



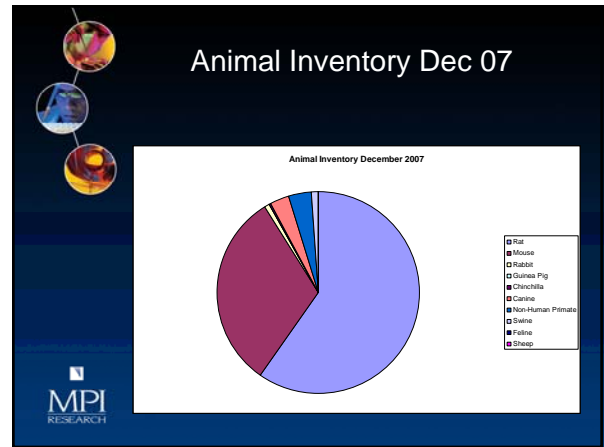
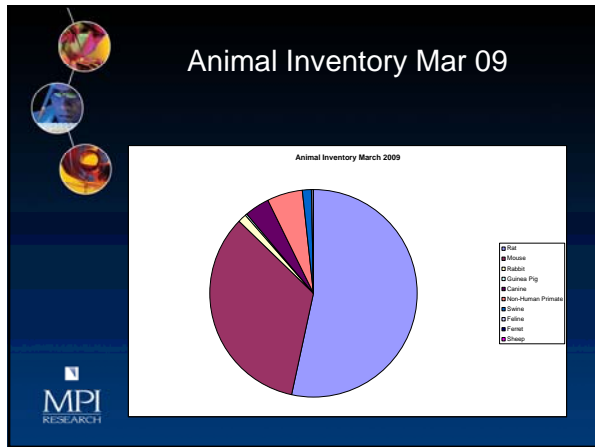

RATS!

Iris D. Bolton, DVM, DACLAM
Director – Clinical Medicine







About me...

- Navy Band
- Purdue University
- UC Davis (CNPRC)
- WNPRC
- Pfizer
- MPI Research



Genus and species


- *Rattus norvegicus*
- What anatomical structures are they missing?
 - Gall Bladder
 - Tonsils
 - Foramen of Magendie

What kind of rat is this?



- Long Evans
- Inbred or Outbred?
 - outbred
- What hooded rat has the mutation that causes renal cell carcinoma?
 - Eker (TSC2 mutant Long Evans)




Eker Rat

- Mutation in the TSC2 gene (Tuberous Sclerosis Complex)
- 100% develop renal tumors by 12 months
- Model for von Hippel-Lindau disease



What kind of rat is this?

- Lister (UK, outbred)
 - Docile
 - Good breeding performance
 - Audiogenic seizures
- Noble (Inbred not isogenic)
 - Prostatic carcinoma model
 - Oncology




Coat color

- Albino
- Black-hooded
- Brown-hooded
- Fawn-hooded
- Non-agouti brown
- Rats were domesticated for show



Which of the following dietary manipulations prevented hormone-refractory prostate cancer in Lobund-Wistar rats?

- Moderate caloric restriction
- Dietary supplementation with soy protein isolate with high isoflavones
- Dietary supplementation with casein protein isolate
- Dietary manipulations do not alter prostate cancer development or progression
- Dietary 4-hydroxyphenylretinamide


What's a Lobund-Wistar rat?!


- Colony of Wistar rats at the Lobund Laboratory - University of Notre Dame that develop prostatic carcinoma



What rats serve as models for prostatic carcinoma?

- Wistar Unilever
- Fischer (F344)
- Noble
- ACI
- Lobund-Wistar (LW)







How am I ever going to pass this test?!


What hooded rat is agouti with a white belly and feet?

- ACI
- What abnormality does this rat exhibit?

Genitourinary abnormalities







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White/Albino Rats and their Abnormalities...

- What albino rat is a model for Type 1 Diabetes?
 - BB
 - Outbred Wistar rats at Bio-Breeding Labs
 - Abrupt onset of diabetes 60-120d age
 - Lymphocytic insulinitis, destruction of pancreatic beta cells
 - Males > Females



White/Albino Rats and their Abnormalities...

- What abnormality is exhibited by the SHR rat?
 - Spontaneously Hypertensive Rat
 - Spontaneous hypertension seen at 7-15 weeks

Which rat strain/stock is an accepted genetic control animal for the SHR strain used in hypertension studies?

- BB
- LEW
- WKY
- SHR/SP
- DIO





Which rat strain/stock is an accepted genetic control animal for the SHR strain used in hypertension studies?

