Exotics

by

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This will be the last CE course held at Drury Lane Theater.

Beginning in January, 2009, all CE courses will be held at Hamburger University, 2715 Jorie Blvd, Oak Brook, IL 60523
Clinical Pathology for Nontraditional Species

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Introduction

- Exotic animals
  - stoic
  - evolved to mask illness
- Treat n’ run?
- Diagnostic Tests
  - to identify physiologic anomalies

Blood Collection

- Blood volume:
  - 8-10% of body weight birds and mammals
  - 5-8% of body weight reptiles
  - Tolerate 10% loss
- General rule of thumb:
  - 0.8-1.0 ml/100 g (avian and mammal)
  - 0.5-0.8 ml/100 g (reptiles)
- To heparinize or not to heparinize?
  - Consider time to collect
  - LIMIT VOLUME OF HEPARIN
  - May affect cell staining
Venipuncture sites: Avian

- Cutaneous ulnar
- Jugular
- Medial Metatarsal

Venipuncture sites: Lizards

- Ventral coccygeal/tail vein
- Ventral abdominal vein
- Cardiac- euthanasia
- Toe nail- never

Venipuncture sites: Snakes

- Cardiac
- Ventral tail vein
- Palatine
- Jugular
Venipuncture sites: Chelonians
- Jugular
- Dorsal coccygeal
- Brachial
- Subcarapacial

Venipuncture sites: Crocodilians
- Ventral tail
- Ventral abdominal
- Cardiac
- Supravertebral

Venipuncture Sites: Mammalian
- Cephalic
- Jugular
- Cranial vena cavae
- Saphenous
Venipuncture Sites: Mammalian

- Cranial vena cavae
  - hedgehog
  - sugar glider
  - guinea pig
- Jugular
  - Rabbits
- Auricular
  - Rabbits
- Tail
  - Rats
- Femoral
  - Rats

Blood collection tubes:

- CBC
- EDTA or lithium heparin
- Plasma chemistry
- Lithium heparin
- Microtainers
- EDTA
  - disadvantages:
    - hemolysis RBC’s, especially tortoises
    - elevated potassium*
    - decreased calcium*
- Lithium heparin
  - less damaging to cells
- Centrifuge immediately
  - cells will consume glucose
  - potassium and phosphorus increase from leakage

Blood collection tubes:
No anticoagulant

- Red top tube or amber top microtainer
  - centrifuge to collect serum
  - serum may form gelatinous clot
    - may lose sample
    - continue to centrifuge, may help
    - more common in glass tubes
      - microtainer: plastic
      - may be due to electric charge
Hematology

Evaluating the packed cell volume

- Reference ranges:
  - 20-40% (reptile)
  - 40-55% (avian)
  - 30-55% (mammalian; ferret 45-58%)

- Buffy coat:
  - anecdotal used to estimate WBC (mammals)
  - limited samples suggest not useful
  - Lawton and Divers, 1999

- Buffy coat: use with caution

- Serum:
  - appearance

Hematology: Slide Preparation

- Techniques
  - Standard slide technique
    - cell destruction in avian and reptile patients
    - 1 drop 22% bovine albumin: 5 drops blood
  - Cover-slip
    - fragile

Hematology: Evaluating the erythron

- Total Red Blood Cell Count
  - Manual techniques:
    - Erythrocyte Unopette system
    - Natt and Herrick’s solution

- Hemoglobin
  - utilize standard mammalian techniques
  - normal: 6-12 gm/dl
Hematology

- Erythrocytes
  - mature cells
    - ellipsoid with central nucleus
    - cytoplasm - orange-pink
  - immature cells
    - small, round cells increased N:C ratio
    - basophilic cytoplasm

- Erythrocytes
  - abnormal shapes and sizes
    - regeneration
  - hypochromatosis-
    - iron deficiency anemia, chronic blood loss

Hematology

- Blood parasites
  - common wild caught specimens
  - evaluate overall health
  - evaluate erythron
    - anemia?
    - regenerative
Hematology: Leukocytes

- Reptiles and birds
  - Manual counts necessary because of RBCs and thrombocytes
  - Natt Herrick's technique
  - stains blue
  - small lymphocytes and thrombocytes appear similar
  - Phloxine B solution
  - stains heterophils and eosinophils red
  - Total WBC count determined after differential
  - Rees and Eckers solution
    - mammalian platelet counting diluent
    - easy to use and stable
    - Lawton and Divers, 1999

- Counting white blood cells
  - Hemocytometer
    - mammals: recommend count all 64 squares
    - Doxey, 1989
    - avian: count 4 large squares
      - Hawley and Samour, 1966
    - reptiles: count 9 large squares
      - Campbell, 1966
    - reptiles: no difference between counting 10 or 40 large squares
      - Lawton and Divers, 1999

- Circulating pool very large
  - Reference ranges
    - 5.0-15.0 x 10^3
  - Rabbits and ferrets
    - <6-10 x 10^3
  - Reptile study
    - Salmonella SQ
      - 12 hr 45.0-76.0 x 10^3
      - 24-48 h returned to normal
    - avian >50.0 x 10^3
Leukocytes: Acidophils

- Acidophils
  - Heterophils and Eosinophils
    - Pienaar type 1 and 2 cells
      - type 1 acidophil- heterophil
      - type 2 acidophil- eosinophil
  - Most squamates have only type 1
  - Crocodilians and chelonians typically have both

Hematology: Granulocytes

- Heterophils
  - fusiform granules
  - large round, acentric nucleus
  - function-
    - phagocytosis
    - heterophilia
      - inflammation, stress
      - seasonal
        - increase summer

Hematology: Granulocytes

- Toxic heterophils
  - suggestive of infectious cause
  - indicative of severity
  - changes
    - degranulation
    - cell swelling
    - cytoplasmic vacuolization
Hematology: Granulocytes

- **Eosinophil**
  - large, round cells
  - spherical granules
  - nucleus centrally located
  - function
    - parasitemia
  - seasonal variation
    - increased winter

Hematology: Granulocytes

- **Basophils**
  - small, spherical cells
  - basophilic meta-chromatic granules
  - function
    - histamine release

Hematology: Lymphocyte

- **Lymphocytes**
  - small, basophilic staining
  - acenitic nucleus
  - function
    - B cells: Ab production
    - T cells moderate immune function
  - seasonal variation
    - decreased in winter
Hematology: Monocyte

- Largest WBC
  - cytoplasm- blue-gray
  - function
    - granuloma formation
    - antigenic processing
- Azurophils
  - morphologically similar
  - metachromatic reaction to Romanowsky stain

