

2011 Topics in Laboratory Animal Medicine

Workshop in Laboratory Animal Medicine
May 20, 2011

Laboratory Rabbit

• Taxonomy

- Kingdom..... Animalia
- Phylum..... Chordata
- Class..... Mammalia
- Order..... Lagomorpha
- Family..... Leporidae
- Genera (*European rabbit*).... *Oryctolagus*
- Genera (*Hares*)..... *Lepus*
- Genera (*Cottontail rabbit*)... *Sylvilagus*

Laboratory Rabbit

Richard W. Young, D.V.M., DACLAM
Wake Forest School of Medicine

Laboratory Rabbit

- Which describes a rabbit and a hare.
 - A describes a rabbit and B describes a hare

A.

- ☐ born naked, blind, helpless, in a fur-lined nest.
- ☐ "Belgian hare"
- ☐ longer palate
- ☐ more than 50 well established breeds

B.

- ☐ born fully haired, open eyed, and in the open, not in a nest
- ☐ "Jack rabbit"

Disclaimer

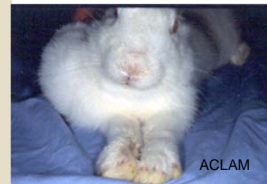
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- All information is deemed reliable and correct
 - No warranty for accuracy
- No information presented is known to be specifically included in the ACLAM Board examinations

- What is the etiologic diagnosis?

❖ Pasteurellosis

- What is the etiologic agent?

❖ *Pasteurella multocida*



Pasteurella multocida

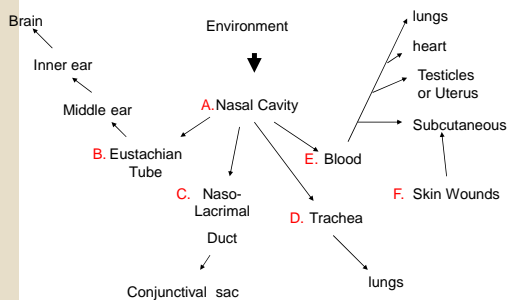
- Gram-negative, nonmotile, coccobacillus
- Five capsular serotypes
 - A, B, D, E, and F
- Seventeen somatic serotypes
- Most common
 - Capsular type A or D and somatic types 3 or 12

Pasteurellosis

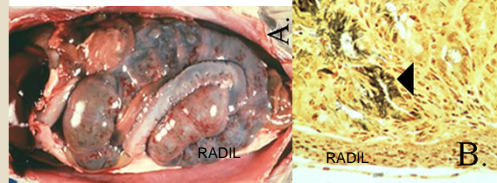
- Control
 - Purchase *Pasteurella*-free rabbits
 - Isolate suspect rabbit
 - Biosecurity
 - Personal Protective Equipment
 - Laminar flow housing
- Treatment
 - Enrofloxacin at 5 mg/kg BID given IM, SC for 14 days
 - Tilmicosin at 25 mg/kg given SC once
 - A macrolide antibiotic
 - May need to be repeated in 3 days (McKay et al, 1996)

Pasteurellosis

❖ Fill in the route of infection



- Name the disease.
 - ❖ Tyzzer's Disease
- What is the etiologic agent?
 - ❖ *Clostridium piliforme*
- What are the major organs effected?
 - ❖ gut, liver; and heart

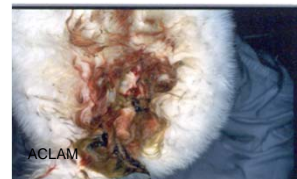


Pasteurellosis

- Name the sign.
 - Torticollis (head tilt)
- What is the pathogenesis?
 - Otitis media progressing to otitis interna or meningoencephalitis



- This rabbit was found dead with no prior signs of illness. What is most likely etiologic diagnosis?
 - ❖ Clostridial enterotoxemia
- What is the most common etiologic agent?
 - ❖ *Clostridium spiroforme*
- Name 4 predisposing factors.
 - ❖ high grain diet (starch)
 - ❖ low fiber diet
 - ❖ restrict diet during pregnancy then *ad libitum* at kindling
 - ❖ stress



