

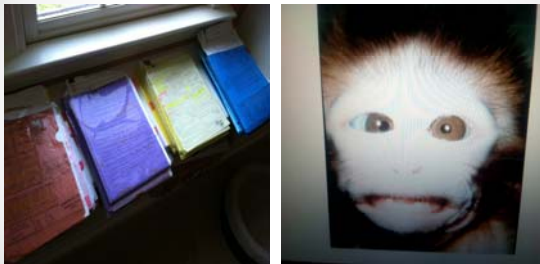
JAALAS Literature Review 2011

Coralie Zegre Cannon, DVM, DACLAM

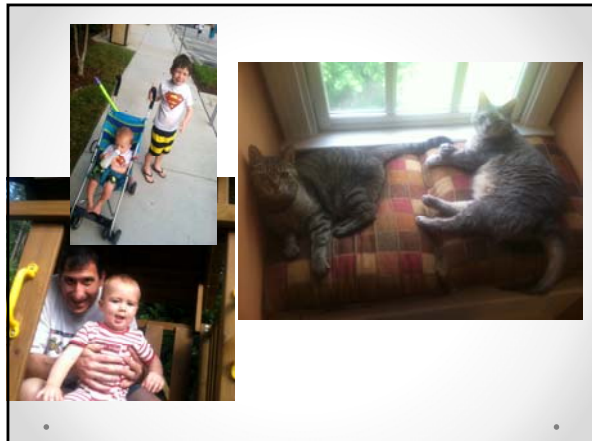
Literature Review Tips

- Review abstract, introduction and discussion
- Review common knowledge
- Test yourself (e.g. Gestation period? Housing temperature? Regulations guidelines)?
- Review photos!!!
- Organize journal abstracts by species or subject

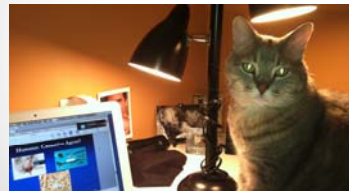
Focus on core material! Board exam will only ask questions with 2 references.



I couldn't have done it without my study group and family support!



JAALAS
January 2011



Laboratory Reptile Surgery: Principles and Techniques

Leanne C Alworth,^{1,3} Sonia M Hernandez,^{1,4,5} and Stephen J Divers²

Reptiles used for research and instruction may require surgical procedures, including biopsy, coelomic device implantation, ovariectomy, orchidectomy, and esophagostomy tube placement, to accomplish research goals. Providing veterinary care for unanticipated clinical problems may require surgical techniques such as amputation, bone or shell fracture repair, and coeliotomy. Although many principles of surgery are common between mammals and reptiles, important differences in anatomy and physiology exist. Veterinarians who provide care for these species should be aware of these differences. Most reptiles undergoing surgery are small and require specific instrumentation and positioning. In addition, because of the wide variety of unique physiologic and anatomic characteristics among snakes, chelonians, and lizards, different techniques may be necessary for different reptiles. This overview describes many common reptile surgery techniques and their application for research purposes or to provide medical care to research subjects.

T/F Do many reptile species need exposure to ultraviolet light?

Answer: TRUE

They require UVB spectrum (290-320 nm) in order to endogenously manufacture vitamin D₃

How often should the UV light be replaced?

- A. Every 3 months
- B. Every 6 months
- C. Every 9 months
- D. Annually

Answer: B

Surgical Positioning of Lizards and Snakes



Which Regulations Contain Guidelines for Reptiles used in Research and Teaching?

- A. The Guide
- B. Animal Welfare Act
- C. The Public Health Service Policy
- D. Biosafety in Microbiological and Biomedical Laboratories (BMBL)

Answer: A, C

Perioperative Ruminal pH Changes in Domestic Sheep (*Ovis aries*) Housed in a Biomedical Research Setting

Bambi H Jaemin,^{1,2} Ray C Boston,² Rolf B Modesto,² and Thomas P Schaer²

Little information is available on normal ruminal pH values for domestic sheep (*Ovis aries*) housed in a research setting and fed a complete pelleted ration. Sheep maintained on pelleted diets undergoing surgical procedures often present with postoperative anorexia and rumen atony. To determine the relationship between diet and postoperative rumen acidosis and associated atony, we studied dietary effects on ruminal pH in an ovine surgical model. Sheep undergoing orthopedic surgical procedures were randomized into 2 diet groups. Group 1 (n = 6) was fed complete pelleted diet during the pre- and postoperative period, and group 2 (n = 6) was fed timothy grass hay exclusively throughout the study. Measures included ruminal pH, ruminal motility, and rate of feed refusal, which was monitored throughout the pre- and postoperative periods. The 2 groups did not differ significantly before surgery, and the ruminal parameters remained largely within normal limits. However, a downward trend in the strength and frequency of rumen contractions was observed in pelleted-fed sheep. After surgery, the pelleted-fed group showed clinical signs consistent with ruminal acidosis, supported by decreased ruminal motility, anorexia, putrid-smelling ruminal material, and death of ruminal protozoa. Intervention by transruminant in clinically affected sheep resulted in resolution of signs. Our findings suggest that sheep fed grass hay appear to have a more stable ruminal pH, are less likely to experience anorexia and rumen atony, and thereby exhibit fewer postoperative gastrointestinal complications than do sheep on a pelleted diet.

Abbreviation: VFA, volatile fatty acids.

According to the National Research Council, at what temperature should natural-ingredient diets be stored at?

- A. 21 C (70 F)
- B. 4 C (39 F)
- C. 27 C (80 F)
- D. 10 C (50 F)

Answer: A

Sheep have small red “nodes” associated with blood vessels. What are they inadvertently named?

- A. Blood-filled mesenteric lymph nodes
- B. Hemal “lymph nodes”
- C. Cowdry bodies
- D. None of the above

Answer: B

Journal of the American Association for Laboratory Animal Science
Copyright 2013
by the American Association for Laboratory Animal Science

Vol. 53, No. 1
January 2013
Page 2046

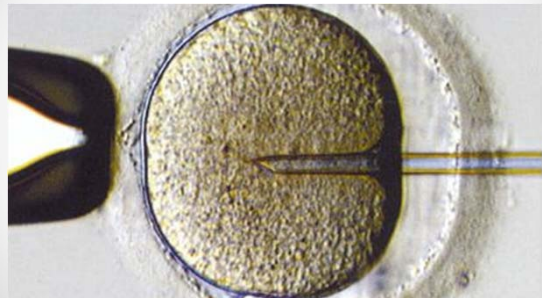
Improvement in the Development of Oocytes from C57BL/6 Mice after Sperm Injection

Takehito Kaneko¹ and Reichiro Ohno

The C57BL/6 mouse strain is used widely for producing transgenic and knockout strains. Sperm motility is extremely low after a freeze-thaw process. Although intracytoplasmic sperm injection (ICSI) can be used to produce embryos from sperm with low or even no motility, its success rate is poor in the C57BL/6 strain. In particular, the survival of C57BL/6 oocytes after ICSI is extremely low compared with that of hybrid strains. We found that the survival percentages of C57BL/6 oocytes (63% and 44%) were lower than those of B6D2F1 oocytes (80% and 80%) when B6D2F1 and C57BL/6 sperm were injected, respectively. For C57BL/6 mice, 87%, 73%, 44%, 56%, and 99% of oocytes survived after ICSI in media containing 0.62, 7.62, 81.62, 41.62, and 103.62 mM NaCl, respectively. In addition, 64%, 81%, and 79% of oocytes survived after ICSI in media with 4.03, 14.03, and 24.03 mM KCl, respectively. Our results suggest that the survival of C57BL/6 oocytes after ICSI is improved by using Na⁺-deficient and K⁺-rich media.

Abbreviation: ICSI, intracytoplasmic sperm injection.

Intracytoplasmic Sperm Injection (ICSI)



Journal of the American Association for Laboratory Animal Science
Copyright 2013
by the American Association for Laboratory Animal Science

Vol. 53, No. 1
January 2013
Page 2046

The Water Delivery System Affects the Rate of Weight Gain in C57BL/6J Mice during the First Week after Weaning

Alexander Gordon¹ and Jeff Wyatt

Facility planners, IACUCs, veterinary staff, and researchers make choices on water delivery systems for rodents on the basis of cost effectiveness, water quality, risk of malfunction, and potential effect on animal health and welfare. Here we compare biometrics, including weight trends, of newly arrived mice unfamiliar with automated watering; weight trends of weanlings; fecundity of mice; and risk of malfunction among 3 water delivery techniques: water bottle only, combination of automated delivery and water bottle, and automated system only. There was no statistically significant difference among the 3 experimental groups with respect to fecundity, mortality, and delivery malfunction. On the basis of body weight trends, the health and wellbeing of the mice used in these studies were not affected by the water delivery system or housing density after the first week; however, there was a significant difference in the growth rate at 21 to 28 d of age among the 3 groups of pups. The mice receiving both automated delivery and water bottles experienced higher growth rates from 21 to 28 d of age than did the other experimental groups. However, after 35 d of age, weight trends did not differ among the groups. Our results suggest that mice weaned into the same method of water delivery as their respective dams thrive equally well among the 3 tested water delivery systems.

What is the weaning age of mice?

- a. 18 days
- b. 21 days
- c. 31 days
- d. 40 days

Answer: b

T/F Oxytocin is required for nursing mice, however is not required for parturition or reproductive behavior.

Answer: True

JAX[®] Mice Pup Appearance by Age

Days of Age	CS7BL/6J (Control)	CS7BL/6J (Oxytocin)	CS7BL/6J (Oxytocin + Vasopressin)
0	Reddish pup	Reddish pup	Reddish pup
1	Reddish pup	Reddish pup	Reddish pup
2	Reddish pup	Reddish pup	Reddish pup
3	Reddish pup	Reddish pup	Reddish pup
4	Reddish pup	Reddish pup	Reddish pup
5	Reddish pup	Reddish pup	Reddish pup
6	Reddish pup	Reddish pup	Reddish pup
7	Reddish pup	Reddish pup	Reddish pup
8	Reddish pup	Reddish pup	Reddish pup
9	Reddish pup	Reddish pup	Reddish pup
10	Reddish pup	Reddish pup	Reddish pup
11	Reddish pup	Reddish pup	Reddish pup
12	Reddish pup	Reddish pup	Reddish pup
13	Reddish pup	Reddish pup	Reddish pup
14	Reddish pup	Reddish pup	Reddish pup

Human Handling Promotes Compliant Behavior in Adult Laboratory Rabbits

Alton C Swenness,^{1,2,3,4,5,6,7,8} Leanne C Alworth,^{5,9} Stephen B Harvey,^{1,2} Carolyn A Jones,¹ Christopher S King,^{1,2} and Sharon L Crowell-Davies¹

Routine laboratory procedures can be stressful for laboratory animals. We wanted to determine whether human handling of adult rabbits could induce a degree of habituation, reducing stress and facilitating research-related manipulation. To this end, adult New Zealand white rabbits were handled either frequently or minimally. After being handled over 3 wk, these rabbits were evaluated by novel personnel and compared with minimally handled controls. Evaluators subjectively scored the rabbits for their relative compliance or resistance to being restrained and removed from their cages, being transported to a treatment room, and their behavior at all stages of the exercise. Upon evaluation, handled rabbits scored significantly more compliant than nonhandled controls. During evaluation, behaviors that the rabbits displayed when they were approached in their cages and while being handled outside their cages were recorded and compared between study groups. Handled rabbits displayed behavior consistent with a reduction in human-directed fear. This study illustrates the potential for handling to improve compliance in laboratory procedures and reduce fear-related behavior in laboratory rabbits. Such handling could be used to improve rabbit welfare through the reduction of stress and exposure to novel stimuli.

What does the Guide say about Procedural Habituation an Training of Animals?

Habituating animals to routine husbandry or experimental procedures SHOULD be encouraged whenever possible as it may assist the animal to better cope with a captive environment by reducing stress associated with novel procedures or people.

Housing and Husbandry of *Xenopus laevis* Affect the Quality of Oocytes for Heterologous Expression Studies

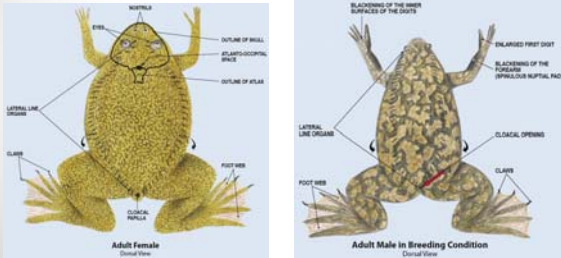
Eric Delprat,^{1,2} Kenneth B Gagnon,¹ Jonathan J Ledford,² and Jeanne M Wallace^{2,3}

To assess the effect of *Xenopus* husbandry on oocyte quality for membrane transport physiology experiments, we compared a recirculating-water housing system with a static-water system in a 23-mo study. Two groups of frogs ($n = 6$) were maintained separately for the entire study: one group was housed in a multiinvestigator centrally managed Xenopus facility which consists of 33 tanks placed on a shared and recirculating water system; the other group was housed in a satellite facility used by a single investigator and consisting of static tanks placed in a dedicated cold-room. The activity of a heterologously expressed membrane transporter was assessed every 4 to 5 wk for a total of 23 mo. Activity of the mouse cotransporter NKCC1 was assessed through isotopic ⁸⁶Rb influx measurements under 2 experimental conditions: stimulation of cotransporter by coapplication of regulatory kinases and by exposure to a hypertonic solution. The results showed a significant difference in the level of ion fluxes under these 2 experimental conditions between the 2 groups of oocytes. During the entire period, oocytes isolated from frogs maintained in the static facility demonstrated consistently robust NKCC1 function, whereas oocytes isolated from frogs maintained in the recirculating facility showed inconsistent and weaker cotransporter function. Furthermore, the oocytes isolated from frogs maintained in the recirculating facility showed significant deterioration during the summer months (April to August), a seasonal variation that was muted in frog oocytes maintained in the static facility.



Figure 2. Images of recirculating and static frog facilities. Photographs of (A) pump and filtration water system, (B) tank tanks, and (C) individual frog tanks of the recirculating water frog facility. Photographs of (D) tank tanks and (E) holding tank of the static water frog facility.

What is the function of the lateral line system?



<https://www.aalaslearninglibrary.org/images/Course2601/AdultFemaleAnat.jpg>

<https://www.aalaslearninglibrary.org/images/Course2601/AdultMaleAnat.jpg>

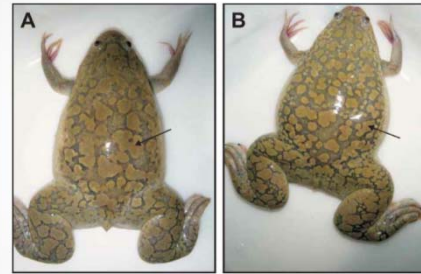


Figure 1. Identification of *Xenopus laevis* frogs based on markings. Photograph of 2 frogs, showing unique markings on their back. Arrows point to specific pigmentation patterns used to identify the frogs from one another.

Journal of the American Association for Laboratory Animal Science
Copyright 2011
By the American Association for Laboratory Animal Science

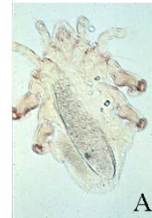
Vol 51, No. 1
January 2011
Pages 5-400

Soiled Bedding Sentinels for the Detection of Fur Mites in Mice

Krista E Lindstrom, Larry G Carbone, Danielle E Kellat, Melinda S Mayoga, and James D Wilkerson

Identification and eradication of murine fur mite infestations are ongoing challenges faced by many research institutions. Infestations with *Myobia muscicola* and *Myocoptes musculinus* can lead to animal health problems and may impose unwanted research variables by affecting the immune and physiologic functions of mice. The purpose of this study was to evaluate the utility and efficacy of soiled bedding sentinels in the detection of fur mite infestations in colony mice. Female young-adult C57BL/6J mice ($n = 180$) were exposed over a 12-wk period to various volume percentages of soiled bedding (11%, 20%, 50%, and 100%) from fur-mite-infested animals. Mice were tested every 2 wk with the cellophane tape test to identify the presence of fur mite adults and eggs. At the end of 12 wk, all mice exposed to 11%, 20%, and 50% soiled bedding tested negative for fur mites. One of the 38 mice (5%) receiving 100% soiled bedding tested positive for fur mites at the end of the 12-wk follow-up period. These findings suggest that the use of soiled bedding sentinels for the detection of fur mite infestations in colony mice is unreliable.

Identify this Fur Mite:



Myocoptes musculinus

How long is its life cycle?

8-14 days

Identify this fur mite and its life cycle.



Myobia muscili;
Life cycle is 23 days

Identify this Fur Mite:



Radfordia affinis

Carbon Tube Electrodes for Electrocardiography-Gated Cardiac Multimodality Imaging in Mice

Philippe Choquet,¹ Christian Grotz,¹ Gaelle Aubertin,¹ Fabrice Hebel,¹ Sébastien Sannicé,¹ and Andrei Constantinescu^{1*}

This report describes a simple design of noninvasive carbon tube electrodes that facilitates electrocardiography (ECG) in mice during cardiac multimodality preclinical imaging. Both forepaws and the left hindpaw, covered by conductive gel, of mice were placed into the openings of small carbon tubes. Cardiac ECG-gated single-photon emission CT, X-ray CT, and MRI were tested ($n = 6$) in 20 mice. For all applications, electrodes were used in a warmed multimodality imaging cell. A heart rate of 563 ± 48 bpm was recorded from anesthetized mice regardless of the imaging technique used, with acquisition times ranging from 1 to 2 h.

Abbreviations: ECG, electrocardiography; SPECT, single-photon emission CT.

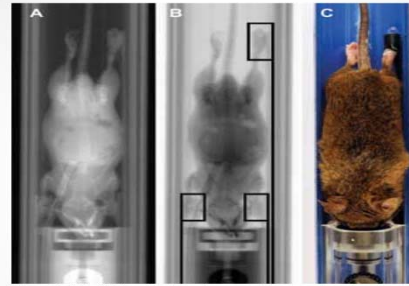
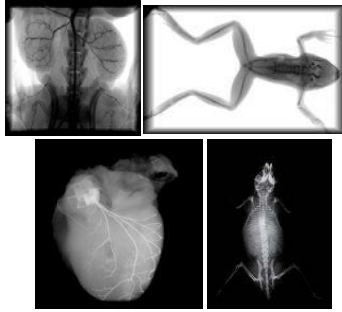


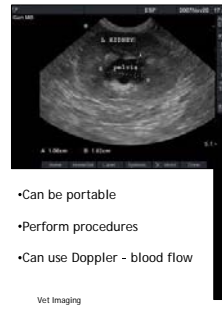
Figure 1. (A) CT "scout" view of warmed-up imaging chamber used for preclinical multimodality imaging with ECG leads connected to carbon tube electrodes. (B) Schematic drawing of carbon-tube ECG electrodes, comprising tubes (length, 10 mm; inner diameter, 4.5 mm) and corresponding lead connections to the ECG module. (C) Close-up view of ECG carbon tube electrode surrounding mouse paw with conductive gel.

X-RAY - FAXITRON

- Uses ionizing radiation to create the image
- Film is exposed to radiation
- Images reflect differences in structure density as beam passes through tissues
- Good for baseline studies, limited information with regard to subtle changes



ULTRASOUND



- Use of high frequency sound waves to travel through tissue
- Waves are reflected on interfaces
- Transducer retrieves information from sound waves

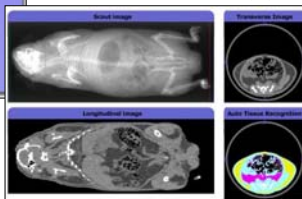
- Can be portable
- Perform procedures
- Can use Doppler - blood flow

Vet Imaging

SMALL ANIMAL CT SCANNING



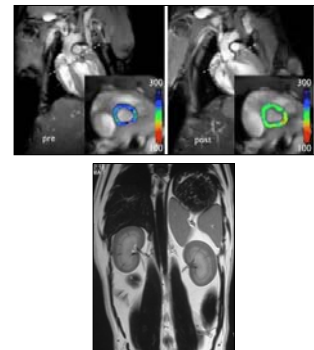
- X-ray beam which images in thin sections
- Computer generates image based on different densities after beam has traversed patient
- Great soft tissue contrast/3D imaging



LaTheta Echo Medical Systems

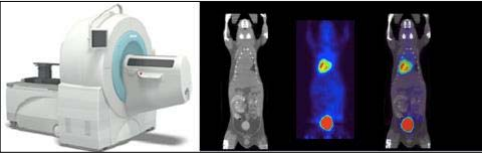
MRI

- Use of radiofrequency pulses in a magnetic field
- Hydrogen ions move and deflect to create image
- Excellent for imaging bones, central nervous system
- Best soft tissue contrast of all imaging
- Good anesthetic techniques critical and challenging due to magnet



Courtesy MGH website

PET-CT



PET images (function) fused with CT images (anatomic) to more accurately localize PET findings. Improves diagnostic accuracy.