Hematology

- Thrombocytes
  - central nucleus
  - confused with lymphocytes
  - functions- thrombus formation, clot, wound healing
  - >200,000 cells/ml

White blood cell counts

- WBC: 5-15,000 cells/ml
  - Heterophil: Lymphocyte ratio
    - 1:1-2:1
    - Exceptions?
      - Tortoises
      - Femels
      - Hoddle
  - Lymphocytes
    - <2,000 cells/ml lymphopenia?
    - <1,500 cells/ml absolute lymphopenia
  - Monocytes
    - < 500 cells/ml normal
    - 500-1,500 cells/ml stress
    - >1,500 cells/ml chronic inflammation
  - Eosinophils and basophils
    - < 500 cells/ml
Plasma Chemistries

- Reference material limited
- Affected by seasonal, environmental, gender and nutritional changes
- Sample size considerations

Glucose

- Reference range highly variable
  - avian: 80-200 mg/dl
  - reptile: 40-160 mg/dl
  - ferret: >80 mg/dl
- Hypoglycemia
  - starvation, septicemia, hepatopathies, high protein diets, insulinoma (ferret)
- Hyperglycemia
  - rare

Protein

- Reference range:
  - avian: 2.5-6.0 mg/dl
  - reptile: 3-8 mg/dl
  - mammals: 4-7 mg/dl
- Refractometer vs. analyzer
- Hyperproteinemia
  - dehydration
  - elevated globulins- serum electrophoresis
    - alpha 1, alpha 2, beta 1, beta 2, gamma
- Hypoproteinemia
  - malnutrition, malabsorption, blood loss, hepatic or renal failure
Plasma Chemistries

- Uric Acid
  - primary catabolic end-product of protein
  - reference range < 10-15 mg/dl
  - hyperuricemia
    - renal disease, dehydration, gout
  - affected by diet: carnivores
  - not specific to renal function

Plasma Chemistries

- Sodium (140-160 mg/dl)
  - hypernatremia - dehydration, renal disease, re-feeding syndrome
  - hyponatremia - diarrhea, diet
- Chloride (90-120 mg/dl)
  - hyperchloremia - dehydration, renal disease
- Potassium (2-6 mg/dl)
  - hypokalemia - diet, diarrhea
  - re-feeding syndrome - shift extra- to intracellular

Plasma Chemistries

- Aspartate aminotransferase (AST)
  - present in all body tissues
  - elevated levels in liver and muscle
- Alanine aminotransferase (ALT)
  - Hepatocytes - mammals
  - Unreliable - birds and reptiles
- Creatine kinase (CK)
  - skeletal muscle
  - rule-out liver disease with AST
Plasma Chemistries: Research

- Glutamate dehydrogenase (Lomas et al., 2000)
  - potential indicator of hepatocellular damage
  - Greek spur thigh tortoise
  - Egyptian tortoise

Plasma Chemistries

- Calcium
  - measures total calcium
    - ionized biologically active
    - unionized bound to protein or complexed
  - reduced pH increases ionic form
    - e.g., apnea- anesthesia
    - increased likelihood for calcification

Plasma Chemistries

- Calcium
  - reference ranges: 7-15 mg/dl
  - tortoises < 6 mg/dl
  - calcium to phosphorus ratio
  - calcium-phosphorus product
  - Dennis et al., 1998
    - Iguanas (n=30)
      - Total calcium: 12.8 mg/dl
      - Ionized calcium: 1.47 mg/dl
Plasma Chemistries

- Calcium
  - hypocalcemia:
    - renal compromise
    - nutritional imbalance
    - African Grey
  - hypercalcemia:
    - primary hyperparathyroidism
    - folliculogenesis

- Phosphorus
  - reference range: 2-6 mg/dl
  - hyperphosphatemia:
    - renal disease, hypervitaminosis D, excessive dietary phosphorus, folliculogenesis
  - hypophosphatemia:
    - starvation (re-feeding syndrome), dietary imbalance

- Bile Acids
  - sensitive indicator of liver function in birds
  - elevations in bile acid- liver biopsy
  - Pre-prandial and post-prandial levels identified in some species of psittacines
Managing endocrine neoplasia in ferrets

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Introduction

- Common
  - Insulinoma
  - Adrenal Disease

- Uncommon
  - Pheochromocytoma

Insulinoma

- Introduction
  - Primarily occurs in geriatric ferrets
  - 3+ years old
  - Pancreatic neoplasia- tumors of the Beta-cells
  - Pathophysiology-
    - Excessive insulin production
    - Beta-cells do not respond to normal inhibitory stimuli
    - Hepatic gluconeogenesis and glycogenolysis are inhibited and uptake of peripheral glucose is increased
Insulinoma

- **History and Physical Examination**
  - acute vs. chronic onset
  - neuroglucopenic-
    - confusion, mental dullness, seizure and coma
  - adrenergic-
    - increased catecholamines
    - tachycardia, hypothermia, tremors, nervousness, irritability
  - miscellaneous-
    - pawing at mouth, grinding teeth (bruxism)

- **Differentials**
  - Cardiac disease
    - hypertrophic
    - dilitative
  - heartworms
  - Neoplasia
  - Trauma- spinal disease

- **Diagnosis**
  - clinical signs, history, physical exam
  - blood work:
    - fast 4-6 hours??
    - glucose levels (<70 mg/dl suspect)
    - insulin levels (>200-12,000pmol/L)
    - CBC: normal
    - chem panel: ALT, AST
  - Radiographs and ultrasound
  - Surgical exploration
Insulinoma

- **Treatment:**
  - **Medical**
    - Controls signs, not curative
    - Discuss prognosis
    - Lifelong treatment
  - **Surgical**
    - Best chance of cure?
    - Microtumors

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Insulinoma: Medical Management

- **Medical management**
  - Prednisone: 0.5-2.0 mg/kg PO BID (start low)
  - Increase peripheral glucose by inhibiting tissue uptake
  - Increases hepatic gluconeogenesis
  - Do not use alcohol base solutions

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Insulinoma: Medical Management

- **Side effects**
  - **Immune system**
    - T-lymphocytes, lymphokines, chemotaxis
  - **GI tract**
    - Increased pepsin and gastric pH
  - **CNS**
    - Lower seizure threshold
  - **Circulatory**
    - Increase blood pressure
Insulinoma: Medical Management

