Preventative Health Care of Primates in Captivity

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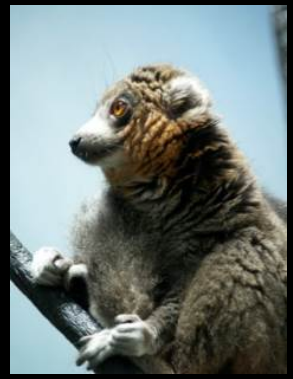
Kansas City Zoo

Introduction

- Primates are commonly kept in zoological collections, research establishments and private facilities.
  - Prone to infectious, non-infectious, nutritional and behavioral maladies.
    - Some of these are zoonotic and anthropozoonotic.
  - Preventative health care is fundamental to long term welfare of primates in captivity



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Introduction

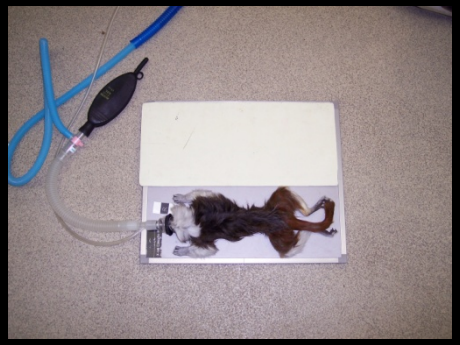
- An ideal program of preventative care includes routine exams, dental prophylaxis, appropriate diet, housing, enrichment, proper social grouping, routine vaccination, fecal exams, and screening for infectious disease.

Preventative Health Care

- Routine exams
  - Exam under anesthesia
    - Safe!
  - Physical examination
    - Ophthalmic, aural, oropharyngeal, musculoskeletal
    - Abdominal palpation
    - Body score
    - Pelage characteristics
    - Reproductive tract assessment
    - Rectal examination

Preventative Health Care

- Routine exams
  - Exam under anesthesia
  - Physical examination
  - Clinical assessment
    - CBC, serum profile
    - Viral titers
    - Ultrasound
    - Colonoscopy
    - Whole body radiographs
    - Bank sera, plasma
    - Skin biopsy
    - Urinalysis
    - ECG
    - Dentistry
    - Tuberculin testing
    - Fecal exam
    - Weight



Preventative Health Care

- Routine exams
  - Vaccinations
    - As indicated
      - » Influenza
      - » Tetanus
      - » Rabies
      - » Measles
      - » DPT/MMR/polio-great apes

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Preventative Health Care

- Routine exams
  - Contraceptive evaluation

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Preventative Health Care

- Nutrition
  - General principles
    - Majority are omnivorous
    - Commercially available pellets
      - » Balanced nutrition but minimal “variety”
    - Foregut fermentors
      - » Colobus
      - » High fiber requirement
      - » Supplement browse
      - » Avoid high fiber vegetables

Preventative Health Care

- Nutrition
  - General principles
    - Protein requirements
      - » 16% DM Old World monkeys
      - » 25% DM New World monkeys
    - Vitamin C
      - » Required in diets of all except prosimians
    - Vitamin D
      - » NWP requirement (not exposed to sunlight)- D3
      - » Callitrichids have highest requirements
      - » Vit D2 adequate for old world primates.

Preventative Health Care

- Nutrition
  - General principles
    - Vitamin D
      - » NWP requirement (not exposed to sunlight)- D3
      - » Callitrichids have highest requirements
      - » Vitamin D2 adequate for old world primates
      - » Lack of sunlight/appropriate balance of calcium and phosphorous leads to metabolic bone disease

Common!!!

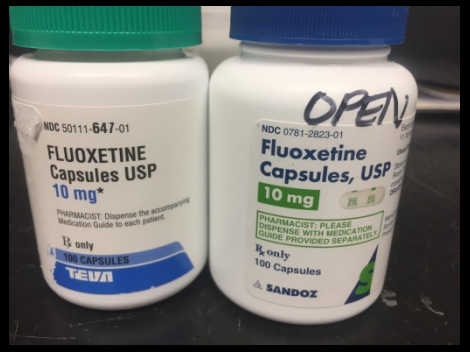
Preventative Health Care

- Behavioral problems
  - Rule-out organic causes
  - Many issues relating to stereotypic pacing/behavioral abnormalities, overgrooming, and self-mutilation may be attributed to;
    - Improper husbandry
    - Inappropriate social groupings
    - Lack of conspecific(s)
    - Lack of or inappropriate enrichment