- BB
- LEW
- **WKY (Wistar Kyoto)**
- SHR/SP
- DIO



References:

- Belanger et al. 2003. Effect of hypertension on reproductive organ weights in various strains of rats. Contemp Top Lab Anim Sci 42(6):39-41.
- Fox JG, Anderson LC, Loew FM, Quimby FW, eds. 2002. *Laboratory Animal Medicine*, 2nd edition. Academic Press, San Diego, CA, Chapter 4 - Biology and Diseases of Rats, p. 122.
- Charles River Laboratories Research Models and Services 2006 US Catalog, page 10.



White/Albino Rats and Their Abnormalities...

- What rat was developed from Sprague-Dawley stock selected for sodium chloride-induced hypertension?
 - Dahl Salt Sensitive (DSS)
- Control?
 - Dahl Salt Resistant (DSR)



White/Albino Rats and Their Abnormalities...

- What rat is the model for Crigler-Najjar Syndrome?
 - GUNN rat
- What is the abnormality?
 - Hyperbilirubinemia (unconjugated)
 - Jaundice
 - Lacks UDP Glucuronyl Transferase in liver






White/Albino Rats and Their Abnormalities...

- What abnormalities are exhibited by the WAG/Rij rat?
 - Retinal Degeneration
 - Retinitis Pigmentosa
 - Absence Epilepsy
- From which albino rat is this strain developed?
 - Wistar

White/Albino Rats and Their Abnormalities...

- What rat strain exhibits autoimmune thyroiditis?
 - BUF
- Autoimmune thyroiditis:
 - Spontaneous
 - After ingestion of 3-methylcolanthrene
 - 100% after neonatal thymectomy


White/Albino Rats and Their Abnormalities...

- What rat is a model for Hirschsprungs Disease?
 - Spotting Lethal Mutant
 - Aganglionic Megacolon
 - Recessive sl/sl (Chromosome 15)
 - White coat with pigmented spot on head




The Zucker rat is a model for which of the following diseases or conditions?

- Obesity
- Type I diabetes
- Diabetes insipidus
- Prostate adenocarcinoma
- Jaundice




The Zucker rat is a model for which of the following diseases or conditions?

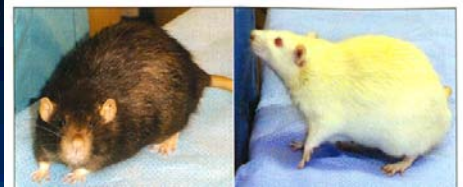

- Obesity
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Reference:

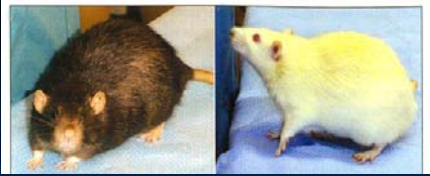
- Fox JG, Anderson LC, Loew FM, Quimby FW, eds. 2002. *Laboratory Animal Medicine*, 2nd edition. Academic Press: San Diego, CA. Chapter 4 – Biology and Diseases of Rats, p. 122 (Table I).




What is the FBN rat ?

What is the FBN rat ?





F1 hybrid of F344 female and Brown Norway male (F1)




What type of rat is this?


- Brown Norway (BN)
- What type of renal disease is exhibited by BN rats?
 - Brown Norway Hydronephrosis
- What type of urinary tract disease does BN/Rij rats develop?
 - Spontaneous Ureter Tumors


What type of rat is this?




- Black Rat
- Genus and Species?
 - *Rattus rattus*






What type of rat is this?



- Nude Rat
- What is the gene symbol for the nude rat?
 - *nu/nu* (Rowett Hooded)
 - *nu^{nz}* (Albino New Zealand)
- *nu/nu* exhibit cyclic hair growth
- T-cell deficient



What condition is depicted in these slides?

- Polyarteritis Nodosa (Periarteritis Nodosa, Mesenteric)




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Other age-related lesions:

- Chronic progressive nephropathy
- Radiculoneuropathy
- Myocardial degeneration
- Urolithiasis
- Cholangiofibrosis
- Pulmonary Foam Cells

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What condition is depicted?

- Urolithiasis - calculi in the bladder and kidney

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What condition is depicted in this slide?

- Renal Aplasia
 - What rat strains exhibit renal abnormalities?
 - ACI – often lacks right kidney
 - BN – hydronephrosis
 - BN/BiRij – bladder and ureter tumors

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Name the tissue and give the gross description...




- Tissue
 - Brain
- Gross description
 - Large red/brown mass
 - Ventral midbrain region

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What is the most likely tumor?






- Pituitary Chromophobe Adenoma

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Name the tissue and give the gross description...