- **Diazoxide:**
  - Structurally similar to thiazide diuretics
  - Functions
    - Reduces release of intracellular ionized calcium
    - Inhibits insulin release from B cells
    - No control on production
    - No antineoplastic activity
    - Stimulates beta-adrenergic system (epinephrine)
    - Reduces cell uptake of glucose
    - Promotes glycogenolysis and gluconeogenesis in liver
    - Reduces blood pressure
    - Direct affect arterioles

- **Diazoxide**
  - Side effects- vomiting and anorexia
  - Reduce prednisone dose
  - Dosing
    - 5-10mg/k BID PO (max 60 mg)
  - Cost

- **Dietary**
  - feed frequent small meals
  - high-quality protein source
  - avoid simple sugars
    - exception- hypoglycemic emergency
  - **Prognosis-**
    - guarded
    - survival- up to 5 yrs.
Insulinoma: Surgical Management

- Animals under 6 years and considered stable
- Curative?
- Pre-surgical considerations:
  - Dextrose I.V. -
    - 2.5 - 5.0%
  - Antibiotics
    - Ampicillin?
  - NPO 4-6 hours - check glucose
- Post-operative considerations:
  - NPO for 4-8 hours

Insulinoma: Surgical Management

- Anesthesia
  - Induction
    - Butorphanol
      - 0.05-0.5 mg/kg BID SC, IM
    - Midazolam
      - 0.3-1.0 mg/kg IM
  - Isoflurane
    - Induction (3-5%)
    - Intubation
    - Maintenance (1.5-3%)

Insulinoma: Surgical Management

- Surgical preparation
  - Provision of heat
  - Monitoring
Insulinoma: Surgical Management

- **Approach**
  - Cranioventral abdomen
  - Below xiphoid process to umbilicus
  - Visualize linea alba
  - Explore abdomen first
    - Spleen, liver, kidneys, stomach, intestines, lymph nodes, urinary bladder, adrenal glands
  - Biopsies
    - LN, liver

- **Nodulectomy**
  - Excisional biopsy
  - Examine liver, spleen, lymph nodes

- **Pancrectectomy**
  - Remove 1/2 of pancreas
  - Best guess

- **Histopathology**
  - Malignant Beta-cell carcinoma

- **Monitor blood glucose**
  - Hospital 48-96 h
  - Weekly
  - Monthly

- **Re-occurrence within 2-6 months**
  - Consider signalment
  - Medical management
Adrenal Glands: Location

- Adrenal glands
  - Paired
  - Embedded in retroperitoneal fat
  - Craniomedial to kidney
- Left (lower)
  - 6-8 mm
  - Adrenolumbar-ventral
- Right
  - 8-11 mm
  - Vena cavae-laterodorsal

Adrenal Glands: Function

- Medulla
  - Ectodermal origin
  - Produces catecholamines
- Cortex
  - Zona glomerulosa
    - Mineralcorticoids
  - Zona fasciculata
    - Glucocorticoids
    - Androgens
  - Zona reticularis
    - Androgens

Adrenal Gland Disease

- Introduction
  - Disease of geriatric ferrets (>3 years)
  - Suspected etiologies:
    - photoperiod, early-age neutering, genetics
  - High occurrence in US, but not in Great Britain
    - 20-25% US (Weiss and Scott)
    - 0.55% (0.2-1.1%) Netherlands (Schoemaker)
Adrenal Gland Disease

- History
  - Progressive alopecia
  - Seasonal alopecia - late winter and early spring
  - Pruritis
  - Muscle wasting

- Females
  - Vulvar enlargement and discharge

- Males
  - Prostatic cysts and stranguria

- Physical Examination
  - Confirm historical answers
  - Left adrenal gland may be palpable (right +/-)
  - Splenomegaly
  - Enlarged prostate
Adrenal Gland Disease

Differentials
- remnant ovarian tissue
- typically < 2 years of age
- HCG 100 IU repeat in 7-10 days
- seasonal alopecia
- insulinoma
- lymphoma

Diagnostics
- Complete blood count
  - normal, anemia, pancytopenia
- Serum chemistry
  - ALT, AST, hypoglycemia
- Radiographs
  - limited value?
- Ultrasound
  - measure adrenal glands
  - Discrepancy
  - 50% effective?

Ferret adrenal panel-
- estradiol, androstenedione, 17-hydroxyprogesterone
- University of Tennessee, Veterinary Teaching Hospital,
  Clinical Endocrine Service, 2407 River Road, Room a105,
  Knoxville, TN 37996
- Exploratory Surgery
Adrenal Gland Disease

Epidemiology
- 85% left side
- 15% both glands
- No pituitary changes
  - Primary adrenocortical insufficiency not reported

Age to AGD
- US
  - Mean age: 3.4 (SD 1.4)
- Netherlands
  - Mean age: 5.1 (SD 1.9)

Role of neutering??

Age neutered
- US: 4-6 weeks
- Netherlands: 0.98 years (SD: 0.65)

Age neuter and disease
- US: 3.3 (SD: 1.4)
- Netherlands: 3.5 (SD: 1.8)
Adrenal Gland Disease

What happens with neutering?
- Removal of gonads = no negative feedback to GnRH
- LH and FSH continually produced
  - LH and FSH receptors found on adrenal glands
  - LH more important
  - Adrenal glands stimulated

Photoperiod
- seasonal, induced ovulator
  - > 12 hours promotes breeding
  - Melatonin related system
- indoors- perpetual light, no seasons
- neutered
  - GnRH→ LH and FSH → androgen cells in adrenal gland are responsive (LH receptors) and cause hyperplasia→ tumor

Management
- MEDICAL
- SURGICAL
Adrenal Gland Disease

- Mitotane
  - Little value in cases at LSU-SVM

- Flutamide
  - Little value in cases at LSU-SVM

- Ketoconazole

Adrenal Gland Disease

- Leuprolide Acetate Depot (Lupron Depot)
  - Synthetic gonadotropin-releasing hormone analog
    - Initial increase, than suppression of pituitary gonadotropins (FSH and LH)
    - Suppresses conversion of cholesterol to androgen and estradiol
      - Humans - down regulates sex steroidogenesis

Adrenal Gland Disease

- Leuprolide Acetate Depot (Lupron Depot)
  - 3.75 mg 30 day formulation ($400.00)
    - Storage -70°C freezer indefinite, other 6 months
    - Dose: 35 ferrets
    - Dosing: 100 mcg/kg IM once every 6-8 weeks
    - Side effects: “hot flashes”
    - Increase time interval between treatments as animal responds
    - Cost
Adrenal Gland Disease

**Surgical management**
- Previously preferred
  - unlikely to remove entire right gland or accessory adrenal tissue
- Pre-surgical considerations
  - Similar to insulinoma
  - fast 6-8 hours
  - dextrose IV if needed

Adrenal Gland Disease

**Adrenalectomy**
- Standard
  - approach is similar to the dog
  - full exploratory
  - usually left side
  - adrenolumbar vein
  - closure
- Cryotherapy
- Vena caval ligation
- Accessory tissue?
- Histopathology: hyperplasia, adenoma, adenocarcinoma

Adrenal Gland Disease

**Post-surgical considerations**
- NPO 6-8 hours
- Dexamethasone SP if animal is slow to recover
Other treatment possibilities?