- Name the disease?
 - ❖ Muroid Enteropathy
- What is the etiology?
 - ❖ Unknown

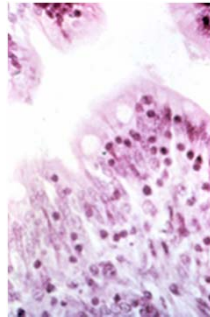


Lawsonia intracellularis

- *L. intracellularis*
 - Curved, Gram-negative, obligate intracellular bacterium
 - Weanlings are most commonly affected
 - Characterized by diarrhea, depression, and dehydration
 - Resolves within 1 or 2 weeks
 - Rarely causes death
- Gross pathology
 - Thickening and corrugation of the ileum
 - watery cecal content
- Histopathology
 - Intestinal mucosa is thickened, crowded, elongated, and branching crypts

Mucoid Enteropathy (ME):

- Synonyms : bloat, mucoid diarrhea, scours, "enteritis", and "mucoid enteritis".
- Both enteritis and mucoid enteritis are incorrect terms based on the pathology of the lesions in which no intestinal inflammation is seen.



- What is the etiologic diagnosis?
 - ❖ Treponematosis or Venereal Spirochetosis
- What is the etiologic agent?
 - ❖ *Treponema parvulus cuniculi*
- What is the common name for the disease?
 - ❖ Rabbit syphilis

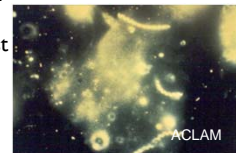


- Name the disease.
 - ❖ Proliferative Enteropathy
- What is the etiologic agent?
 - ❖ *Lawsonia intracellularis*

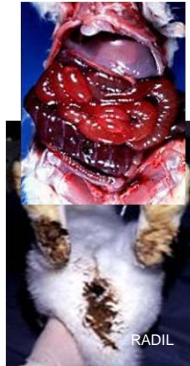


Treponematosis

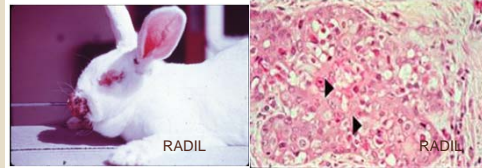
- What test is depicted in this picture?
 - ❖ Darkfield Microscopy
- What other tests might be used to diagnosis this agent?
 - ❖ Microhemagglutination Test
 - ❖ Fluorescent Treponemal Antibody-Absorption Test
 - ❖ Fluorescent Monoclonal Antibody Test
 - ❖ Rapid Plasma Reagin Test
 - ❖ Venereal Disease Research Laboratory (VDRL) Slide Test
 - ❖ VDRL ELISA
 - ❖ Wassermann Test (CF)



- What is the etiologic diagnosis?
 - Colibacillosis
- What is the etiologic agent?
 - *Escherichia coli*
- What age of rabbit is most effected?
 - an important cause of diarrhea and death in 5-10 week old rabbits with mortality ranges from 20-100%.



- What is the etiologic agent?
 - Myxoma virus
- This virus belongs to what family of viruses?
 - Poxviridae (Genus: *Leporipoxvirus*)
- What are the arrowheads indicating?
 - intracytoplasmic inclusions in the epidermis



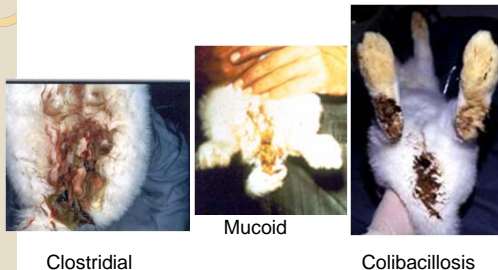
Escherichia coli

- Important serotypes in rabbits
 - O15:H
 - previously know as RDEC-1 (rabbit diarrhea *E. coli*)
 - Highly virulent strain affecting weanling rabbits
 - O103
 - Express *eae* gene and pathogenic to rabbits
 - *eae* gene encodes intimin required for "attaching and effacing" lesions
 - O109:H2, O103:H2, O15:H, O128, and O132

- Name the disease?
 - Viral Hemorrhagic Disease of Rabbits (VHDR) or Rabbit Hemorrhagic Disease (RHD)
- What type of virus is the etiologic agent?
 - Calicivirus (Genus *Lagovirus*)