Journal of the American Association for Laboratory Animal Science
Copyright 2011
By the American Association for Laboratory Animal Science

Vol. 51, No. 1
January 2011
Page 69-72


Vascular Access Port Implantation and Serial Blood Sampling in a Gottingen Minipig (*Sus scrofa domestica*) Model of Acute Radiation Injury

Maria Moroni,¹ Thea Y Crobaugh,¹ Jennifer M Mitchell,¹ Eric Lombardini,² Kinon D Meock,² Larry J Shelton,¹ Vitya Nagy,¹ and Mark H Whittall¹

Threats of nuclear and other radiologic exposures have been increasing, but no countermeasure for acute radiation syndrome has been approved by regulatory authorities. Because of their similarity to humans in regard to physiology and anatomy, we are characterizing Gottingen minipigs as a model to aid the development of radiation countermeasures. Irradiated minipigs exhibit immunosuppression, severe thrombocytopenia, vascular leakage, and acute inflammation. These complications render serial acquisition of blood samples problematic. Vascular access ports (VAP) facilitate serial sampling, but their use often is complicated by infections and fibrin deposition. We demonstrate here the successful use of VAP for multiple blood samplings in irradiated minipigs. Device design and limited postoperative prophylactic antimicrobial therapy before irradiation were key to obtaining serial sampling, reducing swelling, and eliminating infection and skin necrosis at the implantation site. Modifications of previous protocols included the use of polydioxanone sutures instead of silk, eliminating chronic port access; single-use, sterile, antistatic ported syringes for flushing; strict aseptic maintenance of the device; and acclimating animals to reduce stress. VAP remained functional in 19 of 20 irradiated animals for as long as 3 mo. The remaining VAP failed due to a small leak in the catheter, leading to clot formation. VAP-related sepsis occurred in 2 minipigs. Blood sampling did not cause detectable stress in nonanesthetized sham-irradiated animals, according to leukograms and clinical signs.

Abbreviations: ARS, acute radiation syndrome; VAP, vascular access port.

Which of the 3 Rs does this instrument represent?



Refinement

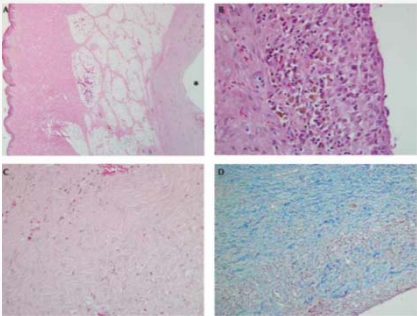


Figure 2. Histologic examination of the skin and subcutis surrounding VAP in minipigs. (A) Haird skin and subcutis. The position of the VAP (V) is denoted by an irregular layer of granulation tissue and further surrounded by dense areas of fibrous connective tissue and fibrosis. The myofibrils and nuclei stain, magnification, $\times 20$. (B) Layer of granulation tissue composed of reactive fibroblasts, histiocytes, hemosiderophages, lymphocytes admixed with loose collagen, and small caliber vessels (arrows) immediately adjacent to the VAP. Hematoxylin and eosin stain, magnification, $\times 40$. (C) Organized, undulating strata of fibrous connective tissue with regularly spaced small caliber capillaries and fibroblasts, histiocytes, and eosinophilic collagen, scale. (D) Condensation of fibrous tissue, which increases in density as distance from the VAP increases, compared with the pale strata of the loose collagen admixed with increased density of small and loose capillaries near the surface of the wound. Masson trichrome stain, magnification, $\times 20$.

Name the common minipigs used in research:

Yucatan, Hanford, Sinclair, Hormel, Gottingen

Journal of the American Association for Laboratory Animal Science
Copyright 2011
By the American Association for Laboratory Animal Science

Vol. 51, No. 1
January 2011
Page 77-82

Ventricular Arrhythmias and Mortality Associated with Isoflurane and Sevoflurane in a Porcine Model of Myocardial Infarction

Marta Reguero-Puñiles,¹ Felipe Fernández-Vázquez,¹ Amando Pérez de Prado,¹ Jose R Albiésaga,¹ Carlos Cuellas-Ramón,¹ Jose M Ajenjo-Silverio,¹ Anuncion Orden,¹ and Jose M Gonzalez-Orden¹

Ischemia of the myocardium can lead to reversible or irreversible injury depending on the severity and duration of the preceding ischemia. Here we compared sevoflurane and isoflurane with particular reference to their hemodynamic effects and ability to modify the effects of acute severe myocardial ischemia and reperfusion on ventricular arrhythmias and mortality in a porcine model of myocardial infarction. Female Large White pigs were premedicated with ketamine, midazolam, and atropine. Propofol was given intravenously for the anesthetic induction, and anesthesia was maintained with isoflurane or sevoflurane. Endovascular, fluorescence-guided, coronary procedures were performed to occlude the midleft anterior descending artery by using a coronary angioplasty balloon. After 75 min, the balloon catheter system was withdrawn and the presence of adequate reperfusion flow was verified. The pigs were followed for 2 mo, and overall mortality rate was calculated. The isoflurane group showed lower arterial pressure throughout the procedure, with the difference reaching statistical significance after induction of myocardial ischemia. The ventricular fibrillation rate was higher in isoflurane group (83.2%) than the sevoflurane group (61.7%; relative risk, 1.57 [1.03 to 2.40]). Overall survival was lower in the isoflurane group (75%) than the sevoflurane group (86.5%). In conclusion, in this porcine model of myocardial ischemia and reperfusion, sevoflurane was associated with higher hemodynamic stability and fewer ventricular arrhythmias and mortality than was isoflurane.

Inhalants Order of Potency

Nitrous oxide < Sevoflurane < Desflurane < Enflurane < Isoflurane < Halothane
< Methoxyflurane < Ether

Why is the Pig a Good Model for Cardiac Research?

- CV system similar to humans, especially the coronary anatomy
- Right side dominant blood supply of coronary artery and no preexisting collateral circulation (90% similar to humans)
- Electrophysiologic system more neurogenic than myogenic and there are prominent Purkinje fibers
- Left azygous vein drains the intercostal vessels into the coronary sinus unlike in most other species and can be ligated or blocked with balloon = total coronary venous drainage into the coronary sinus
- Aorta has a true vaso vasorum like humans

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol 50, No 1
January 2011
Pages 106-117

Harmonic Analysis of Noninvasively Recorded Arterial Pressure Waveforms in Healthy Bonnet Macaques (*Macaca radiata*)

Oladipupo Olatimoye,¹ Louis Salicrudi,² Hanon Kamran,³ Mark Stewart,² John Carter,⁴ and Jason M Laza^{1,5*}

To characterize primate arterial waveforms, we prospectively studied 38 bonnet macaques (*Macaca radiata*; 25 female, 13 ± 4 y). Brachial artery waveforms were recorded from these animals by applanation tonometry and were decomposed into harmonics by using Fourier analysis. The ratio of individual to total harmonic amplitude (HT) was derived from frequency spectra. Left ventricular (LV) mass, ejection fraction, fractional shortening, septal wall thickness, posterior wall thickness, LV end-diastolic diameter, and LV end-systolic diameter were obtained by echocardiography in all 38 monkeys. Blood pressure was obtained by sphygmomanometry. The fundamental frequency was 2.76 cycles/s. Harmonic ranged from 1 to 14. Indexed LV mass was inversely correlated with third HT and second HT but not with systolic or diastolic blood pressure. In addition, the third HT was inversely correlated with septal wall thickness, posterior wall thickness, and LV end-diastolic diameter, whereas second HT was inversely correlated with LV end-diastolic diameter. Heart rate was inversely correlated with eighth HT. Our multivariate analysis adjusting for age, gender, weight, and length, only third HT was an independent predictor of LV mass. Harmonic analysis of arterial waveforms may provide information pertaining to LV mass. Lower HT ratios (second and third) are related to LV mass, whereas higher HT (eighth) is related to heart rate.

Abbreviations: HT, ratio of the individual harmonic to the total harmonic amplitude; LV, left ventricular.

What is *Macaca radiata* a model for? Name the SuperFamily, Family and Subfamily?



Kysanur Forest Disease

Super Family:
Cercopithecoidea
(“oidea” refers to superfamily)

Family:
Cercopithecidae (dae
for family)

Subfamily:
Cercopithecinae (nae
for subfamily)

JAALAS
March 2011



Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol 50, No 2
March 2011
Pages 106-117

Determination of Hemoglobin A1c and Fasting Blood Glucose Reference Intervals in Captive Chimpanzees (*Pan troglodytes*)

Margaret S McTigue,^{1*} Barbara C Hansen,² John J Elj,³ and D Rick Lee¹

Type 2 diabetes mellitus (T2DM), reaching epidemic proportions in humans, has emerged as a disease in aging captive populations of adult chimpanzees; however, little information is available regarding T2DM in chimpanzees. Our goals were to (1) distinguish between normal, healthy chimpanzees and those with early (prediabetic) or advanced diabetes; (2) establish and compare the fasting 16 M blood glucose reference range for chimpanzees at our facility with published reference ranges; and (3) establish hemoglobin A1c (HbA1c) reference intervals for healthy, nondiabetic chimpanzees and define threshold values for prediabetes and diabetes. If reliable, our reference ranges for FBG and HbA1c could become clinical tools for screening animals at risk and for monitoring therapeutic progress. The overall incidence of T2DM in our colony of 260 chimpanzees is 0.8% but is increased to 3.7% in animals older than 30 y (geriatric). For our defined reference intervals, chimpanzees with FBG or HbA1c levels up to the 90th percentile (glucose, less than or equal to 107 mg/dL; HbA1c, less than or equal to 5.0%) were considered healthy; those whose values lay between the 90th and 95th percentiles (glucose, 106 to 119 mg/dL; HbA1c, 5.1% to 5.2%) were possibly prediabetic, and animals whose values exceeded the 95th percentile (glucose, greater than or equal to 120 mg/dL; HbA1c, greater than 5.2%) were identified as potentially having diabetes. We found that our FBG range was comparable to other published results, with a positive correlation between HbA1c and glucose. Furthermore, the negligible HbA1c response to acute stress or recent food consumption suggests that HbA1c is highly useful for evaluating glycemic control during treatment of diabetic chimpanzees and is more informative concerning overall glucose control than are FBG levels alone.

Abbreviations: FBG, fasting blood glucose; HbA1c, hemoglobin A1c; T2DM, type 2 diabetes mellitus.

Name the Superfamily? Family?

Superfamily: Hominoidea Family: Hominidae



Environmental Enrichment Reduces the Likelihood of Alopecia in Adult C57BL/6J Mice

Allison Bechard,¹ Rebecca Meagher, and Georgia Mason

Barbering (incessant grooming) is an abnormal behavior causing alopecia and commonly affects various strains of laboratory mice, including C57BL/6J. Barbering-induced alopecia is a potential symptom of brain impairment and can indicate a stressful environment. We compared alopecia prevalence and severity in mice housed in enriched or standard cages. Providing an enriched environment delayed the onset and reduced the prevalence and overall severity of alopecia in C57BL/6J mice. Husbandry methods that reduce adult alopecia are likely to promote the wellbeing of the animals. We suggest that environmental enrichment is a simple and economic way to reduce alopecia in mouse colonies.

Abbreviations: EE, environmental enrichment; PVD, postnatal day.

Name this condition: Barbering

How do you tell the difference between the dominant mouse versus the subordinate mice?

What does the Guide recommend for rodent enrichment?

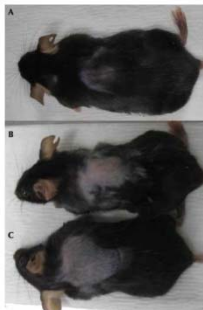


Figure 2. Examples of barbering-induced alopecia in the mice and the categorical score assigned based on visual assessment. All mice pictured have intact whiskers. (A) Alopecia score of 1. (B) Alopecia score of 2. (C) Alopecia score of 3.

The dominant mouse is known as the barber mouse. This mouse will retain its whiskers versus the subordinates will not.

Shelters for rodents allows them to retreat in case of disturbances and nesting material and deep bedding allow mice to control their temperature and avoid cold stress during resting and sleeping.

Heart Rates of Male and Female Sprague–Dawley and Spontaneously Hypertensive Rats Housed Singly or in Groups

Toni Azar, Jody Sharp, and David Lawson¹

This study was conducted to confirm our previous reports that group housing lowered basal heart rate and various evoked heart rate responses in Sprague–Dawley male and female rats and to extend these observations to spontaneously hypertensive rats. Heart rate data were collected by using radiotelemetry. Initially, group- and single-housed rats were evaluated in the same animal room at the same time. Under these conditions, group-housing did not decrease heart rate in undisturbed male and female rats of either strain compared with single-housed rats. Separate studies then were conducted to examine single-housed rats living in the room with only single-housed rats. When group-housed rats were compared with these single-housed rats, undisturbed heart rates were reduced significantly, confirming our previous reports for Sprague–Dawley rats. However, evoked heart rate responses to acute procedures were not reduced uniformly in group-housed rats compared with either condition of single housing. Responses to some procedures were reduced, but others were not affected or were significantly enhanced by group housing compared with one or both of the single-housing conditions. This difference may have been due, in part, to different sensory stimuli being evoked by the various procedures. In addition, the variables of sex and strain interacted with housing condition. Additional studies are needed to resolve the mechanisms by which evoked cardiovascular responses are affected by housing, sex, and strain.

Name these devices and their function.

Guide to PhysioTel[®] Transmitters



Radiotelemetry Transmitters used to capture temperature, heart rate, etc.

DSI
Proven Performance

Which of the following has been shown to decrease blood pressure and heart rate in rats?

- A. Extending the dark phase of the photocycle
- B. Providing social enrichment by group or colony housing
- C. Increasing cage size
- D. Addition of enrichment devices to the animal's home cage

Answer: All of the above

Journal of the American Association for Laboratory Animal Science
Copyright 2011
By the American Association for Laboratory Animal Science

Vol. 50, No. 2
March 2011
Pages 152-159

Effects of Buprenorphine, Meloxicam, and Flunixin Meglumine as Postoperative Analgesia in Mice

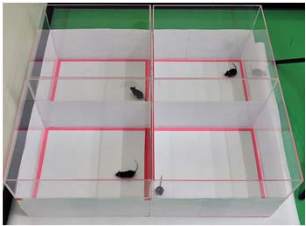
Jacquelyn T. Tubbs,^{1*} Grace E. Kissling,² Greg S. Traylor,¹ David R. Gaulding,² James A. Clark,³ Angela P. King-Herbert,¹ and Terry L. Blankenship-Paris^{1†}

C57BL/6J male mice (n = 40; age, 6 to 7 wk) underwent partial hepatectomy or no surgery and were given 1 of 3 analgesics pre- and postoperatively. Food and water consumption, body weight, running wheel activity, locomotor activity, and serum corticosterone concentrations were measured before and after surgery. Mice that were surgically manipulated weighed significantly less on days 1 through 3 after surgery than did mice not manipulated surgically. On the day of surgery, the surgery groups consumed significantly less feed (4.5 ± 0.35 g) than did nonsurgery groups. There were no differences in water consumption on any day between surgery and nonsurgery groups or among the 3 analgesic groups. For running wheel activity, significant decreases in the surgery groups were seen at day 1 after surgery compared with baseline. Surgery groups that received buprenorphine and meloxicam returned to baseline activity levels on day 2 after surgery. Open-field testing revealed no significant differences in locomotor activity in any groups; however, posttreatment locomotor activity in the buprenorphine nonsurgery group was increased compared with baseline, and posttreatment locomotor activity in the flunixin meglumine surgery group was decreased compared with baseline. Serum corticosterone concentrations were within normal limits regardless of treatment in all groups. Comparison of the overall results indicated that meloxicam and buprenorphine, at the dose given, appear to be suitable postoperative analgesics for partial hepatectomy in mice. Flunixin meglumine at the given dosage (2.5 mg/kg) may not provide adequate analgesia for partial hepatectomy.

Abbreviation: NSAID, nonsteroidal antiinflammatory drug.

Name this device: Open Field Test

What does it measure? General locomotor activity and anxiety



Describe Buprenorphine:

- [μ-partial agonist and κ-antagonist](#)
- [μ-antagonist and κ-agonist](#)
- [μ-agonist and κ-agonist](#)
- [μ-antagonist and κ-antagonist](#)

Answer: A

Journal of the American Association for Laboratory Animal Science
Copyright 2011
By the American Association for Laboratory Animal Science

Vol. 50, No. 2
March 2011
Pages 152-159

Analgesic Effects of Tramadol, Tramadol-Gabapentin, and Buprenorphine in an Incisional Model of Pain in Rats (*Rattus norvegicus*)

Gabriel P. McKenna,^{1*} Cholawat Pacharinsak,¹ Charles T. Long,² Anthony M. Howard,² Katchan Jampachaisri,³ David C. Youmans,² and Stephen A. Fell¹

Postoperative pain management in laboratory animals relies heavily on a limited number of drug classes, such as opioids and nonsteroidal antiinflammatory drugs. Here we evaluated the effects of saline, tramadol, tramadol with gabapentin, and buprenorphine (n = 6 per group) in a rat model of incisional pain by examining thermal hyperalgesia and weight-bearing daily for 6 d after surgery. All drugs were administered preoperatively and continued for 2 consecutive days after surgery. Rats treated with saline or with tramadol only showed thermal hyperalgesia on days 1 through 4 and 1 through 3 after surgery, respectively. In contrast, buprenorphine-treated rats showed no thermal hyperalgesia on days 1 and 2 after surgery, and rats given tramadol with gabapentin showed reduced thermal hyperalgesia on days 2 and 4. For tests of weight-bearing, rats treated with saline or with tramadol only showed significantly less ipsilateral weight-bearing on day 1 after surgery, whereas rats given either buprenorphine or tramadol with gabapentin showed no significant change in ipsilateral weight-bearing after surgery. These data suggest that tramadol alone provides insufficient analgesia in this model of incisional pain; buprenorphine and, to a lesser extent, tramadol with gabapentin provide relief of thermal hyperalgesia and normalize weight-bearing.

Abbreviation: GABA, γ-aminobutyric acid.

What DEA Schedule is Buprenorphine?

- Schedule I
- Schedule II
- Schedule III
- Schedule IV
- Schedule V

Answer: C

DEA Schedules

Schedule I

- Drug has high potential for abuse
- Drug has no currently accepted medical use in treatment in the US
- Lack of accepted safety for use of the drug under medical supervision

Eg. Heroin, Ecstasy, LSD, marijuana

Schedule II

- Drug has high potential for abuse
- Drug has currently accepted medical use in treatment in the US or currently accepted medical use with severe restrictions
- Abuse may lead to severe psychological or physical dependence

Eg. Morphine, oxycodone, pentobarbital, fentanyl

DEA Schedules

Schedule III

- Drug has potential for abuse less than the drugs in I and II
- Drug has currently accepted medical use in treatment in the US
- Abuse of drug may lead to moderate or low physical dependence or high psychological dependence
- Eg. Buprenorphine, ketamine, 'T' drugs Thiopental, Telazol

Schedule IV

- Drug has low potential for abuse relative to drugs in III
- Drug has currently accepted medical use in treatment in the US
- Abuse may lead to limited physical dependence or psychological dependence relative to drugs in III
- Eg. Phenobarbital, Valium, chloral hydrate, midazolam

Schedule V

- Drug has low potential for abuse relative to drugs in IV
- Currently accepted medical use in treatment in the US
- May lead to limited physical dependence or psychological dependence relative to drugs in IV
- Eg. Cough suppressants containing small amounts of codeine

Evaluation of a Sustained-Release Formulation of Buprenorphine for Analgesia in Rats

Patricia L. Foley,^{1,2} Haixiang Liang,¹ and Andrew R. Crichton^{1*}

Preventing and minimizing pain in laboratory animals is a basic tenet of biomedical research and is warranted for ethical, legal, and scientific reasons. Postoperative analgesia is an important facet of pain management. A sustained-release formulation of buprenorphine was tested in rats for analgesic efficacy and plasma concentration over a 72-h time period. Rats were injected subcutaneously with either 1.2 mg/kg sustained-release formulation (Bup-SR), 0.2 mg/kg buprenorphine HCl (Bup-HCl), or an equivalent volume of sustained-release vehicle and tested in a thermal nociception model for a surgical postoperative pain model. In both models, Bup-SR showed evidence of providing analgesia for 2 to 3 d. Thermal latency response in rats that received the sustained-release formulation increased 28.4% and 15.6% compared with baseline values on days 1 and 2, respectively. Rats with a unilateral tibial defect and treated with Bup-SR showed similar willingness to bear weight on the hindlimbs as did negative-control animals (no surgery), demonstrated by counting vertical zippers; rats treated with Bup-HCl had significantly fewer vertical rises than did control rats for 2 d after surgery. Plasma concentrations of buprenorphine remained over 1 ng/ml for 72 h after a single dose of Bup-SR. Taken together, the results indicate that this formulation of buprenorphine may be a viable option for treating postoperative pain in laboratory rats.

Abbreviations: Bup-HCl, buprenorphine hydrochloride; Bup-SR, sustained-release formulation of buprenorphine.

Which of the following has not been reported as a side effect of buprenorphine?