- Not neuter?????
- Progestagens
  - Megestrol acetate
    - Suppress gonadotropic hormones
    - Ovarian cycling
    - Estrus return 8% ferrets (2-5 months)
    - Second dose responsive
  - Side effects
    - Pyometra

Other treatment possibilities?

- Sham matings
  - Remain intact: induced ovulators
    - Odor
    - Unwanted aggressive behaviors
  - GnRH administration
    - Administer 20 mcg GnRH IM 10 days after onset estrus
    - Ferrets ovulate, anoestrus 40-60 days
    - Side effect: anaphylaxis

Other treatment possibilities??

- Photoperiod manipulation or melatonin
  - Limit light (<8 hours)
  - Administer 1mg melatonin 8 hours post light
- GnRH immunization
  - Used in other mammals
  - Pilot study ferrets: lymphoplasmocellular infiltration
- LH immunization
  - Must make for FSH too
Other treatment possibilities??

- GnRH antagonists
  - No initial increase in FSH, LH
  - Being tested in humans
    - Oral and injectable

Endocrine disease

- Diabetes mellitus
  - Spontaneous forms are rare
  - Post-operative cases
    - Transient: 1-4 weeks
  - Clinical signs
    - PU, PD
    - Weight loss, good appetite
    - Lethargic

Endocrine disease

- Diagnosis
  - Hyperglycemic: >400 mg/dl
  - Urinalysis- glucosuria, bacterial infection

- Treatment
  - Neutral protamine Hagedorn insulin
    - 0.5-1 U BID
  - Ultralente insulin
    - BID?
  - Maintain 125-200 mg/dl
Endocrine diseases

- Pheochromocytomas
  - Rare
  - Adrenal medulla
  - Produce catecholamines
- Diagnosis
  - Immunohistochemical staining
  - Grave prognosis

Rabbit and Rodent Gastroenterology: Anatomy to Clinical Medicine

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Introduction

- Understanding our patients
  - Evaluating animals by system
    - Anatomy
    - Physiology
    - Diagnostic testing
    - Specific Diseases
Anatomy

- **Oral cavity**
  - Narrow, long
  - Visualization, intubation?
- **Teeth**
  - Hypsodont: open-rooted
  - 3-5 weeks of age: permanent teeth
- **Dental formula**
  - Upper: Incisors: 2, Canines: 0, Premolars: 3, Molars: 3
  - Lower: Incisors: 1, Canines: 0, Premolars: 2, Molars: 3
- **Incisor growth**
  - 2-2.4 mm/week
- **Cheek teeth**
  - Last molar small, other 5 primary occlusal surface

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Anatomy

- **Gastrointestinal tract**
  - Up to 20% body weight
  - Dosing considerations?
    - Drugs with narrow therapeutic index

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Anatomy

- **Stomach**
  - Ingesta reservoir
    - 15% typically
  - Cardia and pylorus well developed
    - No vomiting
  - Thin-walled
    - Surgical concerns
Anatomy

Small intestine
- 12% gastrointestinal tract volume
- Peyer’s patches: jejunum, distal ileum
- Duodenum and jejunum: narrow lumen
- Ileum terminus in cecum
  - Sacculus rotundus (ileocecal tonsil)
  - Site of foreign body impaction

Large intestine
- Cecum
  - Largest abdominal structure
  - Coiled: 3 folds
  - Holds 40% digesta
  - Fermentation
- Colon
  - Sacculations and bands
  - Contractions
    - Separate fiber from non-fiber components

Gastrointestinal physiology

Coprophagy (Syn.: Cecotrophy)
- Cecotropes (syn. Night feces, soft feces)
  - Hard vs. soft feces
  - Clustered small pellets
  - Covered with mucilaginous membrane
  - Protect against gastric pH
Anatomy

- Pancreas
  - Location

- Liver
  - Caudate lobe: narrow stalk to liver
    - Displacement possible

- Gall bladder
  - Separate bile and pancreatic ducts into duodenum
  - Secrete biliverdin primarily in bile

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Anatomy

- Guinea pig
  - Dental formula
    - Upper- Incisors: 1, Canines: 0, Premolars: 1, Molars: 3
    - Lower- Incisors: 1, Canines: 0, Premolars: 1, Molars: 3
  - Cecum: 65% GI contents
  - Liver: 6 lobes

- Physiology
  - Gastric emptying: 2 hours
  - Total GI: 20 hours
  - Coprophagy

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GI Physiology

- Rabbits primarily browsers
  - Wild: succulents

- Importance of fiber
  - Stimulate GI motility
    - Particle size
      - Coarse, non-digestible
      - Stimulate cell regeneration, motility, digestion, absorption, peristalsis, and excretion
    - Separation fiber from small particles (energy)
GI Physiology

- Microbial flora
  - Neonatal rabbits
    - Milk oil: antimicrobial fatty acid (<4-6 weeks)
  - Adult flora
    - Small intestine: aerobes, anaerobes
    - Gram-negative Bacteroides
    - Cecum/Colon: primarily obligate anaerobes

- Causes of dysbiosis
  - Elevated gastric pH, low fiber (motility), high carbohydrates (acidic large bowel pH)

Nutrition

- Choices
  - Pellets
    - Primary diet
      - Problems: obesity, diarrhea, malocclusion
    - Protein <18%, Fiber >18%
    - Restrict pellets
  - Timothy (grass hay) vs. Alfalfa (legume hay)
  - Guinea pigs: Vitamin C
  - Water
    - Free-choice always

History and Physical Examination

- Importance of history
  - Husbandry
    - Environment
    - Nutrition
    - Disinfection
    - Epidemiology
    - Current problems
  - Physical Examination
Diagnostic test considerations

**Hematology**
- Complete blood count
  - Anemia
  - Heterophilia/Neutrophilia
  - Monocytosis
- Plasma chemistry analysis
  - Hyperglobulinemia
  - Hypoalbuminemia
  - Electrolyte imbalances
  - Enzymatic changes
  - AST, CK
- Infectious disease testing