Enteric Diseases



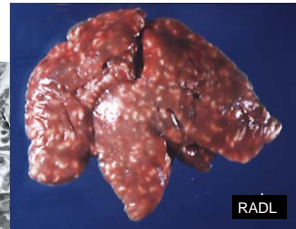
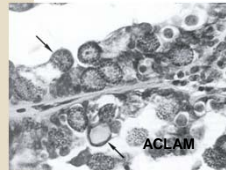
Rabbit Hemorrhagic Disease

- First reported in China in 1984 and spread through Asia and Europe
- The first outbreak in the USA occurred in 2000
 - Depopulation has eradicated the disease in the US
 - Virus can be carried of fomites and transmitted by respiratory and intestinal secretions
- Clinical signs
 - Lethargy, anorexia, and fever
 - Incubation period can be 1-2 days with sudden death
- Pathology
 - Periportal hepatic necrosis
 - DIC with deep venous thrombosis

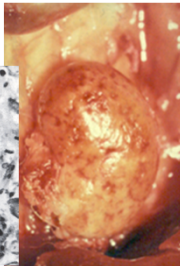
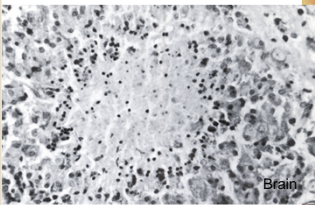
- What is the etiologic diagnosis?
 - Dermatophytosis
- What is the most common dermatophyte seen in rabbits?
 - *Trichophyton mentagrophytes*



- What is the etiologic diagnosis?
 - Hepatic coccidiosis
- What is the etiologic agent?
 - *Eimeria stiedae*



- What is the etiologic diagnosis?
 - Encephalitozoonosis
- What is the etiologic agent?
 - *Encephalitozoon cuniculi*



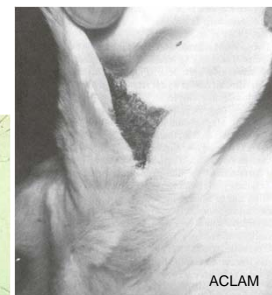
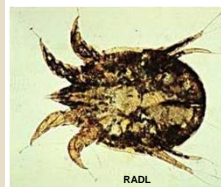
- What is the Genus and species for #1, #2, and #3?
 - #1 *Eimeria magna*
 - #2 *Eimeria perforans*
 - #3 *Eimeria stiedae*
- What other rabbit coccidia species are not pictured?
 - *E. iridis*
 - *E. media*



Encephalitozoon cuniculi

- What stains differentiate *E. cuniculi* from *Toxoplasma*?
 - Giemsa, Gram, and Goodpasture
 - remember "3 G's for E"
- What are the staining characteristics of *E. cuniculi* and *Toxoplasma*?
 - *E. cuniculi* stains poorly with H&E and well with Gram stain (Gram positive)
 - *Toxoplasma* stains well with H&E and poorly with Gram stains (Gram nothing)

- What is the etiologic diagnosis?
 - Acariasis
- Name the etiologic agent.
 - *Psoroptes cuniculi*



- What is the Genus and species?
 - *Cheyletiella parasitovorax*
- Mite or louse?
 - mite
- Burrowing or non-burrowing?
 - Non-burrowing
- What is the distinguishing feature?
 - large curved claws



- What is the morphologic diagnosis?
 - Ulcerative pododermatitis
- Name 3 predisposing factors.
 - poor sanitation
 - wire bottom cages
 - obese rabbits



GASTRIC TRICHOBEZOARS

- Provide 3 predisposing factors.
 - abnormal grooming habits due to boredom.
 - lack of sufficient roughage, minerals, or protein in the diet
 - Inability to vomit and a small pyloric lumen.



