RATS!

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About me…

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

Animal Inventory Mar 09

Genus and species

- *Rattus norvegicus*

What anatomical structures are they missing?

- Gall Bladder
- Tonsils
- Foramen of Magendie

Animal Inventory Dec 07

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?
A. Moderate caloric restriction
B. Dietary supplementation with soy protein isolate with high isoflavones
C. Dietary supplementation with casein protein isolate
D. Dietary manipulations do not alter prostate cancer development or progression
E. 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?!

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 insulitis, destruction of pancreatic beta cells
  - Males > Females

- What abnormality does this rat exhibit?
  - Genitourinary abnormalities

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

- ACI

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 (Wistar Kyoto)
- SHR/SP
- DIO

References:
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 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-methylcholanthrene
  – 100% after neonatal thymectomy

White/Albino Rats and Their Abnormalities…

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

White/Albino Rats and Their Abnormalities…

• The Zucker rat is a model for which of the following diseases or conditions?
  – Obesity
  – Type I diabetes
  – Diabetes insipidus
  – Prostate adenocarcinoma
  – Jaundice
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- Obesity
- Type I diabetes
- Diabetes insipidus
- Prostate adenocarcinoma
- Jaundice

Reference:

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?
  - mu/mu (Rowett Hooded)
  - mu+/-(Albino New Zealand)
- mu/mu exhibit cyclic hair growth
- T-cell deficient
What condition is depicted in these slides?

• Polyarteritis Nodosa (Periarteritis Nodosa, Mesenteric)

Other age-related lesions:

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

What condition is depicted?

• Urolithiasis - calculi in the bladder and kidney

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

Name the tissue and give the gross description…

• Tissue
  – Brain
• Gross description
  – Large redbrown mass
  – Ventral midbrain region

What is the most likely tumor?

• Pituitary Chromophobe Adenoma
**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

Differential Diagnosis?

- Mycoplasma pulmonis
- CAR bacillus
- Corynebacterium kutscheri

What condition is depicted in this slide?

- Chronic dermatitis
- Acariasis

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

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

What condition is depicted?

- Porphyrin staining (chromodacryorrhea)
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

What is going on here?

- Malocclusion

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

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

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

Chloral Hydrate

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