**Fecal examination**
- Direct saline and fecal float

**Microbiological culture**
- Gram-stain
- Bacterial
- Fungal
- Aerobes v. anaerobes

**Survey radiographs**
- Lateral and DV/VD

**Advanced imaging**
- CT and MRI

**Endoscopy**

**Biopsy**

**Histopathology**
Gastrointestinal disease
- Malocclusion
  - Incisors
    - Lowers grow out past uppers
  - Mandibular prognathism
  - Congenital

Gastrointestinal disease
- Malocclusion
  - Cheek teeth
    - Uppers: buccal
    - Lowers: lingual

Gastrointestinal disease
- History and Clinical signs
  - Anorectic
  - Unable to hold food
  - Slobbers
    - Moistened front legs
  - Abscess formation
  - Nasal and ocular discharge
  - Blood-stained oral cavity
Gastrointestinal disease

- Gastric stasis
  - History
    - Anorexia
    - Reduced water intake
    - Reduced/absent fecal output
    - Low fiber diet
      - High carbohydrate
      - Excessive grooming
      - Painful abdomen
  - Physical examination
    - "Doughy" cranial left abdominal quadrant

Gastrointestinal disease

- Diagnostics
  - CBC
  - Plasma chemistries
  - Radiographs
  - Ultrasound

Gastrointestinal disease

- Medical treatment
  - Fluid therapy
  - Energy: Oxbow critical care
  - Antibiotics?
  - Competitive bacteria: yogurt or commercial
  - Metoclopramide: confirm no obstruction
  - Analgesia
    - Buprenorphine
      - 0.03-0.05 mg/kg
  - Laxatone, papain, pineapple (bromelain)
Gastrointestinal disease

- Sequella
  - hepatic lipidosis

- Surgical management
  - gastrotomy: similar to cat and dog
    - Necrotic duodenum
  - closure: 2-layer, synthetic monofilament
  - prognosis: guarded

Gastrointestinal disease

- Antibiotic induced dysbiosis: enteritis
  - Iatrogenic fatal enteritis
    - History of exposure to antibiotics
      - clindamycin, lincomycin, ampicillin, amoxicillin, clavamox, penicillin, cephalosporins, erythromycin
    - Clinical signs
      - Reduced fecal output to diarrhea
      - Anorexia
      - Painful abdomen
  - Treatment
    - Fluid therapy
    - Anti-inflammatories and analgesics
    - Antimicrobials?
    - Cholestyramine (2 g/20 mL water, gavage q 24 h)
      - Bacterial toxin binding agent

Gastrointestinal disease

- Enterotoxemia
  - Clostridium spiroforme toxin
    - History
      - Anorexia, depression, diarrhea, hypothermia
      - Neonatal rabbits
        - High gastric pH: easily colonize
      - Adults
        - Alteration in cecal flora (antibiotics)
    - Death 24-48 hours
Gastrointestinal disease

- *Clostridium spiriforme*
  - Post-mortem
    - Serosal and cecal hemorrhage
  - Treatment
    - Fluids, fluids, fluids
    - High fiber diet
    - Metronidazole (20 mg/kg BID)

Gastrointestinal disease

- Mucoid enteropathy
  - Neonates
    - Anorexia, lethargy, weight loss, excessive mucous production
  - Bacterial dysbiosis and cecal pH changes
    - Hyperacidity alters microflora
    - Mucous produced in response
  - Prevention
    - High fiber, low carbohydrate diet

Gastrointestinal disease

- Colibacillosis
  - Primarily a disease of neonates (1-14 days)
  - Diarrhea, anorexia, acute mortality
  - Diagnosis: culture and histopathology
  - Treatment:
    - TMP/S (30 mg/kg PO BID)
    - Enrofloxacin (10 mg/kg PO BID)
Gastrointestinal disease

- *Lawsonia intracellularis*
  - Obligate intracellular pathogen
  - Gram negative
  - Proliferative ileitis
  - Diarrhea, anorexia, lethargy
  - Rabbits and rodents
  - Primarily young
  - Diagnosis: culture, response to treatment
  - Treatment:
    - Macrolides preferred
    - Chloramphenicol 30-50 mg/kg PO BID

Gastrointestinal disease

- Tyzzer’s Disease
  - *Clostridium piliforme*
  - Obligate intracellular, spore forming, Gram variable
  - Predisposing factors: stress, sanitation, breeding, temperature
  - Susceptible species: rodents, rabbits

Gastrointestinal disease

- Tyzzer’s disease
  - Clinical signs: depression, lethargy, watery diarrhea, death
  - Neonates more susceptible
  - Diagnosis
    - Post-mortem: necrotic lesions liver, myocardium, edematous intestine
  - Treatment: difficult- intracellular
  - Prevention key
Gastrointestinal disease

- Opportunistic bacterial enteritis
  - Gram-negative, Enterobacteriaceae
    - Salmonella
    - Pseudomonas
  - Clinical disease: anorexia, depression, diarrhea
  - Diagnosis: culture (with biopsy), radiography
  - Treatment: based on culture and sensitivity

Gastrointestinal disease

- Viruses
  - Papillomatosis
    - Sessile to pedunculated oral masses
    - Generally self-limiting (145 days)

Gastrointestinal disease

- Rabbit Enteric Coronavirus
  - 1980
  - Primarily a neonatal disease; adults too
  - High morbidity and mortality
  - Epidemiology: large numbers (all) affected
  - Compared with bacterial
  - Clinical course: similar to bacterial infections
  - Post-mortem:
    - Edema intestines, atrophy villi
    - Pleural effusion, cardiomyopathy
    - Demonstrate virus
  - No treatment
Gastrointestinal disease

- Rabbit rotavirus
  - Similar presentation to other enteric diseases
  - Greenish-yellow watery diarrhea
- Morbidity and Mortality
  - Variable, can be high
  - Variable types=variable pathogenicity
- Diagnosis
  - Histopathology
  - Serology
- Prevention: hygiene

Gastrointestinal disease

- Rabbit calicivirus
  - Rabbit viral hemorrhagic disease
    - China, Europe
    - Mexico: 1988, eradicated
    - U.S. 2000: Iowa
- Susceptible animals: >2 months
- Transmission: fecal-oral, fomites
  - 1-2 day incubation

Gastrointestinal disease

- Clinical course
  - Lethargy, febrile, diarrhea, acute death (common)
  - Lymphopenia, thrombocytopenia
  - Coagulopathies
- Post-mortem
  - Hemorrhage and congestion of organs
  - EM confirmation
- Prevention: sodium hypochlorite (0.5%) or formalin (1%)
Heat Prostration