- Body weight loss
- Body weight gain
- Pica
- Lack of efficacy compared to other opioids

Answer: b

Name these assays and what they measure:



Tail Flick Assay
Evaluates latency (time) to assess pain via tail flick due to thermal heat



Hot Plate Assay
Evaluates latency (time) to assess pain via paw withdrawal



Respiratory Rates and Arterial Blood-Gas Tensions in Healthy Rabbits Given Buprenorphine, Butorphanol, Midazolam, or Their Combinations

Carrie A. Schroeder and Lesley J. Smith^{1*}

The objective of this study was to evaluate the respiratory effects of buprenorphine, butorphanol, midazolam, and their combinations in healthy conscious rabbits. Six adult female New Zealand white rabbits were anesthetized briefly with isoflurane by mask to allow placement of a catheter into the central ear artery. After a 60-min recovery period, a baseline arterial sample was obtained. Animals then were injected intramuscularly with either 0.9% NaCl (1 mL), buprenorphine (0.03 mg/kg), butorphanol (0.3 mg/kg), midazolam (2 mg/kg), buprenorphine + midazolam (0.03 mg/kg, 2 mg/kg), or butorphanol + midazolam (0.3 mg/kg, 2 mg/kg). Arterial blood gases were evaluated at 30, 60, 90, 120, 180, 240, and 300 min after drug administration. All drug treatments caused significant decreases in respiratory rate, compared with saline. Buprenorphine and the combinations of midazolam–butorphanol and midazolam–buprenorphine resulted in statistically significant decreases in pO_2 . No significant changes in pCO_2 pressure were recorded for any treatment. Increases in blood pH were associated with administration of butorphanol, midazolam, and the combinations of midazolam–butorphanol and midazolam–buprenorphine. In light of these results, buprenorphine and the combinations of midazolam–buprenorphine and midazolam–butorphanol result in statistically significant hypoxemia in rabbits that breathe room air. The degree of hypoxemia is of questionable clinical importance in these healthy subjects. Hypoxemia resulting from these drug combinations may be amplified in rabbits with underlying pulmonary or systemic disease.

What is the mechanism of action of midazolam?

- Gamma-aminobutyric acid (GABA) agonist
- Dopamine agonist
- Mu agonist and Kappa antagonist
- Dopamine antagonist

Answer: A; Benzodiazepine

Journal of the American Association for Laboratory Animal Science
Copyright 2013
by the American Association for Laboratory Animal Science


Vol 53, No 2
March 2013
Pages 215-220

Pharmacokinetics of Oxymorphone in Titi Monkeys (*Callicebus* spp.) and Rhesus Macaques (*Macaca mulatta*)

Kristi R Kelly,^{1,2} Bruno H Pypendop,³ J Kevin Grayson,³ Scott D Stangle,³ Karl L Christie,^{1,4} Laura M Summers,² and Nicholas W Leitch²

Oxymorphone is a pure μ -opioid receptor agonist that is commonly used in nonhuman primate medicine and surgery to minimize pain ranging in intensity from moderate to severe. We compared pharmacokinetic profiles and physiologic and behavioral responses to oxymorphone between titi monkeys (*Callicebus* spp.) and rhesus macaques (*Macaca mulatta*). Titi monkeys ($n = 4$) and rhesus macaques ($n = 4$) were injected intravenously with either a bolus of 0.075 mg/kg oxymorphone or placebo on multiple occasions, with a minimal washout period of 7 d between trials. Blood collection was limited to no more than 3 samples per trial, with samples collected at multiple time points until 10 h after injection. Collection periods, animal order, and feeding day were randomized. In addition, macaques underwent single-oral collection at all time points to validate study design. A 2-compartment model best described the disposition of oxymorphone in both species. Clearance was faster in macaques than titi monkeys, in which terminal half-life was longer. Statistically significant physiologic differences were found between species and between treatments within species. Apart from these effects, oxymorphone did not significantly change physiologic parameters over time. After oxymorphone treatment, macaques demonstrated behaviors reflecting pruritis, whereas titi monkeys exhibited sedation. Despite its mild side effects, we recommend the consideration of oxymorphone for pain management protocols in both Old and New World nonhuman primates.

Name the Infraorder and what it is a model for:



Family: Cebidae
Subfamily: Callicebinae (Titi Monkey)
Model for: Hypercholesterolemia; Develops a ketosis-like syndrome

Journal of the American Association for Laboratory Animal Science
Copyright 2013
by the American Association for Laboratory Animal Science

Vol 53, No 2
March 2013
Pages 221-229

Maropitant Citrate for Treatment of Ulcerative Dermatitis in Mice with a C57BL/6 Background

Misty Williams-Frizzo,¹ Judi A Carlson Scholz,¹ Caroline Zeise,¹ Yanhong Dong,² Steven S Wilson,¹ Robert Franklin,¹ and Peter C Smith¹

Murine ulcerative dermatitis (UD) is a common progressive condition of mice with a C57BL/6 background. Typically, mice present with scales and crusts on the skin of the dorsal neck and ears, and are often severely pruritic. Animals tend to scratch the lesions, causing additional trauma to the already ulcerated and inflamed skin. Therapeutic intervention largely has been unsuccessful, in part due to the lack of a known cause for the disease. Though the exact etiology of UD has not been elucidated, substance P (SP) has recently been demonstrated as an important neuropeptide linked to the itch-scratch cycle. SP functions at the tachykinin neurokinin 1 (NK1) receptor. We hypothesized that inhibition of SP binding to the NK1 receptor would decrease the itch sensation, thus decreasing scratching behavior and subsequent skin trauma. The purpose of this study was to evaluate the effectiveness of an NK1 receptor antagonist, maropitant citrate, as a treatment for murine UD. Treatment with 1 mg/kg maropitant citrate significantly reduced the size of UD lesions in mice.

Abbreviations: NK1, neurokinin type 1; UD, ulcerative dermatitis.

What background of mouse commonly gets Ulcerative Dermatitis?
C57BL/6 !!!

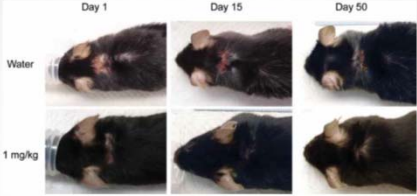


Figure 5. Typical progression of healing of UD lesions by treatment group.

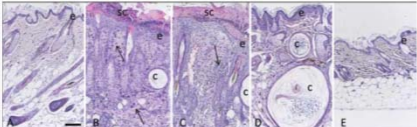


Figure 6. Representative histology from (A) normal, (B) water-treated (control), and (C) maropitant-treated (1 mg/kg) mice at 57 d. Changes include epidermal hyperplasia (e), acellular crusting (c), follicular cysts (f), and dermal inflammatory infiltrates (arrows). Hematoxylin and eosin stain, 50x.

Journal of the American Association for Laboratory Animal Science
Copyright 2013
by the American Association for Laboratory Animal Science

Vol 53, No 2
March 2013
Pages 227-247

Differences in Postsurgical Recovery of CF1 Mice after Intraperitoneal Implantation of Radiotelemetry Devices through a Midline or Flank Surgical Approach

Mark G Chappell,¹ Craig A Koellig,² and Shaman I Hall¹

Minimizing the pain or discomfort of research animals through refinement of surgical techniques is inherent in the humane use of animals in investigative studies. The current approach for intraperitoneal implantation of radiotelemetry devices in mice is a ventral midline incision. An optional surgical approach is a flank incision. We used multidimensional analysis to compare midline and flank approaches for implantation of radiotelemetry devices in regard to time of surgery, activity, temperature, food intake, gel intake, body weight, and vitality scores. A third group was used to evaluate the effects of buprenorphine in healthy mice. The study demonstrated positive benefits related to the flank approach, including quicker surgery times, improved activity levels, more stable temperature homeostasis, smaller losses in body weight, and quicker return to pre-surgical baseline levels of food intake. In addition, direct effects of buprenorphine included decreases in food intake and body weight, with the effects on body weight lasting approximately 7 d after treatment. Collectively, these results suggest that implantation of intraperitoneal radiotelemetry devices by using a flank approach is beneficial to mice.

Russell and Burch proposed a strategy (referred to as the Three Rs) for researchers to apply when designing experiments using animals. In this article, which principle best describes the experimental approach used by the investigators by simple alteration of the surgical approach?

- A. Relocation
- B. Reduction
- C. Replacement
- D. Refinement

Answer: D

In this paper, the authors maintained the ambient mouse room temperatures in a tight range, between 21.3 °C and 21.9 °C. Is this an acceptable dry bulb temperature per the Guide?

Answer: Yes

What is the Dry-Bulb Macroenvironmental temperature range for mice per the Guide?

Answer: 20-26°C

Characterization of Cardiac Time Intervals in Healthy Bonnet Macaques (*Macaca radiata*) by Using an Electronic Stethoscope

Haroon Kamran,¹ Louis Salcedo,¹ Sergei Pashilin,¹ Parag Kumar,¹ John Carter,¹ John Kim,¹ Carol Newberry,² and Jason M. Lopez¹

Nonhuman primates are used frequently in cardiovascular research. Cardiac time intervals derived by phonocardiography have long been used to assess left ventricular function. Electronic stethoscopes are simple low-cost systems that display heart sound signals. We assessed the use of an electronic stethoscope to measure cardiac time intervals in 10 healthy bonnet macaques (age 4–5.5) based on recorded heart sounds. Technically adequate recordings were obtained from all animals and required 1.5–1.8 min. The following cardiac time intervals were determined by simultaneously recording acoustic and single-lead electrocardiographic data: electromechanical activation time (QSI), electromechanical systole (QS2), the time interval between the first and second heart sounds (S1S2), and the time interval between the second and first sounds (S2S1). QS2 was correlated with heart rate, mean arterial pressure, diastolic blood pressure, and left ventricular ejection time determined by using echocardiography. S1S2 correlated with heart rate, mean arterial pressure, diastolic blood pressure, left ventricular ejection time, and age. S2S1 correlated with heart rate, mean arterial pressure, diastolic blood pressure, systolic blood pressure, and left ventricular ejection time. QSI did not correlate with any anthropometric or echocardiographic parameter. The relation S1S2/S2S1 correlated with systolic blood pressure. On multivariate analyses, heart rate was the only independent predictor of QS2, S1S2, and S2S1. In conclusion, determination of cardiac time intervals is feasible and reproducible by using an electrical stethoscope in nonhuman primates. Heart rate is a major determinant of QS2, S1S2, and S2S1 but not QSI; regression equations for reference values for cardiac time intervals in bonnet macaques are provided.

Abbreviations: CTI, cardiac time intervals; QSI, electromechanical activation time; QS2, electromechanical systole; S1S2, interval between first and second heart sounds; S2S1, interval between second and first heart sounds.

Name the Genus and Species:

Macaca radiata



JAALAS May 2011



Hematologic, Serologic, and Histologic Profile of Aged Siberian Hamsters (*Phodopus sungorus*)

Gabriel F. McKoon,¹ Claude M. Nagamine,¹ Norman F. Ruby,² and Richard H. Luong¹

Biologic samples from 18 (12 female, 6 male) Siberian hamsters (*Phodopus sungorus*) representing an aged colony (17 to 27 mo) were examined. Values for CBC and serum biochemical parameters were determined, and macroscopic and microscopic pathologic evaluations were performed. Blood urea nitrogen levels were significantly higher in male (54.2 ± 14 mg/dL) compared with female (35.3 ± 22 mg/dL). Hamsters and correlated histologically with a higher incidence of chronic glomerulonephropathy in males (5 of 6 males) than in females (1 of 12 females). All 18 hamsters had histologic evidence of follicular rite infection. Half (6 of 12) of the female hamsters showed cystic rete ovarii. Other histologic findings included thymic or thyroid branchial cysts (3 of 18), focal enteritis (2 of 18), and single cases of hepatic hemangiomas, renal adenoma, subcutaneous mast cell tumor, cutaneous sebaceous adenoma, cutaneous trichofolliculoma, squamous papilloma of the rugulular stomach, epidermal cholesteatoma, pyometra, and primary craniopharyngeal cyst. This study is the first published report of hematologic and serum chemical values for any population of Siberian hamsters and the first published report showing a potential male predisposition for chronic progressive glomerulonephropathy and a potential female predisposition for cystic rete ovarii.

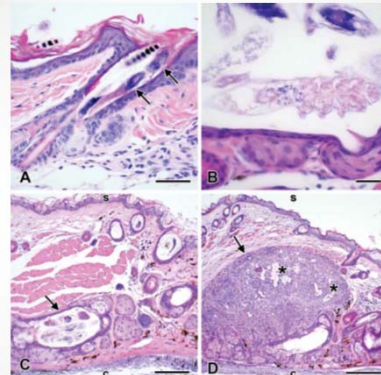
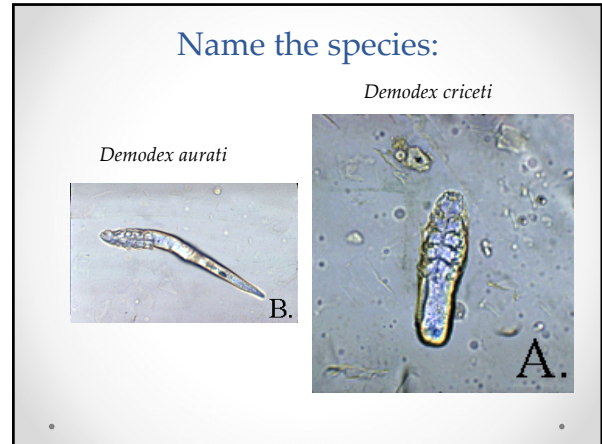
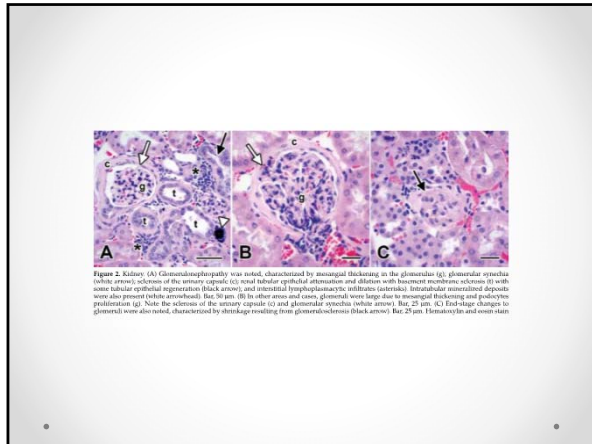


Figure 3. Histoid data. (A) Single to multiple parallel of adult mice (black arrows) were noted within the hair follicular lamina in sections of haired skin sampled from all locations of the body. (B) The rete ovarii were diagnosed (100 × CD) as long, and distended (4 panels) from the luteal, regressed, luteinized and likely regressing (luteal) corpus luteum. (C) Unusually in the rete ovarii, the hair follicles were dilated (black arrows) with many intraepithelial keratin cysts, and cystic degeneration. (D) Chronic pyometra (black arrows) contained aspirated hair follicles (black arrows) were present in the apical arch and contained degenerated rete-derived body parts (asterisks). (E) Fungal-like mycelia in a cranial connective tissue. (F) 200 × Immunohistochemical analysis.



According to the Animal Welfare Act, which animal is never allowed to be housed outside and is allowed to have feed on the floor?

A. Gerbil
 B. Hamster
 C. Guinea pig
 D. Rat

Answer: B

HAMSTER

HAM \rightarrow Histamine and Morphine RESISTANT

STER \rightarrow STERoid SENSITIVE

Journal of the American Association for Laboratory Animal Science
 Copyright 2011
 by the American Association for Laboratory Animal Science

Vol. 56, No. 3
 May 2011
 Pages 215-221

Cardiac Tissue Doppler and Tissue Velocity Imaging in Anesthetized New Zealand White Rabbits

Augusta Peloni,¹ Linda St John,² Jean Gaymer,² Danielle Ferguson,² Sandeep K Goyal,¹ George S Abela,¹ and Jack Rabinstein¹

New Zealand white rabbits are commonly used in cardiovascular research. Complete echocardiographic examination of the heart includes the evaluation of tissue Doppler (TDI) parameters, yet normal data are unavailable for rabbits. In addition, tissue velocity imaging (TVI) is a potentially useful measure of myocardial function that has not yet been applied to rabbits. Anesthetized New Zealand white rabbits ($n = 31$) underwent echocardiography to establish the feasibility of performing TDI and TVI and establishing corresponding reference values. Standard 2D, M-mode, and Doppler measurements were obtained in all rabbits and showed values comparable to previously published data. Interpretable TDI images were obtained in all 31 rabbits and TVI in 24 of 31 rabbits. The values obtained were similar to those seen in healthy cats and are comparable to the values found in adult humans. TDI and TVI can easily be added to standard echocardiographic evaluation in rabbits. The values from the current study, obtained in normal rabbits, can be used as reference values to improve characterization of cardiac disease in this species.

Abbreviations: a-wave, transmitral peak flow velocity during atrial contraction; A', peak late diastolic velocity of the wall at the mitral annulus; E-wave, transmitral peak flow velocity in early diastole; E', peak early diastolic velocity of the wall at the mitral annulus; E/A, ratio of transmitral flow; E'/A', ratio between early and late diastolic velocity of the wall; E/E', transmitral to early diastolic velocity ratios; S', peak systolic velocity of the wall at the mitral annulus; TDV, tissue Doppler imaging; TV, tissue velocity imaging.

Journal of the American Association for Laboratory Animal Science
 Copyright 2011
 by the American Association for Laboratory Animal Science

Vol. 56, No. 3
 May 2011
 Pages 123-125

Spontaneous Lesions in Aged Captive Raccoons (*Procyon lotor*)

Amir N Hamir¹

In nature, free-ranging raccoons typically do not live longer than 7; most raccoons in the wild die young due to accidents and diseases. Therefore, few data are available regarding lesions associated with advancing age in raccoons. This communication documents the lesions present in raccoons (7 male 3 female) that were older than 7 and had been used as breeders at a commercial facility in central Iowa. The most frequent microscopic lesions in these raccoons included accumulation of iron pigment in livers and spleens (10 of 10 animals evaluated), neuromuscular degeneration in caudal medulla (10 of 10), vascular mineralization (xanthoma body) on choroid plexus (9 of 10), myocardial inclusions (7 of 10), and cystic endometrial hyperplasia (2 of 3). Other conditions were seen with less prevalence. Except for the detection of gastritis with bacteria in the gastric mucosa of 3 raccoons, the presence of inflammatory cells in subconjunctival tissues, and the presence of Langerhans bodies in the brain of 1 animal, all conditions observed had previously been reported in raccoons. Surprisingly, islet-cell amyloidosis, previously observed as common incidental finding in older captive raccoons, was not seen in any of the raccoons we examined. Because free-ranging raccoons are distributed over wide geographic areas, their local environment may have considerable influence on the range of spontaneous lesions that would occur in raccoons obtained from a specific location. Therefore, the lesions found in these raccoons from central Iowa may differ from those of other raccoon populations.

What is the genus and species of the raccoon?

- A. *Procyon lotor*
- B. *Didelphis virginiana*
- C. *Octodon degus*
- D. *Mystromys albicaudatus*

Answer: A

Compare these stains:

H&E

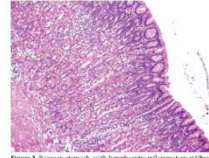


Figure 3 Raccoon stomach, with lymphocytic inflammatory infiltrate in the mucosa. Hematoxylin and eosin stain, magnification, 40x.

Silver Stain

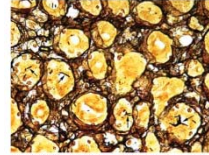


Figure 4 Raccoon stomach. Note the presence of rod-shaped bacterial (arrows) in the mucosal cells. Silver stain, magnification, 500x.

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol. 50, No. 1
May 2011
Page 152-159

Eliminating Animal Facility Light-at-Night Contamination and Its Effect on Circadian Regulation of Rodent Physiology, Tumor Growth, and Metabolism: A Challenge in the Relocation of a Cancer Research Laboratory

Robert T Dauchy,^{1,2*} Lynell M Duppe,² Tara G Ooms,² Erin M Dauchy,³ Cody R Hill,¹ Lulu Mao,¹ Victoria P Belancio,¹ Lauren M Slakey,¹ Steven M Hill,⁴ and David E Blank¹

Appropriate laboratory animal facility lighting and lighting protocols are essential for maintaining the health and wellbeing of laboratory animals and ensuring the credible outcome of scientific investigations. Our recent experience in relocating to a new laboratory facility illustrates the importance of these considerations. Previous studies in our laboratory demonstrated that animal room contamination with light-at-night (LAN) of as little as 0.2 lx at rodent eye level during an otherwise normal dark-phase disrupted host circadian rhythms and stimulated the metabolism and proliferation of human cancer xenografts in rats. Here we examined how simple improvements in facility design at our new location completely eliminated dark-phase LAN contamination and restored normal circadian rhythms in nontransgenic-bearing rats and normal tumor metabolism and growth in host rats bearing tissue-isolated MCF7/SR7 human breast tumor xenografts or ZR75.2CT rodent hepatomas. Reducing LAN contamination in the animal quarters from 26.5 ± 2.3 lx to undetectable levels (complete darkness) restored normal circadian regulation of rodent arterial blood melatonin, glucose, total fatty and linoleic acid concentrations, tumor uptake of ¹⁴C-glucose, total fatty acid and C/D₂ production and tumor levels of cAMP, triglycerides, free fatty acids, phospholipids, and cholesterol esters, as well as extracellular signal-regulated kinase, mitogen-activated protein kinase, serine-threonine protein kinase, glycogen synthase kinase-3β, histone H2AX, and proliferating cell nuclear antigen.