- What is the diagnosis?
 - Traumatic Vertebral Fracture
- What is the most common fracture location?
 - generally L7 or its caudal articular processes

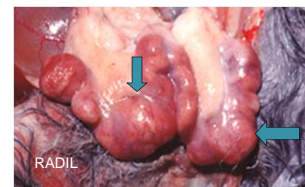


GASTRIC TRICHOBEZOARS

- What two fruit supplements provide fur digesting proteases?
 - Pineapple
 - Papaya
- Name the proteases for each fruit.
 - **Bromelin**
 - pineapple
 - **Papain**
 - papaya



- What is the diagnosis?
 - Uterine adenocarcinoma
- How common is this tumor?
 - the most common neoplasm of rabbits ≥ 5 yrs with $\geq 50\%$ prevalence



- What is the second most common rabbit neoplasm?
 - Lymphosarcoma
- What is the tetrad of necropsy lesions?
 - enlarged kidneys, light tan in color with irregular lumpy surface, and thickened cortex but normal medulla
 - hepatomegaly
 - splenomegaly
 - lymphadenopathy



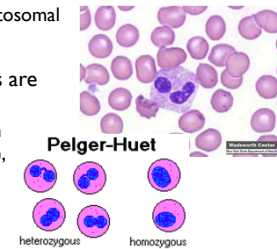
- Name the condition?
 - Femoral luxation (Splay Leg)



- What is the condition?
 - Malocclusion
- What is morphologic cause and mode of inheritance?
 - mandibular prognathism
 - an autosomal recessive trait (mp/mp) with incomplete penetrance



- Name the condition?
 - Pelger-Huet anomaly
- What is the mode of inheritance?
 - Partial dominant autosomal
 - Pg/pg = pelger
 - Pg/Pg = super pelger
- What other animals are effected?
 - Also present in man (autosomal dominant), mouse, dog



- What is the diagnosis?
 - Buphthalmia
- What is the mode of inheritance?
 - autosomal recessive gene (bu/bu) with incomplete penetrance



Pelger-Huet Anomaly

- First described in rabbits in 1958
- Pelgers
 - Heterozygotes (Pg/pg)
 - Neutrophils have reduced number of nuclear lobes
- Super Pelgers
 - Homozygotes (Pg/Pg)
 - Leukocytes have round, hyperchromatic nuclei
 - Possible fetal deaths lead to reduced births (18%) and early deaths of neonates soon after birth
 - Chondrodystrophic shortening of long bones, particularly ribs, lead to asphyxiation of neonates

- What is the etiologic agent of enterotoxemia in rabbits?

- a. *Clostridium difficile*
- b. *Clostridium spiroforme*
- c. *Clostridium perfringens*
- d. *Clostridium cocleatum*

b. *Clostridium spiroforme*

Reference: *The Biology of the Laboratory Rabbit*, Manning, P.J. 1994. Academic Press, Inc. New York. Page 193-195

- Which of the following causes a severe and massive intravascular coagulopathy in rabbits?

- a. Myxoma virus
- b. Pleural effusion disease/infectious cardiomyopathy virus
- c. Rabbit pox
- d. Rabbit hemorrhagic disease virus

d. Rabbit hemorrhagic disease virus

Reference: *The Biology of the Laboratory Rabbit*, Manning, P.J. 1994. Academic Press, Inc. New York. Page 193-195

- What is the recommended (The Guide 1996) or required (AVA) height for rabbit cages?

- a. 12 inches
- b. 13 inches
- c. 14 inches
- d. 15 inches

c. 14 inches

- Ammonium magnesium phosphate and _____ crystals are the major causes of turbidity in rabbit urine.

- a. biurate
- b. calcium oxalate monohydrate
- c. calcium oxalate dihydrate
- d. calcium carbonate monohydrate

d. calcium carbonate monohydrate

Reference: *Laboratory Animal Medicine*, 2nd Edition Fox, et al. 2002. Academic Press, Inc. London. pp. 333

- Urine is a source of allergens from which of the following species?

- a. mouse, rat, rabbit
- b. mouse, rat, Guinea pig
- c. Mouse, dog, horse
- d. Mouse, rabbit

b. mouse, rat, Guinea pig

Reference: *Occupational Health and Safety in the Care and Use of Research Animals*. 1997. NRC, National Academy Press, Washington, D.C. Pages 54-59

- Choose the correct statement regarding Cottontail Rabbit (Shope) papillomavirus:

- a. Neoplastic transformation only occurs in epidermis-bearing hair follicles.
- b. Papillomatosis occurs most frequently as a natural disease of the wild hare in the Eastern United States.
- c. Transmission of the virus may occur by vectors such as the flea.
- d. Characteristic skin tumors may occur anywhere on the body including the oral cavity.

a. Neoplastic transformation only occurs in epidermis-bearing hair follicles.