- Rabbits
  - Prefer temperatures <88°F
  - Provide protection
    - Caged rabbits
      - Shade cloth
    - Ad lib access fresh water
    - Free-roaming rabbits

- Emergency case
- Physical examination
  - Body temperature
    - 99-102°F
    - >104°F
    - >107°F
  - Prognosis: guarded to grave
  - Open mouth breathing
  - Mentation

- Goals of therapy
  1. Lower rabbit’s body temperature
     - Alcohol over ears and extremities
     - Cool water baths: gradual
     - Fluid therapy: isotonic fluids (cephalic, aural, saphenous)
  2. Stabilize breathing
     - Provide supplemental oxygen
  3. Stabilize gastrointestinal tract
     - Broad-spectrum antimicrobials
Heat Prostration

- Additional treatment:
  - Antimicrobials
    - Enrofloxacin (5 mg/kg IM once, PO, Q12h)
    - Trimethoprim-Sulfadimethoxine (15-30 mg/kg PO)
  - Anti-inflammatories
    - Non-steroidal:
      - Carprofen (2.2 mg/kg PO); Meloxicam (0.2 mg/kg PO)
      - Flunixin meglumine (1-2 mg/kg SC, IM, IV) no more than 3 days
  - Analgesics: Carprofen, Meloxicam, Flunixin

Endoparasites

- Non-specific ciliated parasites
- To treat or not to treat?
  - Clinical disease?
  - Protozoal density
    - secondary overgrowth
    - Metronidazole
      - 15-25 mg/kg

Endoparasites

- Flagellates
  - *Giardia*
    - Clinically apparent and inapparent cases
    - Clinical signs: anorexia, diarrhea
    - Diagnosis
      - Saline smear
      - Centrifugation
    - Treatment
      - Metronidazole
      - 15-25 mg/kg PO
      - q 12h for 5-10d
Endoparasites

- Coccidia
  - Eimeria spp.
  - Direct life cycle
    - epithelial surfaces of intestinal, biliary and renal systems

Endoparasites

- Coccidia
  - Intestinal *Eimeria*
    - transmission: ingestion of oocysts
    - signs: none, diarrhea, dehydration, colic
    - diagnosis: direct and fecal float
    - RX: trimeth sulfa, sulfadimethoxine, amprolium
  - Hepatic (*Eimeria stiedae*)
    - signs: hepatomegaly, neurologic signs, other signs similar to intestinal form

Endoparasites

- Treatment
  - Sulfadimethoxine
    - 30-75 mg/kg/day for 10-14 days
  - Trimethoprim-sulfadiazine
    - 30 mg/kg PO q 12 h for 10-15 days
Endoparasites

- *Cryptosporidium parvum*
  - Colony problem
  - Poor sanitation and quarantine
  - Neonates
  - Clinical signs
    - Poor-doer
    - Greasy fur
    - Diarrhea

Endoparasites

- *Cryptosporidium*
  - Pathology:
    - Colonizes the anterior portion of the ileum
    - Atrophy and metaplasia of villi epithelium are seen.
    - Eosinophilic infiltration of the lamina propria

Endoparasites

- *Cryptosporidium*
  - Diagnosis
    - Fecal
    - Acid-fast
    - Merifluor
    - Post-mortem
  - Treatment
    - Not 100% effective
    - Sulfamethazine
      - 0.02% in the water may suppress
    - Environmental control
      - 5% ammonia
  - Zoonotic
Endoparasites

- Cestodes
  - Not common in domestic animals
  - Cittotaenia variabilis
    - Rabbit
    - Small intestine
    - Insect intermediate host
  - Diagnosis
  - Praziquantel
    - 5-10 mg/kg PO once

Endoparasites

- Nematodes
  - direct or indirect life cycle
  - signs: anorexia, anemia, wasting, regurgitation
  - diagnosis:
    - fecal float

Endoparasites

- Passalurus ambiguus
  - Common pinworm of rabbits
  - Anterior cecum and colon
  - Diagnosis
    - Fecal
    - Tape prep of perineum
  - Treatment
    - Fenbendazole
      - 10-20 mg/kg PO
      - Repeat 10 days
Introduction

- Understanding our patients
  - Evaluating reptile by system
    - Anatomy
    - Physiology
    - Diagnostic testing
    - Specific Diseases

Anatomy

- Respiratory passage
  - External Nares
  - Olfactory chambers
  - Buccopharyngeal cavity
  - Glottis
  - Larynx
  - Trachea
  - Bronchial tubes
  - Lung(s)
Anatomy: Upper respiratory System

- Upper respiratory tract
  - External nares and Olfactory chambers
    - Positioning
    - Obligate closed mouth breathers
    - Dual function
      - Respiration
      - Olfaction
    - Nasal salt glands

- Buccopharyngeal cavity and glottis
  - Mucous membrane lining
  - Opening to lower respiratory tract
  - Intubation

Anatomy: Crocodilian Upper Respiratory System

- External Nares:
  - Voluntary Control
  - Elevated External Nares
    - Allows partial submersion
- Cavum Proprium Nasi
  - Cavemous tissue that fills with blood
### Anatomy: Crocodilian Upper Respiratory System
- **Velum Palati**
  - Extension of soft palate, which seals pharynx
- **Basihyal Valve**
  - Muscular structure located at the base of the tongue, which seals pharynx

### Anatomy: Lower Respiratory System
- **Larynx**
  - Glottis (opening)
  - 2 vertical arytenoid cartilages
  - Ventral cricoid cartilage
  - Preglottal keel
    - *Pituophis*
    - Freely moveable
    - Prey ingestion

### Anatomy: Lower Respiratory System
- **Trachea**
  - Chelonians and crocodilians
    - Complete tracheal rings
  - Squamates
    - Dorsal membrane
  - Intubation
    - Endotracheal cuff
Anatomy: Lower Respiratory System

- **Lungs**
  - Highly variable among reptiles
  - Single-chambered
  - Transitional
  - Multichambered

Anatomy: Lower Respiratory System

- **Lizards**
  - Saclike lungs
    - Single chamber to transitional
    - Iguanas: central chamber divided by septate
    - Surface area
    - Single bronchus empties into large chamber
    - Faveoli
    - *Airsacs*" 
      - Tubes/chambers that extend beyond lung hold air

Anatomy: Lower Respiratory System

- **Chelonians, Varanids, Crocodilians**
  - Multichambered lungs
    - Bronchus empties into lung
    - Subdivides into bronchioles that each ends in a faveolus
Anatomy: Lower Respiratory System