Abbreviations: 15-HODE, 15-hydroxyoctadecadienoic acid; pDNA, histone H2AX; AKT, serine/threonine protein kinase; ERK1/2, extracellular signal-regulated kinase; pH_i/6i, CNS3β; glycogen synthase kinase; Jβ, LAN; light at night; MCF, mitogen-activated protein kinase; PCNA, proliferating cell nuclear antigen; SPC, steroid receptor-negative.

What sensitive marker was evaluated in this study because it is sensitive to the effects of light on the circadian system in all mammals? Melatonin

According to the bluebook, what should the standard animal room door size be? 42" x 84"

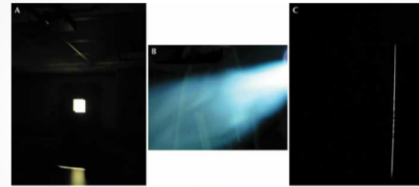


Figure 1. (A and B) Example of a traditional-design animal room door with translucent observation window and light-at-night contamination (LAN) exceeding 50 lx leading into the animal room. LAN contamination exceeding 10 lx around door frame, and modifications and improvements made to the animal rooms, including (C) removal of lighted equipment, (D) installation of door frame above seals, and covers with vinyl gaskets and anodized aluminum enclosures, and (E and F) exterior light-light curtains.

According to The Guide, what light level is sufficient for animal care and doesn't cause clinical signs of phototoxic retinopathy in albino rats? 325 lux (30-ft candles) approximately 1 m (3.3 ft) above the floor

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol. 50, No. 3
May 2011
Page 109-114

Effect of Sampling Strategy on the Detection of Fur Mites within a Naturally Infested Colony of Mice (*Mus musculus*)

Kelly A Metcalf Pate,^{1*} Kelly A Rice,¹ Roberta Wighters,² and Julie Watson¹

Fur mites are one of the most common ectoparasites of laboratory mice and traditionally are diagnosed through surveillance of individual colony animals. Although multiple diagnostic modalities exist, few recommendations suggest optimal testing methods, target colony populations, or sampling sites. We compared the fur pluck and sticky paper techniques for the diagnosis of *Myocoptes muscaulus* in naturally infested immunocompetent mice and evaluated the effect of mouse age and sampling site on the efficacy of fur plucks. We found that the sticky paper technique was more likely to detect fur mites than were fur plucks. Housing mice individually increased the incidence of false-negative fur pluck tests, whereas sensitivity was equivalent for preventing and adult mice. The ventral abdomen was the most likely single sampling location to detect evidence of any stage of *Myocoptes muscaulus*, but fur mite eggs were overrepresented on the neck. We found that the surface temperature of the murine neck surface was warmer than was the rump and therefore may represent a unique microenvironment for fur mite egg development. Given our findings, we recommend that group-housed adult or preweaning mice should be selected for *Myocoptes muscaulus* evaluation and that the ventral abdomen should be sampled. When possible, the postmortem sticky paper technique should be used rather than the antemortem fur pluck method.

Which of the following treatments for fur mites can be lethal in neonatal pups and genetically modified mice with defective blood-brain barriers?

- A. Ivermectin
- B. Moxidectin
- C. Selamectin
- D. Dichlorvos

Answer: A, B

This demonstrates the response of fur mites to a heat gradient:

Room Temperature

98.3 F

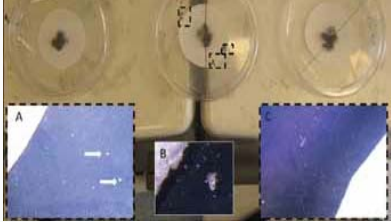


Figure 3. The response of fur mites to a heat gradient. (A) All 9 adult and nymph mites exposed to the heat gradient were found on the

Effect of a Short-term Fast on Ketamine-Xylazine Anesthesia in Rats

Maggie B Struck,¹ Karl A Andreati,¹ Harvey F Ramirez,¹ and August H Battles¹

Although ketamine-xylazine (KX) anesthesia is commonly used in rats, it is often reported to have an inconsistent anesthetic effect, with a prolonged induction time, an inadequate anesthetic plane, or a very short sleep time. Blood flow to the liver is known to shift after a meal in rats, perhaps explaining anesthetic variability among rats with variable granular status. The current study tested the hypothesis that a short period of fasting (3 hr) prior to induction with intraperitoneal KX anesthesia would provide a shorter time to recumbency, a longer total sleep time, and a more consistent loss of toe pinch response than would fed rats. Two groups of male Sprague-Dawley rats were used in blinded, crossover experiments. KX anesthesia was administered at 2 different doses (50 mg/kg + 7 mg/kg and 70 mg/kg + 7 mg/kg) after ad libitum feeding or a 3-h fast. There were no significant differences between groups in induction time, total sleep time, or loss of toe pinch response. We conclude that fasting rats for 3 hr prior to KX intraperitoneal anesthesia does not affect induction time, total sleep time, loss of toe pinch response or reduce KX anesthetic variability in male Sprague-Dawley rats.

Abbreviation: KX, ketamine-xylazine.

What DEA Schedule is Ketamine?

- A. Schedule I
- B. Schedule II
- C. Schedule III
- D. Schedule IV

Answer: C

High Doses of Ketamine-Xylazine Anesthesia Reduce Cardiac Ischemia-Reperfusion Injury in Guinea Pigs

Ruben C Sloan,^{1,2} Matthew Rosenbaum,² Debra O'Rourke,² Karen Oppedi,¹ Chad R Frasier,¹ Corinne A Watson,² Amanda G Allan,² and David A Brown^{1,2*}

Choosing an appropriate anesthetic protocol that will have minimal effect on experimental design can be difficult. Guinea pigs have highly variable responses to a variety of injectable anesthetics, including ketamine-xylazine (KX). Because of this variability, supplemental doses often are required to obtain an adequate plane of anesthesia. Our group studies the isolated guinea pig heart, and we must anesthetize guinea pigs prior to harvesting this organ. In this study, we sought to determine whether a higher dose of KX protected isolated guinea pig hearts against myocardial ischemia-reperfusion injury. Male Hartley guinea pigs (Crl:HA; 275 to 300 g, n = 14) were anesthetized with either of 2 doses of KX (60 mg/kg, X, 15 mg/kg or 120 mg/kg, X, 60 mg/kg). After thoracotomy, hearts underwent 20 min of ischemia followed by 2 h of reperfusion. The high dose of KX significantly reduced myocardial infarct size as compared with the low dose (50% ± 3% and 33% ± 6%, respectively). Furthermore, the high dose of KX improved hemodynamic function over that associated with the low dose as measured by increases in both left ventricular developed pressure (8 ± 4 and 10 ± 4 mm Hg, respectively) and maximal rate of left ventricular relaxation (-875 ± 70 and -576 ± 120 mm Hg/s, respectively). However, the high dose of KX did not alter the maximal rate of left ventricular contraction or coronary flow. These results suggest that supplementation of KX to ensure an adequate anesthetic plane may introduce unwanted variability in ischemia-reperfusion studies.

Abbreviations: KX, ketamine-xylazine; VT, ventricular fibrillation; VT, ventricular tachycardia.

Infarcted tissue is represented by the pale tissue and viable tissue is stained red.

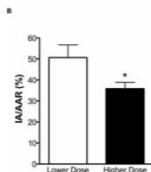
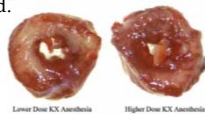
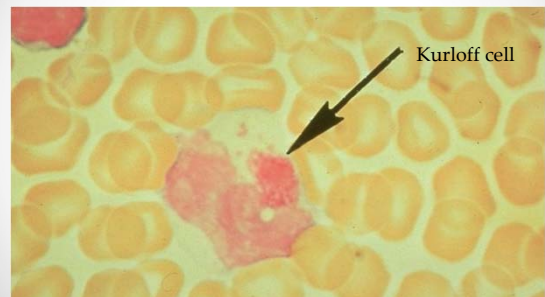


Figure 1. (A) Representative left ventricular guinea pig heart slices from low-dose (left) and high-dose (right) KX anesthesia groups. Infarcted tissue is represented by the pale tissue, and viable tissue is stained red. (B) Infarct size for all hearts in the study, expressed as percentage of the infarct area or area at risk (IA/AA). Data are shown as mean ± SEM, *P < 0.05.

What is this unique cell found in Guinea Pigs?



Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol 50, No 3
May 2011
Pages 557-560

Analgesic Effects of Meloxicam, Morphine Sulfate, Flunixin Meglumine, and Xylazine Hydrochloride in African-Clawed Frogs (*Xenopus laevis*)

Dendraz J Coble,¹ Douglas K Taylor,^{1,2} and Deborah M Moak^{1,2}

We evaluated analgesic use and analgesiometry in aquatic African-clawed frogs (*Xenopus laevis*). We used the acetic acid test (AAT) to assess the analgesic potential of systemic xylazine hydrochloride, meloxicam, flunixin meglumine, and morphine sulfate after injection into the dorsal lymph sac. Flunixin meglumine provided better analgesia than did the other drugs, most evident at 3 and 9 h after administration. Because the AAT was associated with the development of dermal lesions, we discontinued use of this assay and chose the Hargreaves test as an alternative method of measuring nociception in *Xenopus*. This assay is commonly performed in rodents, but its efficacy in an aquatic species such as *Xenopus* was unknown prior to this study. We found that the Hargreaves test was an effective measure of nociception in *Xenopus*, and we used it to evaluate the effectiveness of the nonopioid agents xylazine hydrochloride, meloxicam, and flunixin meglumine both in the absence of surgery and after surgical oocyte harvest. Similar to findings from the AAT, flunixin meglumine provided better analgesia in the Hargreaves test than did the other agents when analyzed in the absence of surgical intervention. Results were equivalent after oocyte harvest. Although surgical oocyte harvest is a common procedure in *Xenopus*, and currently there are no published recommendations for analgesia after this invasive surgery, future studies are needed to clarify the efficacy of nonsteroidal antiinflammatory drugs for that purpose.

Abbreviation: AAT, acetic acid test.

Name this instrument and what it measures:

Hargreaves apparatus;
Measurement of hyperalgesia to thermal stimulation


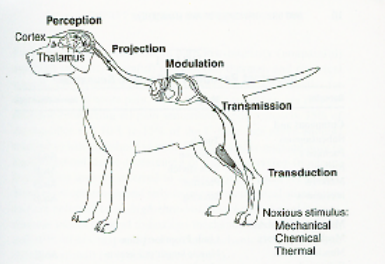


Figure 1. Photograph of the testing mechanism, including the Hargreaves apparatus, glass chamber, and *Xenopus laevis*.

What is Nociception?

It is the sensation of a noxious stimulus



Gaynor and Muir, 2002

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol 50, No 3
May 2011
Pages 561-565


Intestinal Resection and Anastomosis in Neonatal Gnotobiotic Piglets

Kristina S Mates,¹ Jill H Ayres,¹ Mojib Zhao,¹ John E Butler,² and David H Francis^{1*}

We describe a surgical method for ileal resection and anastomosis in newborn germfree piglets that was undertaken to establish a model that can be used for immunologic research and other applications. A preliminary experiment indicated that neonatal piglets with resection of approximately 60 cm of their ileum (removal of approximately 90% of the continuous ileal Peyer patches; group A) and those in which the ileum was transected (group B) could be maintained germfree for 35 d, colonized with defined gut flora, and maintained in a clean room until 70 d of age. In the final study, 12 piglets (4 each for groups A and B and 4 untreated controls), were monitored for postoperative feeding behavior, malaise, evidence for contamination with pathogenic bacteria, and weight gain. All surgical animals were free from incidental contamination from pathogens and environmental organisms with atypical colony types for 35 d. Two piglets in group B died postoperatively (1 during the preliminary experiment and 1 during the final study). Control (group C) piglets gained significantly more weight than did those in group A. These studies demonstrated that surgical resection of the ileal Peyer patches under germfree conditions can be accomplished successfully without compromising piglet health or introducing pathogens and with only a modest reduction in weight gain.

Abbreviation: I/P, ileal Peyer patches.

Gnotobiotic Isolator:



Gnotobiotic Incubator:




Figure 1. Housing. (A) Stainless steel gnotobiotic isolator, showing a single entry port with an inner and outer cover. All materials brought into the isolator are fogged twice with peracetic acid at 30-min intervals. Experimental animals are handled from the isolator by using the gloves attached to the plastic bubble. A filtered air-exchange system located at the rear end of the isolator is used to maintain the germ-free condition of the piglets (B). From view of the incubator where gnotobiotic piglet surgery was performed. The incubator was attached to the gnotobiotic isolator by using a transfer sleeve attached to the isolator port and the side port of the incubator. Arms (sleeves) located at the front and back of the incubator served as an opening to allow the surgeons to insert their hands and forearm to perform the surgery. Temperature inside the incubator was maintained at 37 °C throughout the surgery.

Which terms describes an animal that is born free of germs and then infected with known microorganisms?

A. Axenic
B. Gnotobiotic
C. Specific Pathogen Free (SPF)
D. Xenograft

Answer: B

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol. 50, No. 1
May 2011
Page 102-107

Performance and Longevity of a Novel Intraosseous Device in a Goat (*Capra hircus*) Model

Erin E Jackson,¹ T Clay Ashley, Karen F Snowden, Vincent C Gresham, Christine M Badke, Bunita M Eichelberger, and Doreity A Taylor

We performed 2 studies to assess the function and longevity of a novel intraosseous catheter device. For study 1, 9 goats were assigned to 3 groups (intraosseous catheter in the proximal humerus, intraosseous catheter in the proximal tibia, or standard jugular catheter). Devices in the tibia remained in place for less time than did those in the humerus, and no goats exhibited radiographic evidence of resulting damage or structural change in surrounding bone. Positive bacterial cultures were found in all 9 goats at various time points. In study 2, 18 goats were assigned to 2 groups (intraosseous catheter in the wing of the ilium or proximal humerus). Samples for aerobic and anaerobic blood cultures and CBC were collected while devices remained in use. Clinical monitoring and removal criteria were identical those for study 1. Catheters in the ilium remained in place for less than 24 h, on average, and those in the humerus remained in place for an average of 2.5 d. Several goats with proximal humeral catheters demonstrated moderate lameness after removal, and radiographic evidence of periosteal bone growth was noted in another goat. Bloodwork indicated mild elevations of WBC counts from baseline in some cases. Bacterial growth was found in samples from 4 of 18 goats at various time points. Our study indicated that intraosseous catheters may remain safely in place for more than 24 h, but animals should be monitored closely for negative side effects for several days after removal.

Lateral View of Proximal Humerus IO catheter Medial View of Proximal Tibial IO catheter

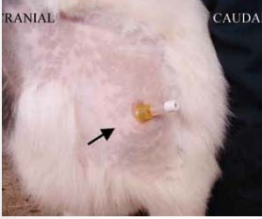




Figure 4. Lateral view of proximal humerus intraosseous catheter left leg. Arrow indicates the head of the catheter.

Figure 2. Medial view of proximal tibial intraosseous catheter left leg.

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol. 50, No. 1
May 2011
Page 17-20/27

Effects of Aging and Blood Contamination on the Urinary Protein-Creatinine Ratio in Captive Chimpanzees (*Pan troglodytes*)

Michael I. Lamney,¹ John J Ely,¹ Tony Zavakis,¹ Elaine Videan,¹ and Meg M Sleeper²

The initial goal of this study was to evaluate proteinuria by using the protein to creatinine (UPC) ratio of urine obtained by cytoreduction of healthy adult captive chimpanzees. Urine samples were collected by using ultrasonically-guided cytoreduction from 125 (80 male, 45 female) captive chimpanzees. All samples were collected over a 17-mo time period (August 2008 to January 2010) during the animals' annual physical examination. Samples were assayed at a veterinary diagnostic laboratory. Results indicated that both age and blood contamination affect the UPC ratio and therefore alter the diagnostic utility of the UPC ratio in chimpanzees. In addition, this research establishes reference ranges by age for the UPC ratio in healthy adult chimpanzees. Chimps younger than the median age of 24.6 y have a median UPC ratio of 0.098 (range, 0 to 1.76), whereas older animals have a median UPC of 0.288 (range, 0 to 2.40). Our results likely will enable veterinarians working with chimpanzees to better evaluate their renal function.

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol. 50, No. 1
May 2011
Page 108-114

Strategies to Prevent, Treat, and Provoke *Corynebacterium*-Associated Hyperkeratosis in Athymic Nude Mice

Holly N Burt,^{1,2*} Neil S Lipman,^{1,2} Julie R White,^{1,2} Junting Zheng,^{1,2} and Felix R Wald^{1,2}

Athymic nude mice infected with *Corynebacterium bovis* typically exhibit transient hyperkeratotic dermatitis. Our vivarium experienced an increased incidence of disease characterized by persistent skin lesions and increased mortality, leading to this study. For detection of infection, skin and buccal swab methods showed comparable sensitivities in nude mice. Various prevention, treatment, and eradication strategies were evaluated through clinical assessment, microbiology, and histopathology. In experimentally naive athymic nude mice, a 2-wk course of prophylactic amoxicillin-containing diet (1200 ppm amoxicillin; effective dose, 200 mg/kg) was ineffective at preventing infection or disease. There was also no significant difference in disease duration or severity in athymic nude mice that received amoxicillin diet or penicillin-streptomycin topical spray (penicillin, 2000 U/ml; streptomycin, 3500 U/g). Prolonged treatment with a 6-wk or 8-wk of amoxicillin diet cleared only a small number of athymic nude mice that had subclinical *C. bovis* infections. Antibiotic sensitivity of *C. bovis* isolates demonstrated a small colony isolate with less susceptibility to all antibiotics compared with a large colony isolate. Resistance did not appear to develop after prolonged treatment with amoxicillin. Provocation testing by administration of cyclophosphamide (50 mg/kg IP every 48 to 72 h for 96 d) to subclinically infected athymic nude mice resulted in prolonged clinical disease that waxed and waned without progression to severe disease. Our findings suggest that antibiotic prophylaxis and treatment of clinical disease in experimentally naive mice is unrewarding, eradication of bacterial infection is difficult, and severe disease associated with *C. bovis* is likely multifactorial.

Abbreviation: CAH, *Corynebacterium*-associated hyperkeratosis.

Clinical Appearance of *Corynebacterium*-associated hyperkeratosis

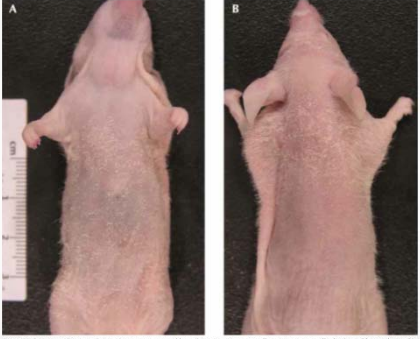
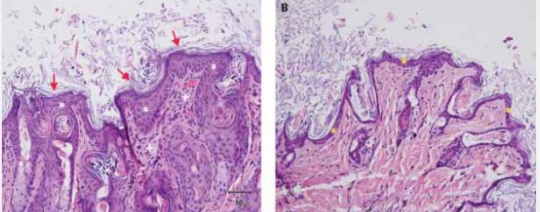


Figure 4. Clinical manifestation of *Corynebacterium*-associated hyperkeratosis. Experimentally naive mice typically display mild to moderate skin lesions (Grade 2 disease shown here) with white flakes adhered over the dorsum, ventrum, and around.

Remember, if see scaly skin think *C. bovis*!
If see cheesy lesions in lungs, think *C. kutscheri* (looks like Chinese letters)

Corynebacterium bovis



1. Skin, mouse. (A) Section of lesional skin demonstrating acanthosis (white asterisks, consistent with average epidermal cell thickness), hyperkeratosis (red arrows), and a mild infiltrate of lymphocytes and plasma cells with fewer mast cells and neutrophils in the superficial dermis (surrounding white crosses, consistent with inflammation score of 2). Hematoxylin and eosin stain; bar, 50 μ m. (B) Section of skin from the periphery of lesional skin, demonstrating relatively normal epidermal thickness (yellow asterisks) and paucity of infiltrar (black asterisks). Hematoxylin and eosin stain; bar, 50 μ m.

Pharmacokinetics of Cefovecin in Cynomolgus Macaques (*Macaca fascicularis*), Olive Baboons (*Papio anubis*), and Rhesus Macaques (*Macaca mulatta*)

Brigitte M Raabe,^{1,2} Jamie Lavaglia,^{1,2} Scott Green,² Scott A Brown,² Joseph F Bouches,² Yang Yuan,² Jacqueline R Civil,² Kimberly A Gillhouse,² Makoida N Stubbs,² Amber F Huggan,² Lisa C Halliday,² and Jeffrey D Forman²

Cefovecin sodium is a long-acting, third-generation, cephalosporin antibiotic approved for the treatment of skin infections in dogs and cats. The pharmacokinetic properties of cefovecin were evaluated in cynomolgus macaques (*Macaca fascicularis*), olive baboons (*Papio anubis*), and rhesus macaques (*Macaca mulatta*) by using a single-dose 8 mg/kg SC dosing regimen. Plasma cefovecin concentrations were determined by using ultra-performance liquid chromatography with tandem mass spectrometry, and a noncompartmental model was used to determine pharmacokinetic parameters. The half-life of cefovecin was 4.92 ± 1.17 h in cynomolgus macaques, 9.71 ± 1.81 h in olive baboons, and 8.40 ± 2.53 h in rhesus macaques. These values are considerably lower than the half-lives previously published for dogs (135 h) and cats (166 h). The extended half-life of cefovecin in dogs and cats is speculated to be due to active reabsorption of drug in the kidney tubules because plasma clearance is well below the normal glomerular filtration rate. In nonhuman primates, renal clearance rates approximated plasma clearance rates, suggesting that active renal reabsorption of cefovecin does not occur in these species. The pharmacokinetic properties of cefovecin in nonhuman primates are vastly different from the pharmacokinetic properties in dogs and cats, precluding its use as a long-acting antibiotic in nonhuman primates. This study highlights the importance of performing pharmacokinetic studies prior to evaluating drug usage.