Reference: *The Biology of the Laboratory Rabbit*, Manning, P.J. 1994. Academic Press, Inc. New York. Page 185-186

- When transferring rabbit kits to a foster dam one should select which of the following management strategies?

- Add younger kits to an older litter
- Add older kits to a younger litter
- Only litters of the same age can be co-mingled with success
- Foster rearing is highly unreliable, with only a 15-20% success rate

b. Add older kits to a younger litter

Reference: *The Biology of the Laboratory Rabbit*, Manning, P.J. 1994. Academic Press, Inc. New York. Page 41

- What is the genus of this rabbit parasite?

- Obeliscoides*
- Trichostrongylus*
- Nematodirus*
- Passalurus*
- Trichuris*



d. *Passalurus*

Reference: *Laboratory Animal Medicine*, 2nd Edition Fox, et al. 2002. Academic Press, Inc. London. pp. 350

- Rabbits have four types of papillae on their tongues. These include _____.

- Stellate, vallate, foliate, fungiform
- Vallate, foliate, fungiform, filiform
- Stellate, fungiform, filiform, fusiform
- Fungiform, fusiform, vallate, cuniform

b. Vallate, foliate, fungiform, filiform

Reference: *The Biology of the Laboratory Rabbit*, Manning, P.J. 1994. Academic Press, Inc. New York. Page 52

- Give the genus of the most likely etiologic agent of the condition seen in rabbits?

- Bordetella*
- Pasteurella*
- Streptococcus*
- Klebsiella*
- Staphylococcus*



b. *Pasteurella*

- Select the correct statement concerning the rabbit urogenital system.

- Rabbit renal tubules cannot be separated with the basement membrane intact.
- In the rabbit most of the glomeruli touch the renal surface.
- The number of glomeruli in the rabbit kidney increases after birth.
- Unlike humans, rabbits have a complex renal medulla which accounts for their high urine-concentrating ability.

c. The number of glomeruli in the rabbit kidney increases after birth.

Reference: *The Biology of the Laboratory Rabbit*, Manning, P.J. 1994. Academic Press, Inc. New York. Page 54

- According to USDA Standards, a 5.0 kg rabbit should be housed in a primary enclosure with a minimum floor space of what?

- 3.0 square feet
- 4.0 square feet
- 4.3 square feet
- 5.0 square feet
- 6.0 square feet

b. 4.0 square feet

Reference: 9 CFR, Part 3, Subpart C, Section 3.53

- According to USDA Standards for the rabbit, which of the following statements about indoor housing is not correct?

- Heating is not required for indoor housing.
- Auxiliary ventilation shall be provided when the ambient temperature is 72°F or higher.
- Adequate ventilation shall be provided at all times.
- Interior building surfaces shall be constructed and maintained so that they are substantially impervious to moisture and may be readily sanitized.

b. Auxiliary ventilation shall be provided when the ambient temperature is 72°F or higher.

Reference: 9 CFR, Part 3, Subpart C, Section 3.51

- According to USDA Standards for the rabbit, which of the following statements is not correct?

- All food receptacles shall be kept clean and sanitized at least once weekly.
- With solid floors, soiled litter shall be removed and replaced with clean litter at least once each week.
- With wire or mesh floors, the pans under the enclosures shall be cleaned at least once each week.
- Primary enclosures for rabbits shall be sanitized at least once every 30 days.

a. All food receptacles shall be kept clean and sanitized at least once weekly.

Reference: 9 CFR, Part 3, Subpart C, Section 3.54

- According to USDA Standards for the rabbit, which of the following statements about outdoor housing is not correct?

- Sufficient shade shall be provided to allow all rabbits to protect themselves from the direct rays of the sun.
- A sprinkler system or other means shall be provided for cooling when the atmospheric temperature exceeds 90°F.
- Outdoor housing facilities shall be fenced or otherwise enclosed to minimize the entrance of predators.
- Shelter shall be provided for all rabbits when the atmospheric temperature falls below 61°F.

d. Shelter shall be provided for all rabbits when the atmospheric temperature falls below 61°F.