- Snakes
  - Species with single-chambered lung(s) and Multi-chambered lung(s)
  - Single right lung
    - Primitive snakes with 2 lungs
      - Vestigial to 2/3 normal size
  - Gas exchange
    - Cranial lung

Anatomy: Lower Respiratory System

- Air sac
  - Distal 1/3 of the lung
  - Air storage, no faveoli
- Tracheal lung
  - Primitive and advanced species
  - Faveoli-dense sac surrounding distal dorsal trachea

Physiology: Respiration

- Respiration
  - Primary gas-exchange-lungs
    - Thoracic aspiration
    - Walls of lungs can change shape
    - No negative pressure
  - Other forms of respiration
    - Buccopharyngeal
    - Skin
    - Interscalar areas: sea snake (Pelamis platurus)
    - CO2 exchange: Sternotherus
    - Cloacal
      - Low vascularity
      - Conflicting results
Physiology: Respiration

- **Lizards**
  - Intercostal contraction forces ribs forward and outward
  - Enlarges the pleural space around the lungs
  - Lungs fill with air
  - Additional intercostal muscles contract and draw the ribs backwards and inwards, forcing air out of the lungs

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Physiology: Respiration

- **Snakes**
  - Intercostal muscles and ribs play important role in respiration
  - Different regions can move independently
  - Prey ingestion
  - Cranial ribs cannot contract
  - Caudal ribs contract and cause air in air-sac to inflate/deflate: bellows
  - Cartilagenous rings remain open in trachea to allow air passage

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Physiology: Respiration

- **Chelonians**
  - Limb and head movements
  - Smooth muscle: shifting visceral volume
  - Aquatic chelonians
    - Submerged
      - Inspiration- active
      - Expiration- passive
      - Hydrostatic pressure
    - Terrestrial
      - opposite
Physiology: Respiration

- Hepatic Piston
  - Septum posthepaticum
  - Exhale: shift forward
  - Inhale: Contract and shift caudal
  - Intercostal muscles
  - Immersed: passive exhale

Physiology: Respiration

- Diving
  - Air pressed against closed glottis
  - Increased intrathoracic pressure
  - Decreased venous return
  - Increased central venous pressure

Physiology: Respiration

- Reptiles appear more sensitive to a low P0_2 than a high PCO_2
- Reptiles capable of anaerobic metabolism
  - Crocodilians tolerate significant acidemia
- Green iguanas recovered faster when recovered at room air (20% oxygen) as compared to 100% oxygen
  - Diethelm and Mader, 1998
Physiology: Clearing exudate

- Clearing exudate in lower respiratory system
  - No diaphragm
    - Can't cough
  - Muco-ciliary escalator
    - Historically not considered present
    - Surfactant
      - Low viscosity: assists beating cilia

History

- Thorough history
  - Signalment
    - Wild vs. captive
    - Reproductive status
  - Husbandry
    - Immunocompromised
  - Nutrition
    - Deficiencies: hypovitaminosis A

Physical examination

- Hands-off examination
  - Note breathing pattern
    - Obligate nasal breathing
    - Extent of forced respiration
  - Note head position
    - Positional dyspnea in snakes
  - Note discharge from oral cavity
Physical examination

- Common abnormal findings:
  - Nasal passages: clear and free of discharge
    - Retained shed, salt concretions, trauma/scarring
  - Buccopharyngeal cavity: moist m.m
    - Abscesses, hemorrhage- petechial, ecchymotic
  - Glottis/Larynx/Trachea: clear and free of discharge
    - Discharge, edema, parasites
  - Auscultation

Diagnostic testing

- Hematology
  - Complete blood count
    - Anemia
    - Heterophilia
    - Monocytosis
  - Plasma chemistry analysis
    - Hyperglobulinemia
    - Infectious disease testing

- Fecal examination
  - Direct saline and fecal float

- Tracheal wash
  - 1-5 ml/kg BW saline
  - Cytology
  - Culture
Diagnostic testing

- Survey radiographs
  - Lateral and DV/VD
  - Chelonians- 3 views
  - AP
- Endoscopy
- Histopathology

Respiratory diseases: Infectious

- Bacterial
  - Most common: Primary?
    - Gram-negative pathogens
    - Emerging bacterial pathogens
    - Chlamydia
    - Mycoplasma
  - Clinical signs
    - Dyspnea, Discharge, Tracheitis, pneumonia
  - Diagnostic testing
    - CONFIRM Culture
    - Interpretation?
    - Histopathology
    - Molecular testing

Respiratory diseases: Infectious

- Bacterial
  - Antimicrobial selection
    - Based on sensitivity
  - Difficulty treating
    - Removal of debris
    - Nebulization
    - Intratracheal medications
  - Public health considerations
Respiratory diseases: Infectious

- Fungal
  - Becoming more common
  - Antimicrobial misuse
- Clinical signs
  - Ubiquitous organisms
    - Aspergillus, Mucor, Candida, Paecilomyces
  - Antifungal therapies
    - Itraconazole: 5-10 mg/kg PO q 24h
    - Nebulization
  - Difficult to treat
  - Granulomatous lesions
- Public health considerations

Respiratory diseases: Viral

- Increased number of diagnosis
  - Improved testing
  - Previously considered bacterial infections

Respiratory diseases: Viral

- Paramyxovirus
  - Snakes
    - High morbidity and mortalities
    - Primarily affects CNS and respiratory
    - Clinical signs: nasal and glottal discharge, severe dyspnea, death
    - Diagnosis: HI, necropsy with isolation
    - Treatment: none
Respiratory diseases: Viral

- Herpesvirus
  - Chelonians
  - Clinical signs
    - Respiratory disease
    - Diarrhea
    - CNS
  - Diagnosis
    - Histopathology
    - Culture
    - ELISA
    - PCR
  - Treatment:
    - Acyclovir?
    - Euthanasia?