Abbreviation: AUC, area under the drug concentration-time curve.

What is the mechanism of action of Cefovecin?

It is a 3rd generation cephalosporin that inhibits synthesis of bacterial cell wall leading to cell death

JAALAS
July 2011



Echocardiographic Evaluation of Cardiac Structure and Function during Exercise Training in the Developing Sprague-Dawley Rat

Reid Hayward¹ and Chiu-Ying Lien

Echocardiography is a widely used evaluation tool in cardiovascular research. Although rats are a common model in such research, normal echocardiographic values for young, developing rats have not been established. Furthermore, whether exercise during the developmental phase of the lifespan affects the structure or function of the heart is unclear. Male Sprague-Dawley rat pups (21 d) were assigned randomly to a nonexercise or voluntary exercise group for 12 wk. Echocardiograms were obtained before and at weekly intervals during the 12-week observation period. Maturation resulted in changes in many echocardiographically derived variables, whereas voluntary exercise failed to alter the development of cardiac structure or function. This study provides normal echocardiographic variables for developing male rats and provides evidence that exercise during the developmental phase of the lifespan has little effect on cardiac morphology and function as assessed by echocardiography.

Abbreviations: d, diastole; ET, ejection time; FS, fractional shortening; IVCT, isovolumic contraction time; relaxation time; LVd, left ventricular dimension; MPI, myocardial performance index; NEX, nonexercise; P, thickness; RWT, relative wall thickness; systole; SW, septal wall thickness; TVI, time velocity integral; V_{max}, ventricular shortening; VEX, voluntary exercise; V_{max}, maximal flow velocity; V_{mean}, mean flow velocity.



Fructosamine Reference Ranges in Rhesus Macaques (*Macaca mulatta*)

Misty J Williams-Fritze,¹ Peter C Smith,² Daniel Zeltman,² and Joeli A Carlson Scholz²

Naturally occurring diabetes mellitus (DM) is common in several species of Old and New World nonhuman primates. Fructosamine value provides important information about recent glycemic control and can be useful in the diagnosis and management of DM. However, despite an abundance of reports in the literature describing spontaneous and induced DM in monkeys, few reference ranges are available for fructosamine. Reference ranges have been published for woolly monkeys (*Leontideus genivittatus*), cynomolgus macaques (*Macaca fascicularis*), and stump-tail macaques (*Macaca arctoides*) but currently are not available for rhesus macaques. At our institution, DM is a common diagnosis in aging rhesus macaques. Here we report reference range for fructosamine in rhesus macaques. The overall range was 157 to 230 μmol/L, with male rhesus and macaques 159 or older having significantly higher values than do female rhesus and macaques younger than 10, respectively. This range provides clinical veterinarians with an additional tool for evaluating glycemic control in rhesus macaques.

Abbreviation: DM, diabetes mellitus.

T/F Type II diabetes is more common than Type I in nonhuman primates?

Answer: TRUE

Effects of Multimodal Analgesia on the Success of Mouse Embryo Transfer Surgery

John M Parke, Jamie Austin, James Wilkerson, and Larry Carlson¹

Multimodal analgesia is promoted as the best practice pain management for invasive animal research procedures. Universal acceptance and incorporation of multimodal analgesia requires assessing potential effects on study outcome. The focus of this study was to assess effects on embryo survival after multimodal analgesia comprising an opioid and nonsteroidal antiinflammatory drug (NSAID) compared with opioid-only analgesia during embryo transfer procedures in transgenic mouse production. Mice were assigned to receive either carprofen (5 mg/kg) with buprenorphine (0.1 mg/kg) CB or vehicle with buprenorphine (0.1 mg/kg) VB in a prospective, double-blinded, placebo-controlled clinical trial. Data were analyzed in surgical sets of 1 to 3 female mice receiving embryonic chimera for a shared targeted embryonic stem cell clone and host blastocyst cells. A total of 99 surgical sets were analyzed, comprising 199 C57BL/6 female mice and their 99 offspring. Neither yield (pups weaned per embryo implanted in the surgical set) nor birth rate (coverage number of pups weaned per dam in the set) differed significantly between the CB and VB conditions. Multimodal opioid-NSAID analgesia appears to have no significant positive or negative effect on the success of producing novel lines of transgenic mice by blastocyst transfer.

Abbreviations: CB, carprofen-buprenorphine; ES cell, embryonic stem cell; ET, embryo transfer; NSAID, nonsteroidal antiinflammatory drug; VB, vehicle-buprenorphine.

Which are not benefits of multimodal analgesia?

- A. Reduction in the dose of one or more individual drugs
- B. More effective analgesia
- C. Less 'breakthrough' pain
- D. Increase recovery time

Answer: D

According to this article, disruption of the gene for _____ results in failure of several female reproductive processes in mammalian species including ovulation, fertilization, blastocyst emergency, endometrial preparation, and implantation.

- A. COX1
- B. COX2
- C. COX1 and COX2
- D. Leukotriene

Answer: B

Mouse Reproduction Review

- Average life span-2.5 years
- Sexual maturity-7 weeks
- Estrous cycle-4-5 days
- Estrus-10 hours
- Ovulation-2-3 hours post estrus onset
- Gestation-19-21 days
- Weaning-10 grams bodyweight or 21 days
- Breeding life-8 months

What is IASP?

International Association for the Study of Pain

Journal of the American Association for Laboratory Animal Science
Copyright 2003
by the American Association for Laboratory Animal Science

Vol 52, No 1
July 2003
Pages 47-62

Superovulation Strategies for 6 Commonly Used Mouse Strains

Charlie Luo,¹ Juliana Zuniga,¹ Ennessa Edison,¹ Shana Palla,¹ Wenli Dong,¹ and Jan Parker-Thornburg¹

We examined different weight ranges and hormone dosages to determine superovulation protocols for 6 mouse strains commonly used in genetic engineering: C57BL/6Hsd, B6(Cg)-Tyr⁷⁹, B6D3F1Hsd, FVB/NHsd, BALB/cAnNCr, and C57BL/6J. Mice from each strain were divided into groups based on weight ranges corresponding to those of 3-, 4-, 5-, and 6-week-old mice. Mice were treated with 5 IU pregnant mare serum gonadotropin (PMSG) and 5 IU human chorionic gonadotropin (HCG). The weights of mice that produced maximal numbers of oocytes in response to these doses were 18.2 g or less for C57BL/6Hsd, 13.7 g or less for B6(Cg)-Tyr⁷⁹, 6.0 to 9.9 g for B6D3F1Hsd, 14.5 to 16.4 g for FVB/NHsd, 14.8 g or less for BALB/cAnNCr, and 23.5 g or more for C57BL/6J. We then compared PMSG dosages of 5 and 2.5 IU per mouse and determined whether 2 doses of PMSG (0 or 2.5 IU, depending on prior ovariectomy) administered 1 wk apart, followed by the standard HCG injection, would produce more oocytes when compared to a single dose of PMSG. FVB, B6D3F1, BALB/c, and C57BL/6 mice responded best to a single dose of 5 IU of each hormone, whereas B6(Cg)-Tyr⁷⁹ mice produced more oocytes after 2.5 IU PMSG. Although C57BL/6 mice given the standard dose produced good numbers of oocytes, the number was higher after 2 doses of PMSG at 5 IU per dose. We conclude that response to superovulation can be optimized based on mouse strain, weight, and the dose and timing of hormone injection.

Journal of the American Association for Laboratory Animal Science
Copyright 2015
by the American Association for Laboratory Animal Science

Vol. 56, No. 4
July 2015
Pages 475-485

Cage Change Influences Serum Corticosterone and Anxiety-Like Behaviors in the Mouse

Skye Rasmussen,^{1,3} Melinda M Miller,² Sarah B Filipiak,² and Ravi J Toivanen¹

Environmental variables and husbandry practices can influence physiology and alter behavior in mice. Our study evaluated the effects of cage change on serum corticosterone levels and anxiety-like behaviors in C57BL/6 male mice. We examined the effects of 3 different methods of performing cage transfer and of transferring mice to a clean or a dirty familiar cage micro-environment. The 3 different handling methods were forepaw transfer, gonite transfer with gloved hands, and a passive transfer technique that did not involve active handling. Active handling methods and transfer to both clean and dirty cage micro-environments significantly increased serum corticosterone (15 min after cage change); however, at 60 min after cage change, levels were comparable to those of unmanipulated mice. Although the effects were transient, cage change altered anxiety-like behaviors in the open field when behavioral testing was performed on the same day. These results demonstrate that the timing of cage change can influence behavioral results, an effect that is an important consideration for rodent behavioral studies.

According to this study, what has been used as a model of hypertensive stress in mice?

A. Feed Withdrawal
B. Cage Change
C. Water deprivation
D. Rack Position

Answer: B

What is the name of this assay?



Charli Tauma

Elevated Plus Maze

www.nature.com

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol. 50, No. 4
July 2011
Pages 419-427

Increased Juvenile and Adult Body Weights in BALB/cByJ Mice Reared in a Communal Nest

Kathleen M Heidenstadt¹ and David A Blizani¹

Both wild and laboratory mice and rats preferentially rear their young in communal nests and indiscriminately nurse any of the young within the nest. In this study, BALB/cByJ mice reared under communal nesting (CN) conditions (3 dams and their litters sharing a common nest) were compared with BALB/cByJ mice reared in single (one dam with her litter) nests (SN) in body weight from birth into adulthood, food and water intake and body composition were compared between adult mice. Compared with SN female mice, female CN mice measured only until weaning exhibited significantly higher body weights at postnatal days 11 and 28. Male CN mice were significantly heavier than were male SN mice at postnatal day 25 and at 20, 26 and 50 wk of age. There were no differences between adult male mice from CN and SN groups in 48-h food and water intake or body composition (total lean:total fat ratio, measured by quantitative MRI). In conclusion, BALB/cByJ mice reared under communal nesting conditions showed more robust juvenile growth rates than did mice reared with a single dam and litter per cage. In addition, body weights of male CN mice remained higher than male SN mice into adulthood.

Abbreviations: CN, communal nesting; PND, postnatal day; SN, single nesting.

According to The Guide 8th Edition, what are the space requirements for Female Mice and Litter?

TABLE 3.2 Recommended Minimum Space for Commonly Used Laboratory Rodents Housed in Groups^a

Animals	Weight, g	Floor Area/Animal, ^a in. ² (cm ²)	Height, ^b in. (cm)	Comments
Mice in groups ^c	<10	6 (38.7)	5 (12.7)	Larger animals may require more space to meet the performance standards.
	Up to 15	8 (51.6)	5 (12.7)	
	Up to 25	12 (77.4)	5 (12.7)	
	>25	≥15 (≥96.7)	5 (12.7)	
Female + litter		51 (330) (recommended space for the housing group)	5 (12.7)	Other breeding configurations may require more space and will depend on considerations such as number of adults and litters, and size and age of litters. ^d

According to the Animal Welfare Act, what amount of space do female mice and their litters require?

Mice, Rats, and Birds are NOT covered under the Animal Welfare Act!

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol 50, No. 4
July 2011
Pages 493-504

Effects of the Physical Form of the Diet on Food Intake, Growth, and Body Composition Changes in Mice

Lin Yan,¹ Gerald F Combs Jr,¹ Lisa C DeMas,¹ and LuAnn K Johnson¹

The present study investigated effects of the physical form of the diet on food intake, growth, and body composition in male C57BL/6 mice. Three-week-old mice were fed isocaloric diets (AINSG or a modification containing 35% wheat) in powdered or pelleted form. In experiment 1, mice were assigned into 4 groups offered the AINSG or the wheat-modified diet in powdered or pelleted form. In experiment 2, mice were pair-fed the powdered diets to the ad libitum level of food intake or those fed the pelleted form of the respective diets. Body weight, food intake, and fecal excretion were recorded, and body composition was assessed on mice 1 wk before termination of the experiment. Mice fed the powdered diets showed greater increases in body weight in 2 wk of feeding than did mice fed the pelleted diets. Compared with the pelleted diets, the powdered diets supported an approximately 85% increase in the fat-mass/body mass ratio and a 2-fold increase in the abdominal-fat-weight/total-weight ratio. In addition, mice fed the powdered diet showed significantly greater plasma concentrations of insulin and leptin and significantly lower plasma adiponectin, compared with their pelleted counterparts. Food intake of mice fed the powdered diet was 15% greater for the AINSG and 18% greater for the wheat diet compared with that of the respective pelleted diet. These results demonstrate that C57BL/6 mice responded to the physical form of these diets in terms of food intake, which affected their growth, body composition, and plasma concentrations of insulin and adipocytokines.

Which of the following are not a mouse model of obesity?

A. (DIO) C57BL/6J
B. *Lep^{ob}*
C. Ob/Ob
D. db/db

Answer: None; They are all models of obesity

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol 50, No. 4
July 2011
Pages 476-489

Eliminating Murine Norovirus by Cross-Fostering

Laurence U Bushman,^{1,2} Pierina C DeRitis,¹ Niansheng Chu,^{1,2} and Pierre A Conti¹

Murine norovirus (MNV) is a newly discovered and extremely prevalent pathogen of laboratory mouse colonies. MNV causes severe disease in some immunocompromised mouse strains and can cause persistent infections even in immunocompetent mice. Despite the fact that immunocompetent mice are generally asymptomatic, the possibility that MNV infection might alter immune responses makes its eradication a potentially useful goal for many facilities. Initial attempts by others to use a strategy of testing and culling were unsuccessful, whereas complete depopulation and facility decontamination was successful. However, these measures may be impractical, and finding less drastic approaches seemed prudent. Based on a report that cross-fostering of pups from MNV-positive mothers to MNV-negative ones could be successful in experimental MNV infection, we undertook a comprehensive fostering program using Swiss Webster mothers, careful sanitary measures, and fecal PCR testing to eradicate the virus from a mouse colony recently infected with MNV. We successfully decolonized 17 of 18 (94%) litters and managed to prevent spread when a new MNV-infected mouse strain entered quarantine at our facility. These results suggest that cross-fostering, when performed in a setting of excellent sanitary procedures, may be practical for the large number of mouse facilities in which MNV is endemic.

Abbreviations: MNV, murine norovirus; B6, C57BL/6.

Which of the following is a nonenveloped ssRNA virus?

A. Circovirus
B. Hepadnavirus
C. Herpesvirus
D. Norovirus

The others are DNA viruses:
'CHHAPPI' for
Circovirus
Hepadnavirus
Hepesvirus
Adenovirus
Parvovirus
Poxvirus
Papovavirus
Iridovirus

Answer: D

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol 50, No. 4
July 2011
Pages 505-506

Detection and Experimental Transmission of a Novel *Babesia* Isolate in Captive Olive Baboons (*Papio cynocephalus anubis*)

Mason V Reichard,¹ Kristene M Gray,¹ Ronald A Van Den Busche,² Jean M d'Offay,¹ Gary L White,² Christine M Simecka,² and Roman F Wolf¹

Babesia spp. are tick-transmitted apicomplexan hemoparasites that infect mammalian red blood cells. Our purpose was to determine the prevalence of *Babesia* infection in a colony of captive baboons and to evaluate potential experimental routes of the transmission of the hemoparasite. DNA was extracted from the blood of baboons and tested for infection with *Babesia* by PCR and primers that amplify the 18S rRNA gene of the parasite. The overall prevalence of infection of *Babesia* in the baboon population was 54% (73 of 135). Phylogenetic analysis of the sequenced DNA from 2 baboons revealed that the *Babesia* isolate found in captive baboons was a novel species most closely related (97% to 99%) to *B. leo*. Blood from a *Babesia*-infected donor baboon was inoculated intravenously, intramuscularly, or subcutaneously into 3 naive baboons. The intravenously inoculated baboon was PCR positive at 7 d after inoculation; the 2 baboons inoculated by other routes became PCR positive at 10 d after inoculation. All 3 baboons remained PCR positive for *Babesia* through day 31. Baboons experimentally inoculated with the new *Babesia* isolate did not exhibit clinical signs of babesiosis during the experiments. We demonstrated that captive baboons are infected with a novel *Babesia* isolate. In addition we showed that *Babesia* can be transmitted in the absence of the organism's definitive host ticks by transfer of infected blood through intravenous, intramuscular, and subcutaneous routes to naive baboons.

Figure 1. Blood smear from baboon IVBab at 10 dpi. The signet-shaped piroplasm is indicated by the arrow. Diff-Quik (Dade Behring, Deerfield, IL) stain; bar, 10 μ m.

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol. 51, No. 4
July 2011
Pages 507-512


Epidural Administration of Liposome-Encapsulated Hydromorphone Provides Extended Analgesia in a Rodent Model of Stifle Arthritis

Jennifer R Schmidt,¹ Lisa Krugner-Highy,¹ Timothy D Heath,² Ruth Sullivan,³ and Lesley J Smith²

Liposome encapsulation of opioids by using an ammonium-sulfate-gradient loading technique significantly slows the release time of the drug. This study evaluated the duration of analgesia in a rodent model of monoarthritis after epidural administration of liposome-encapsulated hydromorphone (LE-hydromorphone; prepared by ammonium-sulfate-gradient loading) compared with standard hydromorphone and a negative control of blank liposomes. Analgesia was assessed by changes in thermal withdrawal latency, relative weight bearing, and subjective behavioral scoring. Analgesia in arthritic rats was short-lived after epidural hydromorphone; increases in pain threshold were observed only at 2 h after administration. In contrast, thermal pain thresholds after epidural LE-hydromorphone were increased for as long as 72 h, and subjective anemesis scores were lower for as long as 96 h after epidural administration. Injection of LE-hydromorphone epidurally was associated with various mild changes in CNS behavior, and 2 rats succumbed to respiratory depression and death. In conclusion, LE-hydromorphone prolonged the duration of epidural analgesia compared with the standard formulation of hydromorphone, but CNS side effects warrant careful administration of this LE-hydromorphone in future studies.

Abbreviations: LE-hydromorphone, ammonium-sulfate-gradient-loaded liposome-encapsulated hydromorphone; CFA, complete Freund adjuvant.

Electric Von Frey



Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol. 51, No. 4
July 2011
Pages 513-515

An Effective, Economical Method of Reducing Environmental Noise in the Vivarium

Maggie T Young,^{1,2} Alan L French,² and Jeffrey W Clymer^{2,3}

High levels of ambient noise can have detrimental effects on laboratory animal wellbeing and may affect experimental results. In addition, excessive noise can reduce technician comfort and performance. This study was performed to determine whether inexpensive, passive acoustic noise abatement measures could meaningfully reduce noise levels. Sound level measurements for various activities were obtained in the incoming processing room for pigs before and after installing gypsum acoustic paneling, covering metal-to-metal contact points with strips of adhesive-backed rubber, and replacing hard plastic wheels on transport carts with neoprene wheels. The modifications reduced the overall average noise level by 8.1 dB. Average noise levels for each activity were all less than 85 dB after the modifications. Average noise levels can be reduced effectively and economically with passive abatement methods. Intermittent spikes in noise are more difficult to control and may require attention to the individual activity.

Abbreviation: SPL, sound pressure level.



Figure 1. Noise abatement tiles within the hogwash room.

According to OSHA, at what noise level are employees required to participate in hearing-conservation program that includes monitoring, audiometric testing, hearing protection, training and record-keeping?

A. 80 dBA
B. 85 dBA
C. 90 dBA
D. 95 dBA

Answer: B (Must participate in a hearing program but at 90 dBA, must use hearing protection).

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol. 51, No. 4
July 2011
Pages 106-112

Detection and Control of Mouse Parvovirus

James D Macy,^{1,2} Gail A Cameron,¹ Peter C Smith,³ Tracy A Ferguson,³ and Susan R Compton¹

Mouse parvovirus (MPV) remains a prevalent infection of laboratory mice. We developed 2 strategies to detect and control an active MPV infection over a 95-week period. The first strategy used a test-and-cull approach in 12 rooms. After all cages corresponding to MPV-seropositive bedding sentinels were removed from the room, a naïve sentinel mouse was dedicated to every 2 to 3 rows per rack and received soiled bedding from these rows every 2 wk. All 12 rooms completed 3 consecutive negative rounds of targeted testing, which required an average of 20 wk. The second strategy used a modified quarantine approach to test unique mice that were critical for breeding. The process required removing selected cages from the reproductive rack and consolidating them to a single rack within the same room. All mice in these cages were tested by using MPV serology and fecal PCR. Cages were not moved, opened, or manipulated between sample collection and the availability of test results. The cages were relocated as a group to another room, because all mice were MPV negative. The mice were retested 3 wk after the initial testing, and all were MPV seronegative. Since the rooms were cleaned 6 to 8 y ago, 7915 routine bedding sentinels and colony mice were tested from these rooms, all with negative results. These consistently negative MPV test results suggest that MPV was eliminated from these rooms, rather than driven down below the threshold of detection. These 2 strategies should be considered when confronting MPV infection.

