<td>Periodic acid-Schiff (PAS)</td>
<td>Glycogen, fungi</td>
</tr>
<tr>
<td>Congo Red</td>
<td>Amyloid</td>
</tr>
<tr>
<td>Gram Stain (Taylor's)</td>
<td>Bacteria</td>
</tr>
<tr>
<td>Gomori Methenamine Silver (GMS)</td>
<td>Fungi</td>
</tr>
<tr>
<td>Von Kossa</td>
<td>Calcium salts</td>
</tr>
<tr>
<td>Luxol Fast Blue (LFB)</td>
<td>Myelin</td>
</tr>
<tr>
<td>Acid fast stain</td>
<td>Mycobacterial organisms &amp; other acid fast + organisms</td>
</tr>
<tr>
<td>Giemsa</td>
<td>Bone marrow</td>
</tr>
<tr>
<td>Fontana Masson's</td>
<td>Melanin and argentaffin cells</td>
</tr>
<tr>
<td>Reticulum silver</td>
<td>Reticulum fibres</td>
</tr>
<tr>
<td>Verhoeff VanGieson (VVG)</td>
<td>Elastic fibres</td>
</tr>
</tbody>
</table>