Preventative Health Care

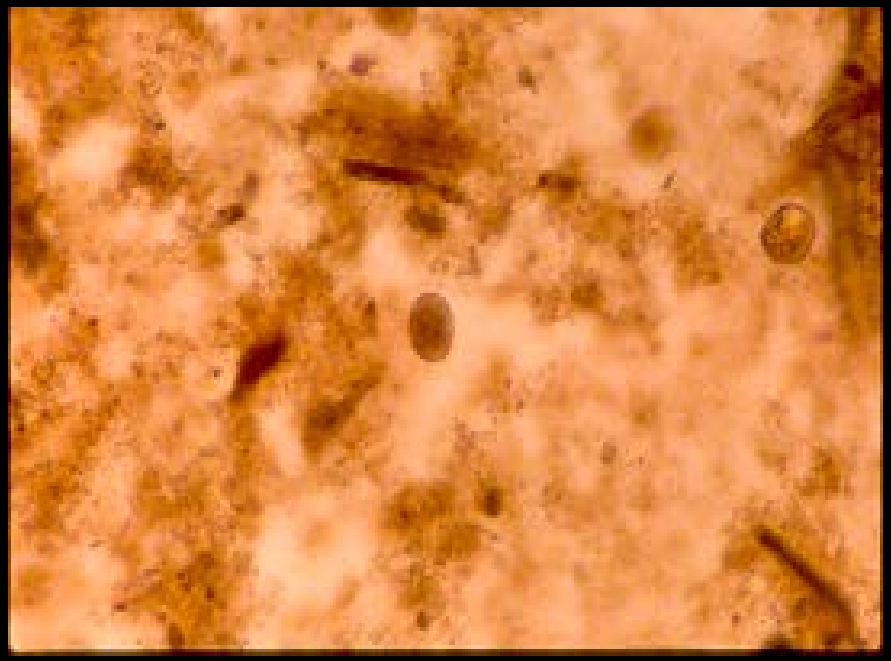
- Behavioral problems
  - Natural history of particular species should be adhered to
    - » Social groupings
    - » Nocturnal vs diurnal
    - » Foraging/diet
    - » Reproduction
    - » Appropriate housing

- Medication is seldom, if ever warranted as a default!
  - Masks underlying issue, but doesn't correct it



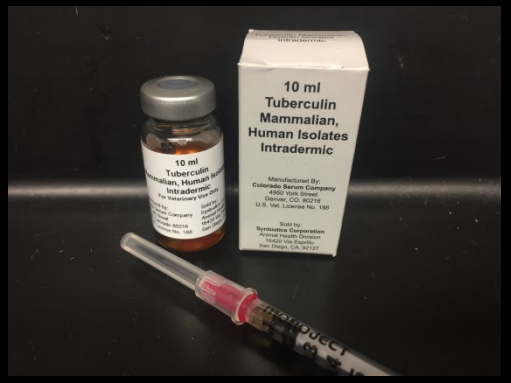
Preventative Health Care

- Parasitic diseases
  - *Acanthocephalus*
  - *Gongylonema pulchrun*
  - *Entamoeba histolytica**
  - *Balantidium coli**
  - *Giardia**
  - Nematodes



Preventative Health Care

- Bacterial diseases
  - Tuberculosis
    - *Mycobacterium bovis*
    - *Mycobacterium tuberculosis*
    - *Mycobacterium avium*
  - *Salmonella*
  - *Shigella*
  - *Campylobacter*



Preventative Health Care

– Viral diseases-screen as appropriate for species
  - RSV-great apes
  - Influenza-great apes
  - Hepatitis A, B-great apes-chimpanzee
  - Enteroviruses-most taxa
  - Adenoviruses-most taxa
  - Reoviruses-most taxa
  - Rhinoviruses-great apes
  - Papillomavirus-most taxa
  - Herpesviruses- all taxa
  - Etc. etc……..

Preventative Health Care

- Viral diseases
  - Zoonotic
    - Herpes B- FATAL!
      - Macaques
    - Lymphotropic polyomavirus
    - Simian foamy virus
    - Simian immunodeficiency virus (SIV)
    - SV40
    - Chimpanzee herpesvirus
    - Cytomegalovirus?
    - Epstein-barr?