Abbreviation: MPV, mouse parvovirus.

Minute Virus of Mice (MVM) is differentiated from Mouse Parvo Virus by serology to which protein?

- A. NS-1
- B. NS-2
- C. VP-1
- D. VP-2

Answer: D

JAALAS September 2011



Journal of the American Association for Laboratory Animal Science
Copyright 2011

Vol. 51, No. 5
September 2011
Pages 024-034

Measurement of Peripheral Arterial Vasculature in Domestic Yorkshire Swine by Using Quantitative Vascular Angiography

Vanessa C Lopes-Berka¹ and Michael A Jørgensen

Anatomic knowledge of the cardiovascular system, including arterial diameters and arterial segment lengths, is important for appropriate selection of animal size. Here we correlate the diameter and segment lengths of the femorotibial artery of Yorkshire swine with animal weight. Angiographic images were acquired by using fluoroscopic equipment, and quantitative vascular analysis software was used to measure the internal iliac, external iliac, external femoral, internal femoral, and circumflex femoral arteries. Results indicated that swine weight appeared to have a positive but moderate statistical correlation with arterial diameters, with the exception of the correlation between femorotibial arterial segment length and swine weight, which was low and sometimes negative. Morphometric data and correlation between animal weight and anatomic dimensional assessments can benefit preclinical researchers and the medical device industry, assisting them to determine their specific animal needs and allowing study design to be performed with a more realistic and educated approach.

Journal of the American Association for Laboratory Animal Science
Copyright 2011

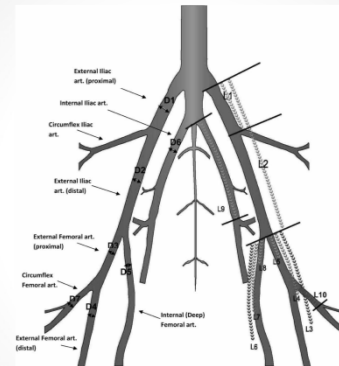


Figure 1. Peripheral arterial vasculature of the Yorkshire swine. External iliac art., proximal; D1, diameter (mm) of proximal external iliac artery; D2, diameter (mm) of distal external iliac artery; D3, diameter (mm) of proximal external femoral artery; D4, diameter (mm) of distal external femoral artery; D5, diameter (mm) of circumflex femoral artery; D6, diameter (mm) of circumflex iliac artery; L1, length (mm) of proximal external iliac artery; L2, length (mm) of distal external iliac artery; L3, length (mm) of proximal external femoral artery; L4, length (mm) of distal external femoral artery; L5, length (mm) of circumflex femoral artery; L6, length (mm) of circumflex iliac artery.

How is the swine model of atherosclerosis induced?

- Use a susceptible breed (Spontaneously Hypercholesterolemic pig)
- Balloon catheter damage to endothelial cells
- Feed a 2% cholesterol and fat-enhanced diet

What is the difference between swine versus human electrical activation of the heart?

In swine the endocardium and epicardium can be activated simultaneously versus in human activation spreads from endocardium to the epicardium.

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol 50, No 3
September 2011
Pages 17-24

Serum Clinical Biochemical and Hematologic Reference Ranges of Laboratory-Reared and Wild-Caught *Xenopus laevis*

Sabrina Wilson,¹ Stephen Feld,¹ Stephanie Torrealba,¹ Antwan Howard,¹ Colleen Bohan,¹ Robert Mauerhahn,¹ and Shari Green¹

The South African clawed frog *Xenopus laevis* and *X. tropicalis* are fully aquatic amphibians and well-established animal models. Because genetically engineered laboratory *Xenopus* are now being produced, the establishment of normal reference ranges for serum biochemical and hematologic parameters is essential for phenotyping and as a diagnostic aid. We determined normal reference ranges for hematologic values from 3 populations of *X. laevis*: wild-caught frogs ($n = 43$) and frogs from 2 commercial sources (A, $n = 16$; B, $n = 10$). For serum biochemistry, we determined normal reference ranges for frogs from source A and wild-caught frogs, divided by sex and season. Significant differences across populations were found in WBC and RBC counts, hemoglobin concentration, hematocrit, mean corpuscular hemoglobin concentration, and mean corpuscular volume. Among serum biochemical analyses, significant differences were found for albumin/globulin ratio, amion gap, and concentrations of albumin, globulin, total protein, lipase, alanine transaminase, γ -glutamyl transpeptidase, creatine phosphokinase (indirect, direct, and total bilirubin), cholesterol, low-density lipoprotein lipase, carbon dioxide, glucose, lactate dehydrogenase, calcium, chloride, and sodium. We hypothesize that these differences can be attributed to differences in water quality, habitat, ambient temperature, diet, sex, recent transport or shipment, and genetic background. However, testing that hypothesis is beyond the scope of the current study. In addition, clinical chemistry and hematologic reference range values *Xenopus laevis* are quite distinct from those for other species and are most consistent with the only values published for another fully aquatic amphibian, the Eastern hellbender (*Cryptobranchus alleganiensis*).

Xenopus is the most primitive of the advanced frogs. What family does it belong to?

A. Bufonidae
B. Pipidae
C. Ranidae
D. Plethronidae

Answer: B

What is the FETAX test and how long is it?

A. 48 hours, Frog Embryo Teratology Assay-Xenopus
B. 72 hours, Frog Embryo Teratogenesis Assay-Xenopus
C. 96 hours, Frog Embryo Teratology Assay-Xenopus
D. 96 hours, Frog Embryo Teratogenesis Assay-Xenopus

Answer: D

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol 50, No 3
September 2011
Pages 447-456

Effects of Age of Pups and Removal of Existing Litter on Pup Survival during Cross-Fostering between Multiparous Outbred Mice

Debra L. Hickman^{1,2} and Melissa P. Swan¹

Periparturient manipulation of mice is a valuable tool for modern research facilities. Although fostering and Caesarian section frequently are used to eradicate pathogens, an often overlooked one is to rescue poorly breeding strains of mice. Here we characterized the weaning success rates after fostering outbred pups of variable ages (younger than 24 h; 5 to 7 d; 10 to 12 d) with full or partial replacement of litters and multiparous dams. There were no significant differences between most groups when analyzed by full or partial replacement or age of donor pups as compared with control groups, in which pups were manipulated but returned to the birth dam or the birth dam was not disturbed. However, significant differences were associated with fostering of 10- to 12-day-old pups in combination with younger pups. Overall, these findings suggest that limiting fostering to pups that are within 48 h of age and age-matching litters when fostering are unnecessary.

Which of the following techniques have not been used to create new animal models, rescue existing lines, and eradicate diseases?

A. In vitro fertilization
B. Ovarian transplantation
C. Embryo transfer
D. Caesarian rederivation
E. Fostering

Answer: None of the above; They're all used!

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol 50, No 3
September 2011
Pages 647-652

Cage Change Intervals for Opossums (*Monodelphis domestica*) in Individually Ventilated Cages

Sarah O. Allison,¹ Jennifer M. Criley,¹ Ji Young Kim,² and Lyndon J. Goodly¹

The opossum *Monodelphis domestica* is the most commonly used mammalian in biomedical research. At our institution, these opossums are housed in polycarbonate (USA $n = 214$; $n = 178$ and) individually ventilated cages. Previous studies of the cage microenvironment of rodents housed in individually ventilated cages have demonstrated that the cage-change frequency could be extended from 7 to 14 d, without detriment to the animals' wellbeing. We sought to determine whether the cage change frequency for opossums housed in individually ventilated cages could be extended to 14 d. Opossums were placed into 3 experimental groups: singly housed males, singly housed females, and females housed with litters. The 14-d testing period was repeated twice, with temperature, relative humidity, and ammonia levels tested on days 0, 7, and 14. Acceptable ranges for the cage microenvironment were based on standards followed by our institution for housing rodents: temperature between 22 to 26 °C, relative humidity between 30% to 70%, and ammonia less than 25 ppm. Throughout both 14-d testing periods, temperature, relative humidity, and ammonia levels for singly housed male and singly housed female opossums were within acceptable ranges. However, ammonia levels exceeded the recommended 25 ppm on day 7 of both testing periods for female opossums housed with litters. In summary, the cage-change frequency for a singly housed opossum in an individually ventilated cage can be extended to 14 d.

Abbreviation: IVC, individually ventilated cage.

What is the genus and species for the Opossum? What research models has it been used for?

Monodelphis domestica

Growth of xenogeneic neoplasms
DNA repair mechanisms
Gene mapping
Dietary influences and genetic control of hypercholesterolemia
Ontogeny of the immune system

According to the Guide, what is the recommended temperature range and relative humidity for housing rodents?

- A. 20-26°C; 40-70%
- B. 22-26°C; 30-70%
- C. 18-26°C; 30-70%
- D. 20-26°C; 30-70%

Answer: D

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol 50, No 5
September 2011
Pages 60-69

Comparative Vibration Levels Perceived Among Species in a Laboratory Animal Facility

John N Norton,¹ Will I Kitand,² and Randall P Reynolds³

The current study was performed to determine the vibration levels that were generated in cages on a ventilated rack by common construction equipment in frequency ranges likely to be perceived by humans, rats, and mice. Vibration generated by the ventilated rack blower caused small but significant increases in some of the abdominal, thoracic, and head resonance frequency ranges (RFR) and sensitivity frequency ranges (SFR) in which each species is most likely to be affected by and perceive vibration, respectively. Vibration caused by various items of construction equipment at 3 ft from the cage were evaluated relative to the RFR and SFR of humans, rats, and mice in 3 anatomic locations. In addition, the vibration levels in the RFR and SFR that resulted from the use of a large jackhammer and were measured at various locations and distances in the facility and evaluated in terms of humans, rats, and mice in 3 anatomic locations. Taken together, the data indicate that a given vibration source generates vibration in frequency ranges that are more likely to affect rats and mice as compared with humans.

Abbreviations: FFT, fast Fourier transform; RFR, resonance frequency range; SFR, sensitivity frequency range.

What does ASHRAE stand for?

American Society of Heating, Refrigeration and Air-Conditioning

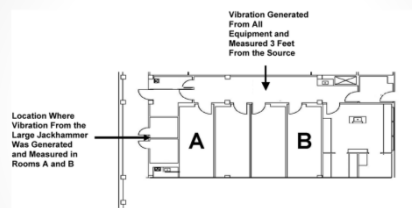


Figure 1. Physical plant configuration of vivarium module where vibration testing occurred. This module is 1 of 4 identical modules on the first floor of the animal facility, which is located at one end of a contiguous module. All modules on the first floor are at grade level. This facility has 4 floors, with the second floor having the same configuration as the first floor and the third floor having a smaller animal facility with laboratory space. The fourth floor is entirely nonanimal laboratory space.

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol 50, No 3
September 2011
Pages 60-69

A Computerized Data-Capture System for Animal Biosafety Level 4 Laboratories

Dennis A Bente,^{1,2} Jeremy Frisen,^{3,4} Kyle White,^{2,4} Jordan Koll,² and Gary P Kohinger¹

The restrictive nature of an Animal Biosafety Level 4 (ABSL4) laboratory complicates even simple clinical evaluation including data capture. Typically, clinical data are recorded on paper during procedures, faxed out of the ABSL4, and subsequently manually entered into a computer. This system has many disadvantages including transcriptional errors. Here, we describe the development of a highly customizable, tablet-PC-based computerized data-capture system, allowing reliable collection of observational and clinical data from experimental animals in a restrictive biocontainment setting. A multidisciplinary team with skills in containment laboratory animal science, database design, and software engineering collaborated on the development of this system. The goals were to design an easy-to-use and flexible user interface on a touch-screen tablet PC with nontransferable processes for recovery, full auditing capabilities, and cost effectiveness. The system simplifies data capture, reduces the necessary time in an ABSL4 environment, offers timely reporting and review of data, facilitates statistical analysis, reduces potential of erroneous data entry, improves quality assurance of animal care, and advances the use and refinement of humane endpoints.

Abbreviations: CADT, computerized animal data-tracking system; ABSL4, Animal Biosafety Level 4.

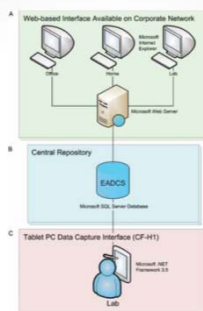


Figure 1. System infrastructure. The CADT has 3 components: (A) a secure, internet-accessible Web interface is used during the study planning and reporting steps. The experimental design and animal information is uploaded into the database at a workstation computer, which allows web-browser-based access in the database; (B) a SQL Server database engine acts as the central data repository for the system. The SQL server is the hub between the database, workstation, and tablet PC and (C) a custom-developed application is used during the capture of animal data within the ABSL4. Animal observations are recorded inside the ABSL4 on a tablet PC. These clinical data are gathered, the tablet PC is returned to its docking station and connects immediately to the server. Data from ongoing and completed studies can then be accessed through the web portal.



Figure 4. A tablet PC as an input device within the ABSL-4. (A) The graphic depicts the tablet PC being tested for factors such as touch, sensitivity, control, and placement, and color scheme. (B) A pole cart supports data input without the need for the operator to hold the device. Here the tablet PC, and cart are shown while factors like portability and maneuverability are available. On close to use the Another Pole cart (Athena, Boston, MA) because of its customizability. A port replicator (Cumber-Johnson, Stevens Point, WI) was designed to fit this particular model of tablet PC, which was easily removed to the cart.

Summary of Recommended Biosafety Levels (ABSL)

TABLE 1
SUMMARY OF RECOMMENDED BIOSAFETY LEVELS FOR ACTIVITIES IN WHICH EXPERIMENTALLY OR NATURALLY INFECTED VERTEBRATE ANIMALS ARE USED.

ABSL	AGENTS	PRACTICES	PRIMARY BARRIERS AND SAFETY EQUIPMENT	FACILITIES (RECOVERY BARRIERS)
1	Not known to occasionally cause disease in healthy adults.	Standard animal care and management practices, including appropriate medical surveillance programs.	Is required for normal care of each species.	Standard animal facility. • No restriction of access or disinfection air flow recommended. • Hand washing sink is available.
2	Associated with human disease. • Hazard: person-to-person exposure, ingestion, mucous membrane exposure.	ABSL-1 practice plus: • Limited access. • Restricted opening signs. • "Threat" precautions. • Routinely monitored. • Decontamination of all infectious wastes and of animal cages prior to washing.	ABSL-1 equipment plus primary barriers: • Containment equipment appropriate for animal species. • Laboratory coats, gloves, face and respiratory protection as needed.	ABSL-1 facility plus: • Accessible available. • Hand washing sink available. • Mechanical cage washer recommended.
3	Indigenous to exotic agents with potential for aerosol transmission. • Disease may have serious health effects.	ABSL-2 practice plus: • Controlled access. • Decontamination of clothing before handling. • Cages decontaminated before handling material. • Disinfectant foot bath as needed.	ABSL-2 equipment plus: • Containment equipment for handling animals and cage dumping activities. • Class II or III BSC available for manipulative procedures (dissection, necropsy) that may cause infectious aerosols. • PPE. • Appropriate respiratory protection.	ABSL-2 facility plus: • Physical separation from access corridor. • Self-closing, double-door access. • Sealed pressure. • Sealed roadway. • Accessible available in facility.
4	Disseminates agents that pose high risk of life-threatening disease. • Aerosol transmission, or related agents with unknown risk of transmission.	ABSL-3 practice plus: • Entrance through change rooms where personal clothing is removed and laboratory clothing is worn, then on leaving. • All items are decontaminated before removal from the facility.	ABSL-3 equipment plus: • Minimum containment equipment (i.e., Class III BSC or partial containment equipment at least in combination with full body, air-circulating protective garments personal (i.e., suits, hoods, gloves, etc.) that meet all for all procedures and activities.	ABSL-3 facility plus: • Separate building or isolated zone. • Dedicated supply and exhaust, vacuum and decontamination systems. • Other requirements outlined in the text.

Which Agent does not require work in a ABSL-4 level?

A. LCMV (Lymphocytic Choriomeningitis Virus)
B. Ebola Virus
C. Marburg Virus
D. Hantavirus

Answer: A (It is a ABSL-2 for studies in adult mice and ABSL-3 for studies with infected hamsters).

Note: * Hantavirus is ABSL-2 when working with experimentally infected rodent species but ABSL-4 when working with *Peromyscus maniculatus*).

Musculoskeletal Load in and Highly Repetitive Actions of Animal Facility Washroom Employees

Claudia Kiermayer,^{1,2} Ulrike M Hocher-Hückelid,^{1,2} Markus Bräuninger,¹ Mark Bräuning,² Rolf Ellergas,² and Jörg Schmidt¹

Journal of the American Association for Laboratory Animal Science Vol 50, No 5
Copyright 2011 September 2011
by the American Association for Laboratory Animal Science Pages 61-69

Regular work tasks in the washroom of laboratory animal facilities include cleaning of cages and bottles and handling of chow and bedding. These operations largely are carried out by hand. We quantitatively determined the musculoskeletal load on the trunk and upper limbs of washroom employees in an animal facility with a holding capacity of 25,000 rodent cages by using a computer-assisted, quantitative, recording, and long-term analysis (CUELA) system, which volunteers wore during routine work. Parallel video recording allowed exact assignment of each movement of body and limbs to the data recorded by the sensors. For the most part, trunk movements were associated with risk of injury. Evaluation of upper limb movements by CUELA indicated elevated burden on shoulder, elbow, and wrists due to the high repetitiveness and range of movements and postures. However, after additional work factors like low effort and the presence of microtraumas were taken into account, workers were not at risk for the development of musculoskeletal disorders of the upper limbs. Handling bottles, chow, and bedding and maneuvering trolleys that entail greater musculoskeletal load did not yield evidence of overexerting, because the actions typically were executed alternately and were of short duration during daily shifts. The results represent quantitative information on the musculoskeletal load of regular washroom operations in a laboratory animal facility. These data provide the basis for ergonomic redesign of operations and implementation of automation for highly repetitive movements.

Abbreviations: CUELA, computer-assisted, quantitative, recording and long-term analysis system; OORA, occupational repetitive action.

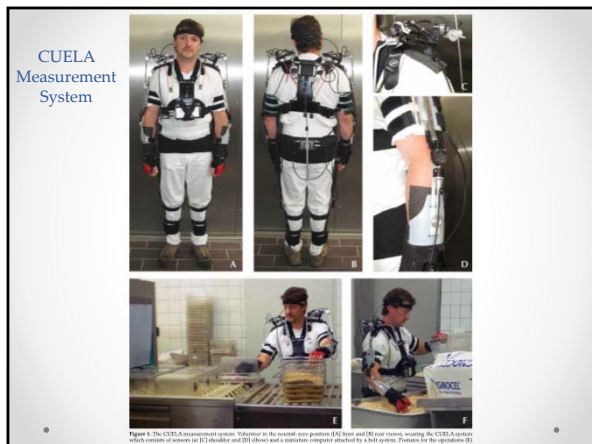


Figure 3. The CUELA measurement system. Volunteer in the recorded stop position. A) Front and B) Back view, wearing the CUELA system which consists of sensor on TU handle and TU elbow and extension component attached to a fish carrier. Photos for the operation of the system.

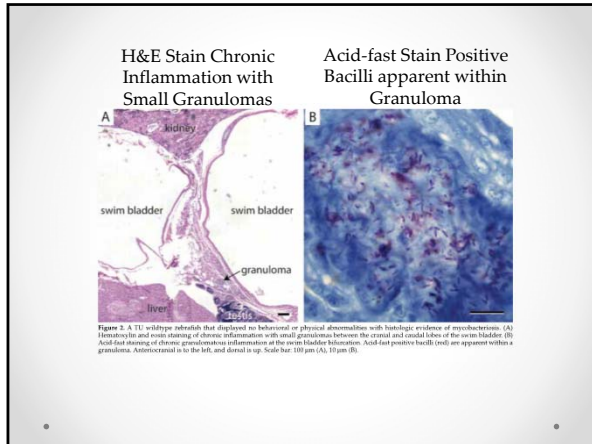
Characterization and Management of Asymptomatic *Mycobacterium* Infections at the Zebrafish International Resource Center

Kathrina N Murray,¹ Justin Baucus,¹ Ari Tallon,¹ Jennifer L Matthews,¹ Monte Westerfield,^{1,2} and Zoltan M Varga¹

Journal of the American Association for Laboratory Animal Science Vol 50, No 5
Copyright 2011 September 2011
by the American Association for Laboratory Animal Science Pages 69-73

The Zebrafish International Resource Center (ZIRC) supplies wildtype, mutant, and transgenic zebrafish (*Danio rerio*) to the international research community. In 2009, the ZIRC halted shipment of adult Tübingen (TU) zebrafish, a popular wildtype line, after diagnosis of asymptomatic *Mycobacterium chelonae* infections in a high proportion of the TU stock. *Mycobacterium chelonae* presents a zoonotic risk to fish handlers. In addition, the presence of underlying chronic disease in a model organism is unacceptable. The TU stock was depopulated and replaced by a new impact of TU with the intent of reducing disease prevalence. In the current study, we sampled the new population of TU and fish of the AB, Tupfel long-fin (TL), TABS and TAB14 (2 AB × TU hybrid lines), and wildtype-in-Kalkutta (WIK) lines for histologic evaluation and acid-fast staining and compared the prevalence of subclinical mycobacteriosis between these lines. Although prevalence in the new TU stock was lower than that of the original TU stock, asymptomatic infections with *Mycobacterium chelonae* remained high (80%) in the new TU stock held in 20-gal tanks. The prevalence was similar (80%) in the TABS line compared with other wildtype lines held in similar conditions. Prevalence of infections in TU can be minimized by husbandry adjustments, including tank size, population density, and cleaning method. Application of these findings has allowed us to decrease mycobacteriosis in TU zebrafish and resume shipment of TU adults to the research community.