- Tissue - Kidney
- Gross -
 - Enlarged kidneys
 - Rough or pitted surface
 - Numerous small yellow foci



Give the histological description...

- Glomeruli – thickened basement membranes, eosinophilic deposits
- Tubules – proteinaceous casts
- Interstitium – lymphocytic infiltrate

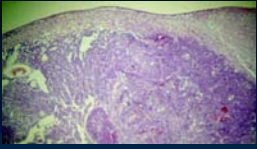
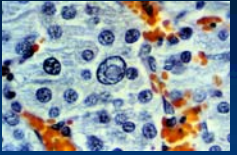

Name the abnormal tissue and describe...

- Adrenal
- Left adrenal enlarged
- Yellow in color
- May be some areas of hemorrhage



What type of adrenal tumor is this?

- Pheochromocytoma
 - Arises from adrenal medulla
 - May produce catecholamines

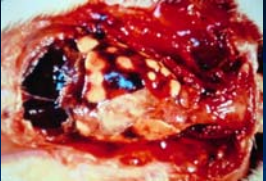

Name the tissue and describe...

- Lung
- Multifocal to coalescing white to yellow nodules with congestion and hyperemia


Differential Diagnosis?

- Mycoplasma pulmonis
- CAR bacillus
- Corynebacterium kutscheri

Name the tissue and describe...


- Lung
- Large areas of white-yellow material throughout the lungs (abscesses, bronchiectasis) with consolidation and atelectasis



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Differential Diagnosis?

- Mycoplasma pulmonis
- CAR bacillus
- Corynebacterium kutscheri



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What condition is depicted in this slide?



- Chronic dermatitis
- Acariasis

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What is this mite?



- Tropical Rat Mite
- Genus and Species?
 - Ornithonyssus bacoti
- What diseases can be carried by this mite?
 - Murine Typhus
 - Rickettsial Diseases
 - Q Fever
 - Plague


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Other Rat Mites...

- Genus and Species of the Spiny Rat Mite?
 - Laelaps echidninus
- What is this mite a vector for?
 - Hepatozoon muris
- Genus and Species for Ear Mange Mite?
 - Notoedres muris

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What condition is depicted?





- Porphyrin staining (chromodacryorrhea)

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What condition is depicted?

- Ringtail
- Lesion of young animals
- Annular constrictions +/- sloughing of tail
- High temperature and low humidity (<40%?)

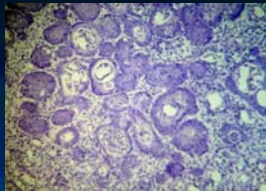

What condition is depicted?

- Zymbal's Gland Tumor
 - Usually present as an ulcerated mass within or just below the external ear canal



Name the tissue and describe...

- Tissue
 - Glandular tissue (nonspecific)
- Histological description
 - Inflammatory cell infiltrate
 - Interstitial edema
 - Duct necrosis
 - Squamous metaplasia

Diagnosis?

- Sialodacryoadenitis virus (SDAV)
- Coronavirus
- Affects serous or mixed glands

What is going on here?


- Silver stain
- Bacteria densely clustered at ciliated surface of respiratory epithelium
- Organisms
 - Gram negative
 - Motile
 - Non-spore forming
 - Gliding bacteria



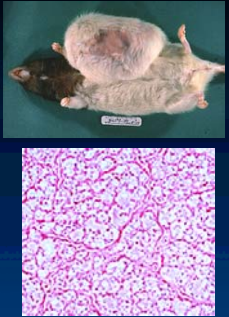


Diagnosis?

- CAR Bacillus
- Ways to diagnose:
 - Histo w/ silver stains
 - Serology (ELISA)
 - Culture (no growth on cell free media)



What is going on here?



- Benign fibroadenoma (most common tumor of rats)
- Can occur anywhere there is mammary tissue
- Hyperplastic fibrous and glandular tissue

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What is going on here?



- Malocclusion

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Rat bite fever can be caused by Streptobacillus moniliformis and what other organism?

- *Bartonella henselae*
- *Spirillum minus*
- *Staphylococcus aureus*
- *Brucella rattus*
- *Pasturella multocida*

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Rat bite fever can be caused by Streptobacillus moniliformis and what other organism?

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- *Pasturella multocida*

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What is going on here?

- Abdominal swelling
- Ddx:
 - Ascites
 - Organomegaly
 - Neoplasia
 - Adynamic Ileus (megacolon)
- What are possible causes of megacolon?
 - Tyzzer's Disease
 - Chloral hydrate



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Chloral Hydrate

- Hypnotic
- Short acting light anesthesia
- Poor analgesia
- Irritating to peritoneum
- Causes adynamic ileus in rats when given IP

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