Preventative Health Care

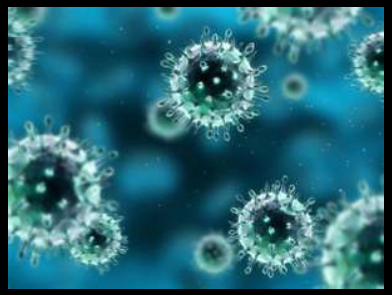
- Viral diseases
  - Zoonotic
  - Anthropozoonotic
    - Adenovirus
    - *Herpes hominis*, simplex
    - Chicken pox
    - Small pox
    - Measles
    - Mumps
    - RSV
    - Coxsackie virus
    - Rhinovirus
    - Rubella
    - Hepatitis
    - Monkeypox

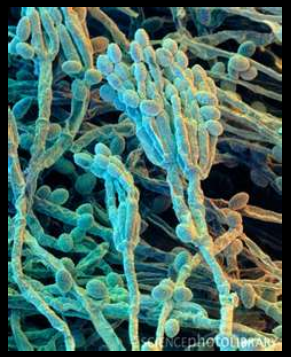
Anthropozoonoses

- A disease transmitted from people to animals

Anthropozoonoses

- Classes of diseases people can transmit to animals
  - Viruses
  - Bacteria
  - Funguses
  - Parasites





Anthropozoonoses

- Viruses
  - Influenza A (Flu)
    - Transmitted to pigs (1998)
    - Ferrets, Great Apes, Giant anteaters
  - All great apes are vaccinated on a yearly basis against influenza

Anthropozoonoses

- Viruses
  - Respiratory syncytial virus (RSV)
    - Contributed to the demise of an infant orangutan at the Kansas City Zoo
    - Most of our apes have positive titers
    - Very common in people!
  - Metapneumovirus
    - Gorillas, chimpanzees
    - Has caused death in Mountain gorillas
    - Caused demise of chimpanzees at Lincoln park zoo

Anthropozoonoses

- Viruses
  - Human Herpesvirus 1 (Herpes simplex)
    - Fatal to marmosets, cotton topped tamarins, tree shrews
    - Staff infected with cold sores should not work with these species or diet preparation
    - Transmitted by direct contact, aerosolization
    - No vaccine available for people or animals
  - Coxsackie B virus (enterovirus)
    - Have had one chimpanzee and two orangutans with documented coxsackie virus in cardiac tissue and one chimpanzee clinical illness
    - All primates are tested for enteroviruses

Anthropozoonoses

- Bacteria
  - *Staphylococcus aureus (Staph)*
    - Normal flora of the skin (hands, hair, and nares) of people
    - The resistant strain is termed MRSA (**Methicillin Resistant *Staphylococcus aureus***)
      - » At some point has been transmitted from staff to several chimpanzees
      - » Female Red capped mangabey died of a MRSA encephalitis transmitted from the bite of an infected male
      - » MRSA infected African elephant calf at San Diego WAP

Anthropozoonoses

- Bacteria
  - *Staphylococcus warneri (Staph infection)*
    - Normal flora of the skin (hands, hair, and nares) of people and animals
    - The resistant strain is termed resistant “Staph” (Resistant ***Staphylococcus***)
      - » At some point may have been transmitted from staff to an orangutan at the zoo
  - Other resistant bacteria
    - *Staphylococcus sp*
    - *Enterococcus sp*

Anthropozoonoses

- Bacteria
  - *Mycobacteria tuberculosis (TB)*
    - People to Asian elephants (India, Nepal)
    - Paucity of information regarding transmission to primates
    - ?????

Anthropozoonoses

- Bacteria
  - *Escherichia coli*
    - Intestinal tract-fecal contamination
    - Can carry resistance factors
    - Chimpanzees
  - *Salmonella typhimurium*
    - Intestinal tract-fecal contamination
    - "Typhoid Mary"
      - » Cook
      - » Infected 53 people, 3 died
    - Tony Labella
      - » Cook
      - » Infected 100 people, 5 died