Abbreviations: AB, wildtype line; TABS, TU × AB hybrid line; TAB14, TU × AB hybrid line; TL, Tupfel long-fin line; WIK, wildtype in Kalkutta line; ZIRC, Zebrafish International Resource Center.



Which type of *Mycobacterium* is associated with incidental infections in zebrafish?

- A. *M. chelonae*
- B. *M. marinum*
- C. *M. haemophilum*
- D. *M. lupinum*

Answer: A. *M. chelonae* (*M. marinum* and *M. haemophilum* are associated with outbreaks in zebrafish colonies).

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol 50, No 5
September 2011
Page 656-661

Effects of Weekly Blood Collection in C57BL/6 Mice

Brigitte M Raabe,^{1,2} James E Artwohl,¹ Jeanette E Puncell,¹ Jamie Lovaglio,^{1,2} and Jeffrey D Fortman¹

We assessed hematologic recovery, body weight, and behavior after serial blood collection in 10- to 14-wk-old C57BL/6 mice. Male and female mice (5 to 31 mice for pilot groups; 23 to 25 mice for full study groups) had either 15%, 20%, or 25% of their estimated total blood volume (TBV) collected once weekly for 6 wk. Except for those of the 25% TBV male pilot group, the weights of all mice recovered or increased from one collection to the next. The behavior of all mice, with the exception of the 25% TBV male pilot group, appeared normal throughout the study. Erythrogram values changed from baselines were analyzed at each weekly blood collection. Recovery was defined as the return of mean hemoglobin values to within 2 SD of mean baseline values. According to this definition, mice in the 15% TBV male group and 15%, 20%, and 25% TBV female groups recovered hematologically. To support the statistical definition of recovery, we compared our data with human anemia categories to assess the clinical relevance of the mouse hemoglobin values. On the basis of these data, we conclude that as much as 25% TBV can be collected once weekly from female mice for 6 wk, and as much as 15% TBV can be collected once weekly from male mice for 6 wk without producing weight loss, behavioral changes, or clinically significant anemia.

Abbreviation: TBV, total blood volume.

According to the Bluebook, which are acceptable methods for blood collection in rodents?

- A. Orbital sinus or plexus
- B. Cardiac puncture
- C. Tail vein
- D. Jugular or carotid vessels in fetal and newborns

Answer: All of the above

Fig. 2. Canine puncture site. A 20-gauge needle is inserted through the jugular vein of a 2-year-old beagle dog.

published in an associated journal (Am. J. Vet. Res. 1996; 57: 1065-1066; Parry et al., 1981; Sisson and Black, 1976; Long and Black, 1974; Stone, 1974). In our study, however, we found that the puncture work, eye muscle, and perineum (especially following blood sampling) are more sensitive to needle trauma without any formation following a single puncture. Our results following the procedure as shown were based (Odeh et al., 1992). The animal held on to the needle, and the operator had to use a 20-gauge needle to the animal. Lighter can be inserted into the muscle and the needle. Recovery occurs from the orbital sinus. The forelegs of the mice had to be held to pull the animal back and produce slight cephalization (Fig. 3). Usually a good respiratory rate or slower pulse is used to measure the animal's response and require

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol 50, No 5
September 2011
Page 661-664

Behavioral and Activity Assessment of Laboratory Mice (*Mus musculus*) after Tail Biopsy under Isoflurane Anesthesia

F Claire Hankenson,^{1,2} Gillian C Braden-Weiss,¹ and Julie A Blendy³

Contemporary laboratory animal guidance suggests that tail biopsy of laboratory mice can be performed before 21 d of age without anesthesia, whereas older mice must receive anesthesia before biopsy. Our objective was to determine whether administration of isoflurane anesthesia before tail biopsy produced a measurable effect on the behavior of mice for 3 d. We evaluated C57BL/6 and BALB/c mice at 21 to 24 (weaning), 28 to 31 (delayed weaning), and 42 to 45 (adult) d of age. Mice were observed at the time of biopsy and then twice within the first hour after a sham or tail biopsy. Anxiety-like responses were assessed by using an elevated plus-maze. Activity was evaluated remotely for 120 min. Isoflurane did not diminish acute responses to tail biopsy in mice 31 d or younger compared with sham-biopsied animals but had a significant effect in C57BL/6 biopsied adult mice. In addition, mice of all ages and strains that received anesthesia, regardless of biopsy, spent more time in the enclosed maze arms and had decreased activity up to 5 h after isoflurane exposure. Although tail biopsy should be performed in young mice to avoid transection of distal lumbar vertebrae, our experimental paradigm indicates that isoflurane anesthesia does not appreciably enhance well-being over that of mice biopsied without anesthesia at weaning ages. The influence of inhaled isoflurane was demonstrable and indicated that acute and prolonged alterations in anxiety and activity must be considered when interpreting the impact of anesthesia on tail biopsy across various ages and strains of laboratory mice.

Abbreviations: B6, C57BL/6; BALB, BALB/c; EPM, elevated plus-maze.

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol 50, No 5
September 2011
Page 664-671

Evaluation of the Aesthetics of Physical Methods of Euthanasia of Anesthetized Rats

Debra L Hickman^{1,2} and Steven W Johnson^{1,2}

Dissection of living brain tissue for *in vitro* experiments requires the use of a rapid euthanasia method. However, the method must not subject animals to unnecessary pain and must be aesthetically acceptable to experimenters. The purposes of the current study were to assess the aesthetics of euthanasia methods, monitor the procedure duration, and evaluate brain for pathology after each procedure. We digitally recorded euthanasia of isoflurane-anesthetized rats by 6 physical methods: anesthetic overdose, cardiac exsanguination, decapitation, closed intrathoracic transection of the great vessels and heart, thoracic puncture, and thoracotomy with rupture of great vessels. Volunteer researchers and animal caretakers watched the video and completed an associated questionnaire. Anesthetic overdose and cardiac exsanguinations were rated most aesthetically pleasing, although these procedures took the longest to complete. In contrast, decapitation and thoracic puncture were the least aesthetically pleasing, but these methods were the quickest. No demographic factor was identified that could predict whether a given euthanasia procedure would be favored for aesthetic reasons, and participants provided a wide variety of rationales for the aesthetic ratings they assigned. Although all of these euthanasia methods meet the criteria of approved methods of euthanasia of anesthetized rats as defined by the AVMA, aesthetic features and the scientific need for rapid euthanasia are both considerations in selecting a method.

According to the AVMA Guidelines on Euthanasia, define ideal euthanasia:

An ideal euthanasia is one that results in a rapid loss of consciousness followed by cardiac or respiratory distress and ultimate loss of brain function yet minimizes the distress and anxiety experienced by the animal.

According to the AVMA Guidelines on Euthanasia, what are Acceptable methods of euthanasia in rodents?

Species	Acceptable* (refer to Appendix 2 and text for details)	Conditionally acceptable† (refer to Appendix 3 and text for details)
Rodents and other small mammals	Barbiturates, inhaled anesthetics, CO ₂ , CO, potassium chloride in conjunction with general anesthesia, microwave irradiation	Methoxyflurane, ether, N ₂ , Ar, cervical dislocation (rats < 200 g), decapitation

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol 50, No 3
September 2011
Pages 124-127

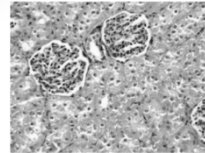
Using a Single Blood Sample and Inulin to Estimate Glomerular Filtration Rate in Rabbits

Yusuki Michigoshi,¹ Norio Yamagishi,^{2,3} Hisoshi Satoh,⁴ Masaki Kato,⁵ and Kazuhiko Furukama^{1,5*}

To establish a simple procedure for estimating the glomerular filtration rate (GFR) in conscious rabbits, we used the conventional multi-sample approach to develop a single-blood-sample method. A bolus injection of inulin was administered intravenously at a dose of 40 mg/kg to male New Zealand White rabbits, and blood was collected 30, 60, 90, and 120 min later. Serum inulin, urea nitrogen, and creatinine concentrations were determined. Using this multi-sample method, the reference GFR in clinically healthy rabbits was 4.01 ± 0.17 mL/min/kg (n = 17). In rabbits given an intravenous injection of the anti-tumor agent cisplatin, GFR fell before serum urea nitrogen and creatinine concentrations increased. Based on cumulative GFR data from healthy and nephropathy rabbits, the GFR obtained from the 3-sample method (30, 60, and 90-min samples) was closely correlated (r = 0.99) with that calculated from the estimated distribution volume and serum inulin concentration at 90 min after inulin injection in the single-blood-sample method. These results demonstrate that the single-blood-sample method supports sequential GFR measurements in rabbits and is a versatile procedure not only for research purposes but also in clinical settings.

Abbreviations: DN, distribution volume; GFR, glomerular filtration rate; UN, urea nitrogen.

Control Rabbit:
Administered Saline with
normal glomeruli and
proximal tubules



Experimental Rabbit:
Administered Cisplatin;
note severe necrosis of
proximal epithelial cells
with casts

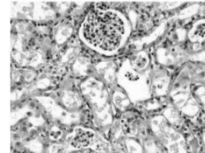


Figure 3. Representative histopathological findings of the kidney on day 3 in a rabbit given a single intravenous injection of 4 mg/kg cisplatin. (Bottom) Note the severe necrosis in proximal epithelial cells with casts. (Top) Rabbits given 0.9% saline solution in the same way as for cisplatin served as a control. Hematoxylin and eosin stain; magnification, 40x.

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol 50, No 3
September 2011
Pages 106-112

Assessment of Sterility in Fluid Bags Maintained for Chronic Use

Kristin A Matthews^{1*} and Douglas S Taylor^{2,3}

Fluid therapy is an integral component of standard supportive care in veterinary medicine and is often given subcutaneously for ease of administration. Multiple animals may be treated by using the same bag. These bags often are used repeatedly until they are empty or until a time specified by an IACUC or similar advisory group. This practice introduces the risk of contamination. Here we assessed the sterility of multiple-use fluid bags in the laboratory setting for a maximum of 60 d. Bags were manipulated to mimic infrequent and frequent use. Bacterial cultures of fluid and bag wall and assays for endotoxin and ATP activity were negative at all time points through 30 d. Two fluid samples yielded bacterial growth at 60 d, although all other tests were negative. These results suggest that fluid bags used chronically can be maintained in a sterile condition for a maximum of 30 d.

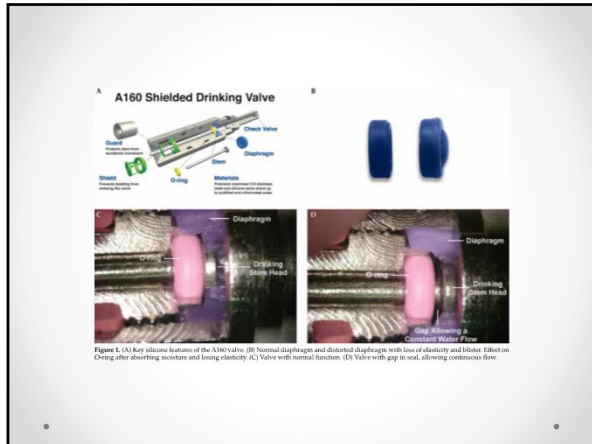
Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol 50, No 3
September 2011
Pages 774-779

Failure and Life Cycle Evaluation of Watering Valves

David M Gonzalez,¹ Sandy J Giaciano,¹ John Karfstad,² Mathias LeBlanc,¹ Tom Clark,² Scott Holmes,² and Jon D Reuter^{3*}

Automated watering systems provide a reliable source of ad libitum water to animal cages. Our facility uses an automated water delivery system to support approximately 95% of the housed population (approximately 14,000 mouse cages). Drinking valve failure rates from 2002 through 2008 never exceeded the manufacturer standard of 0.1% total failure, based on monthly cage census and the number of floods. In 2007, we noted an increase in both flooding and cases of clinical dehydration in our mouse population. Using manufacturer's specifications for a water flow rate of 28 to 50 mL/min, we initiated a wide-scale screening of all valves used. During a 4-mo period, approximately 17,000 valves were assessed, of which 2200 failed according to scoring criteria (12.9% overall; 7.2% low flow; 1.6% no flow; 4.1% leaky). Factors leading to valve failures included residual metal shavings, silicone flash, introduced debris or bedding, and most common distortion of the autocheck-vented diaphragm and O-ring. Further evaluation revealed that despite normal antiseptic conditions of heat, pressure, and steam, an extreme negative vacuum pull caused the valves' internal silicone components (diaphragm and O-ring) to become distorted and water-permeable. Normal flow rates often returned after a 'drying out' period, but components then reabsorbed water while on the animal rack or during subsequent antiseptic cycles to revert to a variable flow condition. On the basis of our findings, we recalibrated autovalves and initiated a preventative maintenance program to mitigate the risk of future valve failure.



According to The Guide, fill in the following with a should or a must:

Watering devices, such as drinking tubes and automated water delivery systems, Should be checked frequently to ensure appropriate maintenance, cleanliness, and operation.

Automated watering distribution systems Should be flushed or disinfected regularly.

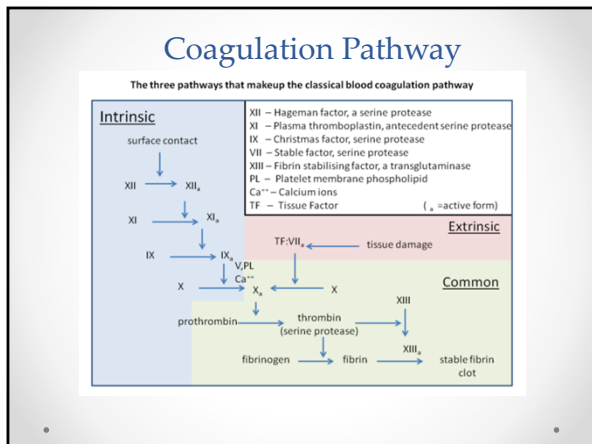


Determination of Plasma Fibrinogen Concentrations in Beagle Dogs, Cynomolgus Monkeys, New Zealand White Rabbits, and Sprague-Dawley Rats by Using Clauss and Prothrombin-Time-Derived Assays

Mehrab Ameri,^{1,2} Henry A Schnaars, John R Sibley, and David J Honor

The most widely used technique for determination of fibrinogen concentration is the Clauss fibrinogen (FIB_{CLAUSS}) assay, which measures the clotting time of plasma after addition of excess thrombin. More recently, the PT-derived fibrinogen (FIB_{PT}) assay has been developed, based on the relationship between fibrinogen concentration and the kinetics of clot formation during the prothrombin time. The objective of this study was to compare the fibrinogen concentration determined by the FIB_{CLAUSS} and FIB_{PT} assays in citrated plasma samples from healthy dogs (n = 40), monkeys (n = 40), rabbits (n = 20), and rats (n = 30) by using an automated coagulation analyzer. Results of a t test analysis indicated that the mean plasma fibrinogen concentrations measured by the 2 assays for all 4 species were significantly different. According to Pearson correlation coefficients, the FIB_{PT} assay displayed a high correlation (0.93 to 0.80) with the FIB_{CLAUSS} assay for all species. When the FIB_{CLAUSS} and FIB_{PT} assays were compared by using Bland-Altman regression, positive or negative constant and proportional biases emerged for all species. Intra- and interassay coefficients of variation for the FIB_{CLAUSS} and FIB_{PT} assays were 0.8% to 2.3% and 1.8% to 7.4%, respectively. In conclusion, the FIB_{PT} assay is a rapid and economical method for estimating fibrinogen concentration in plasma samples from dogs, monkeys, rabbits, and rats. However, it should not be used without restriction. Further studies are required to investigate the performance of this assay in animals with various pathologic states, including coagulopathy, dysfibrinogenemia, and hypo- or hyperfibrinogenemia.

Abbreviations: FIB_{CLAUSS}, fibrinogen concentration as determined by the Clauss assay; FIB_{PT}, fibrinogen concentration as determined by the prothrombin-time-derived assay.

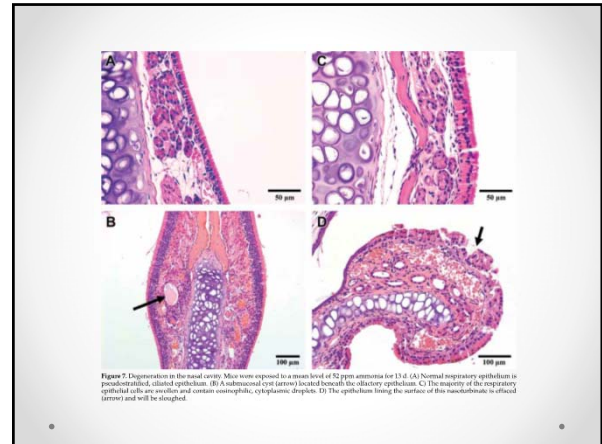
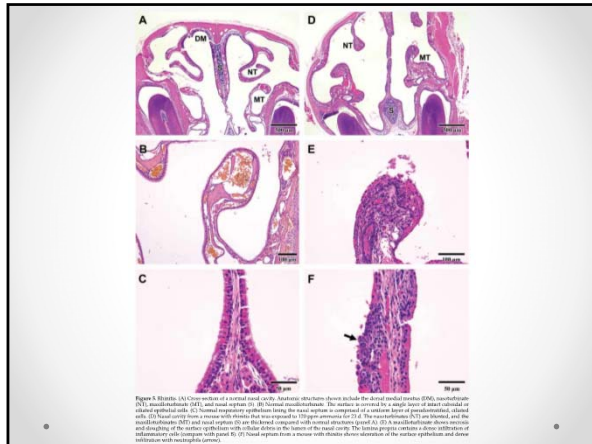


Effects of a 28-Day Cage-Change Interval on Intracage Ammonia Levels, Nasal Histology, and Perceived Welfare of CD1 Mice

Catherine M Vogelweid,^{1,2} Kathleen A Zapfen,¹ Matthew J Hingford,¹ Linghui Li,¹ Hua Li,¹ and Heather Marshall^{1,2}

We measured daily intracage ammonia levels and performed weekly assessments of CD1 male, female, and breeder mice housed within disposable, ventilated cages that remained unchanged for 28 d. We tested housing groups comprising 1, 3, or 5-matched mice per cage and breeder pairs with litters. Mice housed in cages with higher concentrations of ammonia developed degeneration and inflammatory lesions in the nasal passages. Mean ammonia exposure levels that caused rhinitis were 18 ppm for 18 d. Ammonia exposures of 93 ppm for 16 d caused necrosis of the olfactory epithelium, whereas 52 ppm for 33 d caused epithelial degeneration. Observers could not detect visible signs of rhinitis or identify cages with elevated ammonia levels, nor did they identify any sick or distressed mice. Observers consistently assigned poorer welfare scores as cages became dirtier. We conclude that we can extend the cage-change interval to at least 28 d for disposable, ventilated caging housing a single CD1 mouse. Cages containing 3 CD1 mice of either sex should be changed biweekly, and cages containing 5 CD1 mice or breeder pairs should be changed at least once weekly.

Abbreviations: IVC, individually ventilated caging; TWA, the 8-h time-weighted threshold limit value of 25 ppm of ammonia.



Which institute sets ammonia permissible levels at 50 ppm?

- A. NIOSH (National Institute for Occupational Safety and Health)
- B. ACGIH (American Conference of Governmental Industrial Hygienists)
- C. CDC
- D. OSHA

Answer: D

Journal of the American Association for Laboratory Animal Science
 Vol. 50, No. 6
 Copyright 2011
 by the American Association for Laboratory Animal Science
 November 2011
 Pages 17-40

Growing Male Rats in Individually Ventilated and Open-Top Cages

Nikolaos Kostomirovopoulos,^{1*} Iamene A Dantas,^{2,3,4*} Pavlos Alexakos,¹ Pavlos Lelovas,² Antonios Galanos,² Euthimios Panoussis,² Evangelos Balafoutis,² Konstantinos Paschidis,² and Alkiviadis Kostakias²

During the past few decades, the development and use of individually ventilated cages (IVC), which are now commercially available for housing laboratory mice and rats, have increased. Because limited information is available regarding the influence of caging systems on the growth of rats, the present study assessed body weight and food and water consumption in growing male rats that were housed in IVC and open-top cages (OTC). We allocated 21-d-old male Wistar outbred rats (Harlan Winkelmann, n = 240) into 2 groups, which then were housed in pairs in IVC (n = 12) and OTC (n = 12). After an 8-d acclimatization period, body weight and food and water consumption were assessed every 7 d until the rats were 94 d old. There were no significant differences between the body weights of rats housed in IVC compared with OTC over the 86-d observation period. Food and water consumption were greater in rats housed in OTC compared with IVC, becoming significantly different when the rats were 86 and 94 d old, respectively. In conclusion, IVC and OTC housing conditions influenced food and water intake but not body weight in growing male rats. Further research is needed to clarify the exact basis for these changes in food and water consumption.