Reference: 9 CFR, Part 3, Subpart C, Section 3.52

- According to USDA Standards for the rabbit transport enclosure, what is the minimum height of the words "Live Animal"?

- Not less than 4 inches
- Not less than 3 inches
- Not less than 2 inches
- Not less than 1 inch

d. Not less than 1 inch

Reference: 9 CFR, Part 3, Subpart C, Section 3.61

- According to USDA Standards for the rabbit, which of the following statements about primary enclosures is not correct?

- A suitable nest box containing clean nesting material shall be provided in each enclosure housing a female with a litter less than one month of age.
- Food and water receptacles shall not be included in floor space calculations.
- Innovative primary enclosures that do not meet the space requirements but provide rabbits with sufficient volume of space and the opportunity to express species-typical behavior, may be used when approved by the Attending Veterinarian.
- Litter shall be provided in all primary enclosures having solid floors.

c. Innovative primary enclosures that do not meet the space requirements but provide rabbits with sufficient volume of space and the opportunity to express species-typical behavior, may be used when approved by the Attending Veterinarian.

Reference: 9 CFR, Part 3, Subpart C, Section 3.53

- According to USDA Standards for a rabbit transport enclosure with ventilation on two opposite walls, _____ percent of the total surface area of each wall is required?

- 20%
- 16%
- 8%
- 10%

b. 16%

Reference: 9 CFR, Part 3, Subpart C, Section 3.61

- According to “The Guide” (1996), *Bordetella bronchiseptica* characteristically produces only subclinical infections in rabbits, but severe respiratory disease might occur in _____?
 - a. Guinea pigs
 - b. Dogs
 - c. Pigs
 - d. Nonhuman primates

a. Guinea pigs

Reference: The Guide for the Care and Use of Laboratory Animals. ILAR. 1996, page 59

- The rabbit intestine is largely impermeable to larger molecular compounds. How do kits receive passive immunity?

- a. Colostrum, which is composed of smaller molecules in the doe's milk
- b. Exchange of maternal and fetal blood at the time of birth
- c. No passive immunity is transferred in the rabbit
- d. Kits receive most of their passive immunity via the yolk sac before birth

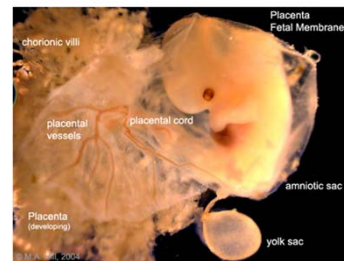
d. Kits receive most of their passive immunity via the yolk sac before birth

Reference: *Laboratory Animal Medicine*, 2nd Edition Fox, et al. 2002. Academic Press, Inc. London. pp. 332

- According to “The Guide”, the environmental temperature range for a rabbit should be what?
 - a. 64-84°F
 - b. 61-84°F
 - c. 64-72°F
 - d. 61-72°F

d. 61-72°F

Reference: The Guide for the Care and Use of Laboratory Animals. ILAR. 1996, page 32



- The rabbit is the intermediate host for *Taenia pisiformis*. Which of the following is the definitive host for these cestodes?
 - a. Cat
 - b. Pig
 - c. Ferret
 - d. Dog

d. Dog

Reference: *Laboratory Animal Medicine*, 2nd Edition Fox, et al. 2002. Academic Press, Inc. London. pp. 423

- What protozoal parasite infects rabbits, rodent, and immunodeficient humans: causes granulomatous foci in the brain and kidney; and is best stained with Gram or Goodpasture-carbol fuchsin stain?

- a. *Sarcocystis* spp.
- b. *Toxoplasma gondii*
- c. *Hepatozoon muris*
- d. *Encephalitozoon cuniculi*

d. *Encephalitozoon cuniculi*

Reference: *Laboratory Animal Medicine*, 2nd Edition Fox, et al. 2002. Academic Press, Inc. London. pp. 348

- Which of the following is the best description of *Cheyletiella parasitovorax*?