Respiratory diseases: Viral

- Inclusion body disease
  - Snakes
    - Primarily boas and pythons
    - Clinical signs
    - GI
    - Respiratory
    - CNS
  - Diagnosis
    - Histopathology
    - Cytology
  - Treatment: None

Respiratory diseases: Parasitic

- Pentastomids
  - Primitive arthropods
    - Armillifer, Sebekia, Porocephalus
  - Clinical signs:
    - Asymptomatic, dyspnea, pneumonia
  - Treatment:
    - Ivermectin
    - 0.2 mg/kg
    - Embolism?
    - Endoscopic removal
  - Zoonotic potential
Respiratory diseases: Parasitic

- Digenetic trematodes
  - Location
    - Lungs, trachea, glottis
  - Life cycle
    - Require intermediate host
    - Self-limiting
  - Diagnosis
    - Fecal or direct exam
  - Treatment
    - Praziquantel

- Nematodes
  - Entomelas, Rhabdias, Strongyloides
  - Direct or percutaneous infection
  - Diagnosis
    - Fecal exam
  - Treatment
    - Animal
    - Environment

Respiratory diseases: Neoplastic

- Neoplasia
  - More common as animals live longer
  - Requires diagnostic testing
    - Hematology, radiographs, endoscopy/surgery, biopsy
  - Common respiratory neoplasias
    - Chondrosarcoma
      - Ball python
    - Fibromas and fibrosarcomas
    - Chelonia
Veterinarians working with exotic pet patients are routinely presented with challenging cases. The purpose of this presentation is to provide attendees with a series of actual exotic pet cases in an interactive forum and discuss different diagnostic and treatment approaches.

A thorough physical examination should be performed on every exotic pet patient. If the animal presents in respiratory distress, the physical examination should be postponed until the animal is stabilized. Placing the animal into an oxygen chamber or delivering oxygen via a facemask or endotracheal tube should be done to reduce the likelihood of hypoxia in the animal. The physical examination can be used to develop an initial prognosis regarding the case. Veterinarians must be realistic when considering the potential outcome for a case.

Diagnostic tests can be invaluable in confirming a specific etiology associated with a case. A complete blood count (CBC) can be used to evaluate the likelihood of an inflammatory response within the animal. In general, exotic pet cases presenting with white blood cell counts (WBC) > 15-20,000 cells/ml are the result of an inflammatory response. However, stress leukograms can occur in animals with WBC counts in this range too; therefore, it is imperative that a differential count be done to determine the most likely cause of a leukocytosis. With stress, heterophilia, monocytosis, lymphopenia and eosinopenia are common. In general, inflammatory leukograms are characterized by heterophilia, monocytosis, and a lymphocytosis. Inflammatory leukograms can occur as a result of an infectious disease, toxin, neoplasia, trauma, or foreign body. In many cases, veterinarians attempt to associate inflammatory leukograms with an infectious etiology, when the etiology may not be infectious. The CBC also provides information regarding the erythron. If anemia is suspected, then attempts to classify the anemia (regenerative, non-regenerative) should be made.

Exotic pet patients are stoic animals that can mask their illness. Serum/plasma biochemistry analysis can be used to evaluate physiologic disturbances in these animals. Veterinarians may find it difficult to find reference data for many of the species being presented to their facilities. Fortunately, the values for many of the biochemistries are similar to those described for domestic species. However, there are some exceptions. For example, while urea nitrogen is the primary end product of protein catabolism in mammals, uric acid is the primary end product in reptiles. Veterinarians should become familiar with the physiologic differences between vertebrate species.

Radiographs are necessary to characterize the extent of injury associated with a fracture. When evaluating a fracture, it is important to consider which bone is affected, the location of the fracture (e.g., metaphysis, epiphysis, diaphysis), type of fracture (e.g., transverse, spiral, oblique), whether the fracture is open or closed, and whether there is soft-tissue and joint involvement. Evaluating the extent of soft-tissue injury associated with a fracture is necessary to estimate the
convalescence period that will be required for the patient. A minimum of two high-quality images is required to fully evaluate an injury. Radiographs can also be used to evaluate the extent of disease associated with non-traumatic injuries too. Granulomas in reptilian species, for example, are often characterized by nodular soft tissue masses. Ultrasound imaging may also be used to assess the exotic pet patient. The author finds ultrasound especially useful for characterizing the reproductive status of animals.

Microbiological culture is an important diagnostic tool for veterinarians. Historically, veterinarians managed most infectious diseases as a primary bacterial disease. We now realize that bacterial infections, at least in some cases, are secondary opportunists that occur following viral infections. When submitting microbiological samples it is important to consider not only bacterial microbes, but fungi too. Performing a cytological examination prior to submitting a sample is strongly recommended, and may be useful in guiding a diagnostic laboratory.

The advancement of serological and molecular diagnostic assays has improved the veterinarian’s chances of making an ante-mortem diagnosis for an infectious disease. Currently, hemagglutination inhibition (HI) assays are available to characterize exposure to a variety of viral pathogens. Because these assays are subject to misclassification, other more specific assays should be pursued to characterize specific viruses. Enzyme-linked immunosorbent assays and serum neutralization assays are considered more sensitive and specific than HI assays. When using serological assays, serial tests are necessary to characterize active infections. Polymerase chain reaction-based assays enable veterinarians to characterize active infections in exotic pet patients.

Necropsy, and subsequent histopathology, is often necessary to confirm a diagnosis in a case. This is especially important in the face of an epizootic. Veterinarians should take appropriate precautions when performing a necropsy on an exotic pet patient. Because many infectious diseases can be transmitted via aerosolization, necropsy should be performed under a negative pressure hood. Veterinarians should submit samples to a pathologist that is familiar with exotic pet pathology.

Success with exotic pet cases requires a thorough and well thought out diagnostic plan. Historically, exotic pet cases were approached by performing few diagnostics and administering empirical therapeutics. By practicing the same good standard-of-care expected for domestic pets, veterinarians will find improved success with their exotic pet cases.
December 10, 2008

To Whom It May Concern:

This letter will serve as certification of attendance at the December 10, 2008 Continuing Education Seminar on Exotics.

This course has been approved for a total of six (6) hours of continuing education credit.

If you should have any questions, please contact the CVMA office at (630) 325-1231.

Respectfully submitted,

Andrew Miz, DVM                               Donald Sedlacek, DVM
Andrew Miz, DVM                               Donald Sedlacek, DVM

Co-Chairs, Continuing Education Committee

AM/dr
CVMA CONTINUING EDUCATION SURVEY

In an attempt to maintain the high quality of the CVMA Continuing Education Series, as well as being receptive to your feedback, please take a moment to complete the following survey and give it to a CE Committee Member attending the meeting or in the return survey box. You may also return via fax to Dr. Miz at (847) 673-3121 or Dr. Sedlacek at (630) 969-4565. Thank you for your continued cooperation.

Exotics

Dr. Mark Mitchell

December 10, 2008

Please rate the following: (1 for very poor and 5 for excellent)

1. HOW WOULD YOU RATE THE SPEAKER?   (1 TO 5)
   1___  2___  3___  4___  5___

   Additional Comments: _____________________________________________________________
   ______________________________________________________________________________
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2. HOW WOULD YOU RATE THE TOPIC?   (1 TO 5)
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