Abbreviations: IVC, individually ventilated cages; OTC, open-top cages.

What is the Lobund-Wistar Rat a model for?

- A. Ovarian Cancer
- B. Mammary Cancer
- C. Prostate Cancer
- D. Uterine Cancer

Answer: C

Journal of the American Association for Laboratory Animal Science
 Vol. 50, No. 4
 Copyright 2011
 by the American Association for Laboratory Animal Science
 November 2011
 Pages 16-40

Manzanita Wood: A Sanitizable Enrichment Option for Nonhuman Primates

Kerith R Luchins,¹ Kate C Baker, Margaret H Gilbert, James L Blanchard, and Rudolf P Bohm

Wooden objects are often used as nonhuman primate enrichment to provide variety and novelty, promote exploratory behavior, and supply an outlet for curiosity. However, concerns have been raised regarding the ability to sanitize wood by using conventional cage-wash procedures. To address this concern, we examined sanitation outcomes between solid plastic toys and manzanita wooden manipulanda immediately after a cage-wash cycle. Both an ATP bioluminescence device, which is capable of providing an immediate assessment of sanitation levels, and traditional bacterial culture were used, with the secondary goal of comparing these methods for sanitation monitoring. Results showed that the wooden objects did not differ from plastic toys with respect to the overall efficacy of cage-wash sanitation. Therefore, manzanita wood can be used as nonhuman primate enrichment without risking pathogen transmission when items are rotated among animals.

Abbreviation: RLU, relative light units.

Manzanita wood includes evergreen shrubs and small trees found in northwestern North America.





Figure 1. Manzanita wood used as an enrichment device on the outside of a nonhuman primate cage.



What is the function of the above device?

It is an ATP detection device used to sample surfaces for organic matter and microorganisms.

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol. 50, No. 8
November 2011
Pages 988-994

Efficacy of 3 Types of Foraging Enrichment for Rhesus Macaques (*Macaca mulatta*)

Daniel H. Gottlieb,^{1,2} Stephanie Chirardo,¹ Darren E. Minier,^{1,2} Nicole Sharpe,^{1,2} Lindsay Tatum,¹ and Brenda McCowan^{1,2*}

Primate facilities provide environmental enrichment to improve animal well-being, increase opportunities for expression of species-typical behaviors, and decrease the occurrence of stereotypic behaviors. The current study assessed the efficacy of 3 types of foraging enrichment: puzzle balls, supertubes, and shakers. We assigned 48 rhesus macaques to 3 experimental groups, each of which received after a 2-wk baseline observation period 1 of the 3 enrichment devices intermittently for 3 wk. Observations were collected during 10-min sessions by using 10-s sampling with 15-s intervals (480 s total). Observations were collected at the same 10 specified time points each week during the baseline period and after enrichment. Data were analyzed by using generalized linear mixed-effects modeling under the assumption that the underlying response followed a Poisson distribution. Foraging behavior increased significantly in all 3 groups and remained increased in some groups when enrichment was removed after 43 h. The 3 enrichment devices had different effects on individual expression of stereotypy: supertubes decreased it, shakers increased it, and puzzle balls led to a decrease followed by an increase. We present potential reasons for the changes in stereotypy and postulate a likely balance between the beneficial and negative effects of enrichment in any given environment.

Vol. 50, No. 8
Journal of the American Association for Laboratory Animal Science
November 2011

Puzzle ball

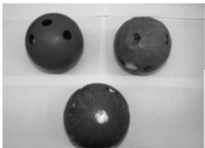


Figure 1. Puzzle ball enrichment devices.

Shaker




Figure 3. Shaker enrichment device.

Supertube




Figure 2. Supertube enrichment devices.

According to the Animal Welfare Act, what should the environmental enhancement plan for nonhuman primates address?

Social Grouping
Environmental Enrichment
Special Considerations
Restraint Devices
Exemptions

'SEERS'

According to the Animal Welfare Act, how often must the Attending Veterinarian review the exemption of NHP from the Environmental Enhancement Plan?

A. Every 30 days
B. Every 3 months
C. Every 6 months
D. Annually

Answer: A

Journal of the American Association for Laboratory Animal Science
Copyright 2011
by the American Association for Laboratory Animal Science

Vol. 50, No. 8
November 2011
Pages 956-960

Efficacy of Cleaning and Disinfection Procedures in a Zebrafish (*Danio rerio*) Facility

Rachel I. Garcia^{1*} and George E. Sanders^{2,3}

Appropriate cleaning and disinfection procedures in zebrafish (*Danio rerio*) laboratories are crucial in preventing the spread of aquatic animal pathogens and minimizing the build-up of waste products and biologic matter. The procedures selected should accomplish these goals and incorporate the individual needs of various laboratories. In this study of a single zebrafish facility, we assessed the efficacy of 2 different cleaning and disinfection procedures for nets, tanks, and lids. ATP levels were used as a surrogate biomarker for microbial burden. We measured the number of relative light units (RLU), as an expression of the amount of ATP present, on items before and after disinfection and calculated the percentage reduction. We compared daily replacement of a commercial net disinfection product in 1 lab with weekly replacement in 11 labs and found a 96.4% reduction in RLU in 11 labs and a 97.2% reduction in 1 lab. These results indicate that either replacement schedule is effective. Evaluation of tanks and lids soaked in a bleach disinfection bath for 30 or 60 min revealed a 99.7% reduction in RLU at 30 min compared with 97.3% at 60 min. Therefore a 30-min soak in a bleach bath achieved a similar level of disinfection as did a 60-min soak. The current results demonstrate that these cleaning and disinfection methods are efficacious.

Abbreviations: SOP, standard operating procedure; RLU, relative light unit; RO, reverse osmosis.

Opaque bucket used to hold nets and disinfection solution.



Figure 1. Opaque 5-gallon bucket used to hold nets and disinfection solution containing benzalkonium chloride and methylene blue. The lid is kept on the bucket when not in active use to decrease light exposure and minimize evaporation.

Opaque bin used to hold 1.98% bleach disinfection solution



Figure 3. Opaque bin used to hold the 1.98% bleach disinfection solution. The lid was kept on the bin when not in active use, to decrease light exposure and minimize evaporation.

What is this device?



Figure 2. Luminometer (NovaLum, Charm Sciences) with dry swab (PocketSwab, Charm Sciences).

Luminometer
(NovaLum,
Charm Sciences)
with dry swab
(PocketSwab,
Charm Sciences)

Nitrogen Cycle



Inclusion of Policies on Ethical Standards in Animal Experiments in Biomedical Science Journals

Sean A Rands

Most published biomedical research involving animal models is evaluated carefully to ensure that appropriate ethical standards are met. In the current study, 500 journals randomly selected from Medline were assessed for whether they presented animal research. Of the 138 journals that did, the instructions to authors of 85 (61.6%) included a requirement for author assurance of adherence to ethical standards during experiments involving animals. In comparison to a wider range of biologic journals, biomedical science journals were more likely to have some sort of ethical policy concerning the reporting and presentation of animal experiments.

Comparison of Traditional and PCR Methods during Screening for and Confirmation of *Aspiculuris tetraptera* in a Mouse Facility

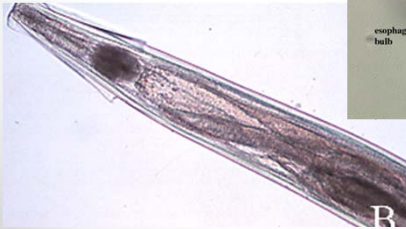
Vandana S Dale,¹ Julia Zain,² Danielle M Kyriopoulos-Cloasby,¹ Laila A Rama,¹
Linda L Walzman,² Kevin Sanders,² and Kenneth S Henderson¹

Pinworm detection in laboratory rodents typically is accomplished by using the tape test or various modifications of fecal flotation test to detect eggs. Direct examination of intestinal contents remains the 'gold standard' for pinworm detection, with the limitation of euthanasia of animals. Here, we compare traditional and real-time PCR methodologies during screening for and confirming the presence of *Aspiculuris tetraptera*. Two sets of pooled fecal samples collected from each of 521 microisolation cages in a mouse facility suspected to be pinworm-positive were tested by PCR and fecal flotation methods. The number of PCR-positive cages was 48 (9.2%) compared with 5 (0.96%) by the fecal flotation method. All of the cages determined to be positive by fecal flotation were positive by PCR. We evaluated 9 positive cages containing 26 mice from the screening group 5 wk later to confirm the initial findings; for 7 of these cages, PCR results from the initial screening were confirmed by fecal centrifugation concentration (FCC) or direct worm detection. Among the 26 mice, 4 were pinworm-positive by FCC, 5 by maceration, and 16 by PCR. All 4 mice positive by FCC were positive by PCR. PCR was positive for 7 of the 7 mice in which pinworms were detected by FCC or maceration. Our study demonstrates that real-time PCR for survival testing of mice for *A. tetraptera* effectively augments current detection methods for quarantine and routine health monitoring.

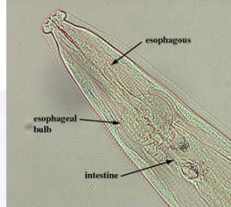
Abbreviation: FCC, fecal centrifugation concentration.

Identify this Pinworm

Aspicularis tetraptera (Note: Oval esophageal bulb).



Syphacia obvelata (Note: Round esophageal bulb).

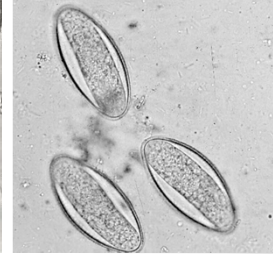


Note the difference in ova

Syphacia obvelata



Aspicularis tetraptera



What is the prepatent period for *Aspicularis tetraptera*?

- A. 19-21 D
- B. 21-23 D
- C. 21-25 D
- D. 23-25 D

Answer: C

Journal of the American Association for Laboratory Animal Science
Copyright 2011
By the American Association for Laboratory Animal Science

Vol 50, No. 6
November 2011
Pages 1050-1053

Use of *Beauveria bassiana* to Control Northern Fowl Mites (*Ornithonyssus sylviarum*) on Roosters in an Agricultural Research Facility

Matthew SW Rosette,¹ Elizabeth I Pierpont,² Tina Wahl,¹ and Mark Barnes^{2*}

Treatment of Northern fowl mite (*Ornithonyssus sylviarum*) infestation on poultry in research facilities can be challenging. The mite has a rapid reproductive cycle (egg to adult in 3 to 7 d), and chemical treatments can be toxic to birds, personnel, and the environment. In addition, antibiotic treatment may interfere with experimental research designs. The current study evaluated the efficacy of topical application of an entomopathogenic fungus, *Beauveria bassiana*, in the treatment of a naturally occurring infestation of Northern fowl mites in pen-housed roosters ($n = 16$ age, 18 mo). Two groups of 7 roosters each were used in 2 experiments: *Beauveria* (50 mL, 2.9×10^9 spores per liter) compared with water (50 mL, control), and *Beauveria* compared with the common topical organophosphate agent tetraethylpyrophosphorodichloride (50 mL). We also assessed a higher dose of *Beauveria* (50 mL, 2.9×10^9 spores per liter) in the 7 birds that were not exposed to tetraethylpyrophosphorodichloride. *Beauveria* reduced mite levels relative to the control group but did not outperform tetraethylpyrophosphorodichloride when used at an equal volume and frequency. Increasing the volume and frequency of *Beauveria* application improved outcomes such that visual inspection failed to detect any mites. The results presented here suggest that, when applied in sufficient doses, *Beauveria* effectively reduces mites on poultry and can be an important part of an integrated pest management program. Additional research is needed to document the most effective dose, frequency, and location of *B. bassiana* application to control Northern fowl mites in poultry.

Abbreviation: NFM, Northern fowl mite.

What is the genus and species of the Northern fowl mite?



Ornithonyssus sylviarum

Journal of the American Association for Laboratory Animal Science
Copyright 2011
By the American Association for Laboratory Animal Science

Vol 50, No. 6
November 2011
Pages 1049-1052

Effects of Early Atipamezole Reversal of Medetomidine-Ketamine Anesthesia in Mice

Naomi J Baker,¹ John C Schofield,² Mark D Caswell,² and Alexander D McLellan^{2*}

Rodents are often anesthetized by using ketamine and medetomidine, with reversal by atipamezole. Methods vary for times of administration of the atipamezole, and literature is lacking regarding appropriate reversal time. We investigated the recovery of mice reversed with atipamezole 30 min (early) or 60 min (late) after induction of anesthesia. Time to regain pinch-reflex or righting reflex did not differ between the 2 reversal points, but time to walking was significantly greater in mice that underwent early reversal with atipamezole. This delay was not mitigated by administration of atropine as part of the anesthetic regimen. Inclusion of acetylpromazine in the anesthetic regimen shortened the time needed to reach a surgical plane of anesthesia but also prolonged recovery times as determined by righting reflex and time to walking.

What class of drug is atipamezole?

- A. Opioid antagonist
- B. Opioid agonist
- C. α 2-adrenoreceptor antagonist
- D. α 2-adrenoreceptor agonist

Answer: C

Glucoregulatory Function in Adult Rhesus Macaques (*Macaca mulatta*) Undergoing Treatment with Medroxyprogesterone Acetate for Endometriosis

Christina L. Cruzen,¹ Scott T. Baum, and Ricki J. Colman

Endometriosis affects a large percentage of the rhesus macaques (*Macaca mulatta*) at our institution. When the disease is diagnosed in macaques on long-term research protocols, the treatment of choice in our facility is monthly administration of medroxyprogesterone acetate (MPA) to decrease estrogen release and subsequently diminish clinical signs associated with the disease. Because hormonal fluctuations associated with the normal menstrual cycle are known to affect parameters of glucoregulatory function in rhesus macaques, we evaluated the effect of MPA treatment on glucoregulatory function cross-sectionally for animals with endometriosis. Our hypothesis was that monthly administration of MPA for the treatment of endometriosis would negatively affect glucoregulatory function in rhesus macaques. We found that adult female rhesus macaques on MPA therapy for 1.4 to 36.1 mo had lower insulin sensitivity than did age- and weight-matched healthy control animals. In addition, glucoregulatory function was reduced after MPA treatment as compared with pretreatment levels in a group of 4 macaques. These data suggest that glucoregulatory function should be considered when endometriosis treatment is planned for rhesus macaques.

Abbreviations: FSIGTT, frequently sampled intravenous glucose tolerance testing; MPA, medroxyprogesterone acetate.

What is the most commonly used treatment for endometriosis in nonhuman primates?

- A. Exogenous progesterone
- B. Ovariectomy
- C. Ovariohysterectomy
- D. Gonadotrophin-releasing hormone antagonists

Answer: A (Medroxyprogesterone acetate MPA)

The primary risk of long-term MPA treatment in humans is an increased risk of osteoporosis.¹⁸ In 2004, the US Food and Drug Administration released a health alert¹⁹ stating that the use of MPA as a contraceptive has been associated with "the loss of significant bone mineral density"¹⁸ and that this risk increases with duration of use and may not be reversible.¹⁷ This risk may be due to a loss of stored calcium¹⁸ or a delay in peak bone mineralization.¹⁸ Both can lead to osteoporosis and osteoporotic fractures later in life, even if MPA treatment is discontinued.¹⁸ The alteration of glucose levels is listed as an unreferenced side effect in the package insert for MPA.¹⁸ Multiple studies in women being treated with MPA have noted various alterations in glucoregulatory function that have been incidental due to sample size or population variation.²⁰⁻²⁴ In addition, these findings suggest that patients with diabetes mellitus may require more intensive monitoring when on MPA and that even a single dose may affect glucose control in confirmed diabetics.²⁵ Given all these findings, we assessed the effects of MPA administration on glucoregulatory function in a cohort of female rhesus monkeys housed at our facility.

Application of the Diagnostic Evaluation for Alopecia in Traditional Veterinary Species to Laboratory Rhesus Macaques (*Macaca mulatta*)

Kerith R. Luchins,¹ Kate C. Baker,² Margaret H. Gilbert,¹ James J. Blanchard,¹ David Xianhong Liu,¹ Leann Myers,¹ and Radolf P. Bohm¹

Alopecia in nonhuman primates in the biomedical research setting is often attributed to compromised psychologic wellbeing. Behavioral causes, mainly hair plucking, have become the unconfirmed and exclusive default diagnosis, and the possibility that alopecia may be secondary to a primary medical or dermatologic disease is often overlooked. Although nonbehavioral causes of alopecia in nonhuman primates are described in the literature, few prospective hypothesis-based studies have investigated medical and behavioral etiologies concurrently. We therefore undertook a study with the aim of designing a clinical diagnostic guide for approaching cases of alopecia in nonhuman primates in the literature and at our facility as not associated with a definitive diagnosis. The hypothesis we tested was that the well-established diagnostic evaluation for alopecia used for traditional veterinary species is not applicable to nonhuman primates. Discounting differences in histopathology and behavioral assessment, the current study revealed few clinically relevant significant differences between nonhuman primates with and without alopecia. As a result, our hypothesis was confirmed, and we conclude that the standard dermatologic diagnostic plan typically described for alopecia diagnosis in traditional veterinary species and used as the basis for assessment of alopecia in nonhuman primates should be reassessed.

Abbreviations: ACTH, adrenocorticotropic hormone; FT3, free triiodothyronine; FT4, free thyroxine; NS, nonsignificant; T3, total triiodothyronine; T4, total thyroxine; TSH, thyroid stimulating hormone.

Alopecia Scoring System

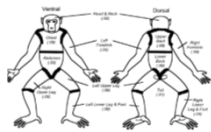


Figure 2. The National Primate Research Center Behavioral Management Consortium Alopecia Scoring System divides the body into 11 body parts by using a modified Rule of Nines as a guide.¹⁷ The tail accounts for 1% of the surface area and is only considered in border-line cases.

Alopecia Score: 0

Alopecia score	% Alopecic	% Control
0	0	53.8
1	0	46.2
2	0	0
3	87.2	0
4	12.8	0
5	0	0



Figure 3. Photograph of the dorsum of an animal with an alopecia score of 0.

Alopecia Score: 4



Figure 4. Photograph of the dorsum of an animal with an alopecia score of 4.

According to this article, what are etiologies of alopecia in traditional veterinary species?

Behavioral:

Hair plucking

Environmental:

Seasonal Shedding
Heat Stress
Erythema ab igne

Medical:

Androgenetic alopecia
Senescent balding
Immune-mediated (Alopecia areata, atopic dermatitis)
Parasitic (*Demodex*, *Sarcoptes*)
Hormonal (Hypothyroidism, Hyperadrenocorticism, Telogen effluvium)
Nutritional (Vitamin A, Zinc, Folate, Protein) Deficiencies
Fungal, Secondary Bacterial

Amniotic Fluid Volume and Composition after Fetal Membrane Resection in Late-Gestation Sheep

Robert A Brage^{1,2} and Cecilia Y Cheung^{1,2}

The chronically catheterized fetal sheep is a widely used model for fetal physiologic and pathophysiologic investigations. Catheterization involves opening the amniocentesis to gain access to the fetus. In the current study, we explored the role of the amnion and amniocentesis in maintaining normal amniotic fluid volume (AFV) and composition and fetal blood gas status after surgery. Fetal sheep were catheterized at 119.6 ± 0.3 (mean ± SE, n = 29) d gestation term, approximately 147 d. An opening equal to approximately 8% of total membrane surface area was created by resecting a portion of the amnion or amniocentesis during surgery. The uterine wall was closed in all animals. Compared with control sheep (AFV = 992 ± 153 mL, n = 13), resection of the amnion had no significant effect on AFV (925 ± 156 mL, n = 7) measured 5 d after surgery, whereas resection of the amniocentesis resulted in extensive loss of amniotic fluid (AFV = 131 ± 38 mL, n = 7). This loss resulted from extensive entry of amniotic fluid into the space between the chorion and uterine wall. Amniotic fluid, fetal plasma, and urinary solute concentrations, arterial pH, oxygen tension, and carbon dioxide tension were unchanged. A small opening in the amnion has minimal effects on ovine AFV, whereas a small opening in the amniocentesis results in oligohydramnios. In addition, the amnion appears to be the primary site that limits the rate of amniotic fluid absorption by the chorionic vasculature.

Abbreviations: AF, amniotic fluid; AFV, amniotic fluid volume; ANCOVA, analysis of covariance.

According to the Blue Book, sheep (*Ovis aries*) are used as for what types of research models?

- Applied fetal and reproductive research
- Circadian rhythms related to day length
- Dubin-Johnson syndrome (congenital hyperbilirubinemia/hepatic organic anion excretory defect)-Corriedale breed
- Wilson's disease (Copper poisoning)
- All of the above

Answer: E

GOOD LUCK!!!



Coralie Zegre Cannon,
DVM, DACLAM

Laboratory Animal Medicine
Veterinary Consultant



Phone: (919)622-0873
Email: cazvet@yahoo.com