- a. Pathogenic obligate parasite of rabbits
- b. Nonpathogenic obligate parasite of rabbits
- c. Nonburrowing skin mite of rabbits
- d. Burrowing skin mite of rabbits
- e. Sucking louse of rabbits

c. Nonburrowing skin mite of rabbits

Reference: *Laboratory Animal Medicine*, 2nd Edition Fox, et al. 2002. Academic Press, Inc. London. pp. 349

- When washing and sanitizing rabbit cages or catch pans, acid pre-wash is used during the wash cycle to:

- a. Reduce bacterial bio-loads
- b. Soften calcium carbonate and triple phosphate crystal deposits
- c. Dissolve fur build up
- d. Soften urate crystal deposits

• **b. Soften calcium carbonate and triple phosphate crystal deposits**

• **References:**

• Fox JG, Anderson LC, Loew FM, Quimby FW, eds. 2002 *Laboratory Animal Medicine*, 2nd edition. Academic Press: San Diego, CA. Chapter 9 – Rabbit, p 358.

- The rabbit placenta is of what type (Grosser classification)?
 - Hemoendothelial
- T/F: The changes in vaginal epithelium during the estrous cycle are a reliable means to determine the physiological state of the reproductive cycle of the rabbit.
 - False, it is not a reliable means.
- How many digits on the rabbit forelimb?
 - 5 digits
- How many digits on the rabbit hindlimb?
 - 4 digits

Nathan R. Brewer. 2006. *Historical Special Topic Overview on Rabbit Comparative Biology*. Biology of the Rabbit. JAALAS. 45 (1): 8-24.

- What is the most common tumor observed in *Oryctolagus cuniculus*?

- a. Uterine adenocarcinoma
- b. Lymphosarcoma
- c. Bile duct adenomas
- d. Basal cell tumors
- e. Osteosarcoma

• **a. Uterine adenocarcinoma**

• **References:**

• Fox JG, Anderson LC, Loew FM, Quimby FW, eds. 2002 *Laboratory Animal Medicine*, 2nd edition. Academic Press: San Diego, CA. Chapter 9 – Rabbit, p 356.

- A NZW rabbit is observed with an enlarged globe of the right eye. Intraocular pressure is increased. The correct genotype for this condition is

- a. *Gl/Gl*
- b. *gl/gl*
- c. *Bu/bu*
- d. *bu/bu*
- e. *Bu/Bu*

• **d. *bu/bu***

• **References:**

• Fox JG, Anderson LC, Loew FM, Quimby FW, eds. 2002 *Laboratory Animal Medicine*, 2nd edition. Academic Press: San Diego, CA. Chapter 9 – Rabbit, p 354.

• Harkness JE, Wagner JE. *The Biology and Medicine of Rabbits and Rodents*, 4th edition. Williams & Wilkins: Media, PA. Chapter 5 – Specific Diseases and Conditions, p 185.

- Which is true about floor drains in rodent or rabbit rooms?

- a. Floor drains should be at least 4 inches in diameter
- b. Floor drains should be at least 6 inches in diameter
- c. Floor drains should be at least 8 inches in diameter
- d. Floor drains are neither essential nor recommended

• **d. Floor drains are neither essential nor recommended**

• **References:**

• Fox JG, Anderson LC, Loew FM, Quimby FW, eds. 2002 *Laboratory Animal Medicine*, 2nd edition. Academic Press: San Diego, CA. Chapter 21 – Animal Facilities, p 927.

References

- Virus Taxonomy: Eighth Report of the International Committee on Taxonomy of Viruses
H.V.Van Regenmortel, D.H.L. Bishop, M. H. Van Regenmortel, Claude M. Fauquet (Eds) <http://www.microbiologybytes.com/virology/VirusGroups.html#IV>
- <http://www.radil.missouri.edu/info/dora/Dora.htm>
- Nathan R. Brewer: 2006. *Historical Special Topic: Overview on Rabbit Comparative Biology*. *Biology of the Rabbit*. JAALAS. 45 (1): 8-24.
- *Laboratory Animal Medicine*, 2nd Edition Fox, et al. 2002. Academic Press, Inc. London.
- The Guide for the Care and Use of Laboratory Animals. ILAR. 1996
- 9 CFR, Part 3, Subpart C
- *The Biology of the Laboratory Rabbit* Manning PJ. 1994. Academic Press, Inc. New York.
- <http://www.emedicine.com/ped/topic1753.htm>