Anthropozoonoses

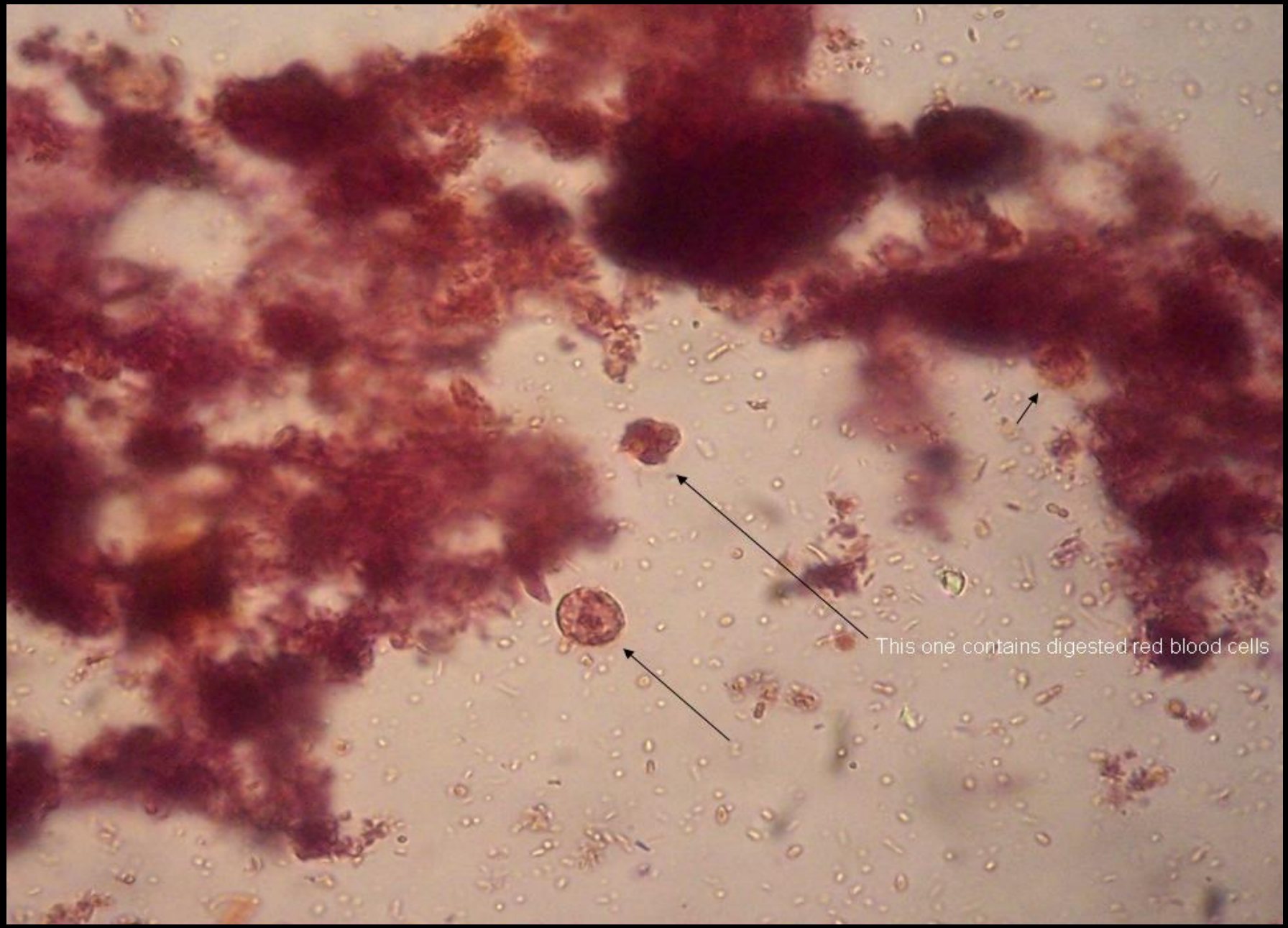
- Funguses
  - *Microsporum audouinii*
    - Dog, guinea pig, monkey

Anthropozoonoses

- Parasites
  - *Giardia lamblia*
    - Transmitted to Mountain gorillas
    - Transmitted to chimpanzees
    - Fecal-oral route
  - Strongyles
    - Hookworms (Ancylostoma)
    - Transmitted to gorillas, chimpanzees
    - Fecal-oral or direct skin penetration
  - Cryptosporidium
    - Fecal-oral route
    - No treatment
    - Controversial contagion

Anthropozoonoses

- Parasites
  - *Entamoeba histolytica*
    - Humans are primary hosts
    - Transmits through fecal-oral route
    - Can penetrate intestinal tract
      - » Travels through bloodstream
      - » Causes hepatic abscesses
    - Have had clinical illness in a gorilla at the Kansas City zoo
    - Has infected chimpanzees at the Kansas City zoo
    - Has caused demise of colobus monkeys at the Kansas City zoo
    - Has infected staff at the Kansas City zoo


This one contains digested red blood cells

Anthropozoonoses

- Preventing transmission of pathogens from us to our animals (and from them!).
  - Do not directly touch animals without gloves-especially primates
  - Routine surveillance (TB tests, fecal exams)
  - Wear masks when in close proximity to primates (i.e. restraint, netting, cleaning, etc.)
  - Practice proper hygiene principles
    - Do not work with susceptible animals or food preparation when you are ill
    - Wash hands!
    - Shower/bathe regularly
    - Routine vaccination (school vaccines)
    - Use footbaths!

Conclusion

- Preventative health care programs should be tailored on a risk/benefit basis, including manpower and costs.
- Preventative health care is integral to the long term benefit of captive primates
- Basic hygiene and an understanding of maladies affecting primates is necessary to prevent zoonoses and anthropozoonoses

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The end