

Topics in Laboratory Animal Medicine

2010 ILAR Review
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Teaching you to fish...

- Teaching you to look for and think about possible board exam questions is better than unlikely “demo” questions
- This review highlights study techniques, points out ILAR info, and asks questions from 2010 ILAR journals

Adult Learning

Adults consistently use the following six learning strategies:

- (1) prior experiences
 - (2) conversations
 - (3) metacognition (i.e., self- assessment and self-correction)
 - (4) reflection
 - (5) authentic experiences
 - (6) images, pictures, or other types of visuals
- Reference: (2007) **ILAR Journal Volume 48(2)**

Yikes! So many journal articles!!!

- What is testable?
 - ACLAM won’t ask you questions if the correct answers haven’t been published at least twice....
- Where do you find testable material?
 - Title
 - (Buried?) In the article
- ILAR: Review Articles, Commentary
- Skim articles effectively
- Use pictures effectively

What you **don’t** need to know (for the test)

- Opinions
- Commentary
- Misc. info
 - Animal housing at U Penn
 - What someone “did” about an outbreak
- ILAR contains a lot of commentary and stories
- Valuable info is present but usually buried within the article

“Skim” ILAR articles effectively

- Title
- ILAR Section titles
- Background info: Find it!
 - it is in there somewhere
- Summaries/conclusions
- Pictures (not many in ILAR)

Study tip:

Photocopy Important pictures

- On the back of the picture, write in pertinent info to refer too – fast and easy and cheap!
- Tape them to the refrigerator 😊
- Your spouse and roommate really appreciate pictures of parasite eggs taped to the fridge!

ILAR: 2010 Topics

- Regenerative Medicine: From Mice to Men
- Disaster Planning and Management
- One Health: The Intersection of Humans, Animals, and the Environment
- Birds as Animal Models in the Behavioral and Neural Sciences

What seems important for you?

Where will you spend your quality study time?

- **Regenerative Medicine:** From Mice to Men
- **Disaster Planning and Management**
- **One Health:** The Intersection of Humans, Animals, and the Environment
 - What is “One health”?
- **Birds as Animal Models** in the Behavioral and Neural Sciences

ILAR Journal Vol. 51 (1)

REGENERATIVE MEDICINE: FROM MICE TO MEN

Journal Article Titles

- The Use of Animals in Human Stem Cell Research: Past, Present, and Future
- Chimeric Animal Models in Human Stem Cell Biology
- The Use of Animal Models to Study Stem Cell Therapies for Diabetes Mellitus
- Practical Considerations in Regenerative Medicine Research: IACUCs, Ethics, and the Use of Animals in Stem Cell Studies

What's in a title?

- Can you define / visualize every word in the title?
 - stem cell, chimera, diabetes mellitus
- Do you know something about the topic already?
 - Review what you know already
- Speed read or Skim the article
 - Is the info totally new to you, mostly review, or is there information that you can add to your base knowledge?
 - Add to your knowledge on each topic every time you read an article!
 - What is the “take-home message”?

Use the title to ask yourself questions

Examples:

- What is a stem cell?
 - Stem cells have the capacity both to self-renew and to differentiate into mature, specialized cells and thus serve as the catalyst for regenerative medicine. (pg 1, paragraph 3, Line 1)
- What are the common animal models for Diabetes mellitus?
 - Several!
 - Review every model you know, not just the one(s) mentioned in the article

Related Information

- What are the related key points (basic info) you should know for the test?
- Link information with other study materials
 - Is there a Comp Med article in the last 3 years that discussed stem cells? Chimeras? Regenerative medicine?

Inside the article: Key paragraphs and Key words

- Look at the first or second paragraph in each ILAR section/subsection
- Keywords: Know something about each word
- Paragraph 1 after an abstract- usually a gold mine of important information in a research article!
- Conclusion paragraphs helpful (research article, less so in ILAR)

Key words

- chicken embryo;
- **chimera**;
- human;
- imaging;
- nonhuman primate (NHP);
- rodent;
- stem cells;
- ungulate;
- **xenotransplantation**

Key Words

- Chimera:
 - What is it?
 - How do you make one?
 - Is there another article about them in CM or JAALAS?
- Xenotransplantation:
 - Examples
 - Consequences

Key Paragraphs

- Look for paragraphs containing “tried and true” information
- Look for 2 or more references to info contained in the paragraph

Chimeric Animal Models in Human Stem Cell Biology: Key Paragraph

- **Genetic tagging with fluorescent or bioluminescent proteins.** Many types of stem cells can be stably transfected, using different types of viruses, with genes encoding fluorescent proteins (Gavrilescu and Van Etten 2007; Kume et al. 2000; Larocca et al. 2002; Rappa et al. 2004). The first fluorescent protein to be used, green fluorescent protein (GFP), has been complemented in recent years by a variety of related fluorescent proteins with different excitation/ emission properties, allowing all sorts of fluorescence combinations (Pakhomov and Martynov 2008). The various fluorescent proteins can be visualized noninvasively *in vivo* in small animals, within limits related to tissue depth, sensitivity, and the spatial resolution of the imaging system.

Question

- What materials or combination of materials can be visualized noninvasively *in vivo* within limits related to tissue depth, sensitivity, and the spatial resolution of the imaging system?
 - a. Quantum dots
 - b. Fluorescent proteins
 - c. BrdU
 - d. Reporter genes

Chimeric Animal Models in Human Stem Cell Biology: Key Paragraph

- **Parkinson's disease.** Nonhuman primates represent one of the most relevant and widely used animal models for studying Parkinson's disease (see Joers and Emborg 2010 in this issue). This is primarily because the neurotoxic effects of MPTP (1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine) on nigrostriatal dopaminergic neurons are very similar in monkeys and humans and the resultant motor abnormalities in monkeys....

What can you learn from this key paragraph?

- Reference to another article in the same journal– Important?
- Basic question: MPTP is associated with what animal disease model?
 - Parkinson's
 - Alzheimer's
 - Bell's Palsy
 - Huntington's

Question

Motor abnormalities caused by MPTP are caused by toxicity to which of the following?

- a. basal ganglia
- b. subventricular zone
- c. nigrostriatal dopaminergic neurons
- d. astrocytic ribbon

In the article

- Practical Considerations in Regenerative Medicine Research: IACUCs, Ethics, and the Use of Animals in Stem Cell Studies
 - *Words in bold:*
the "ethnicality" of stem cell use, versus specific implications for animal welfare engendered by animal model-based studies, is beyond the purview of the IACUC insofar as that issue is largely theologically based

What great info is in the abstract?

- **Not** the conclusion of original research published for the first time!!!
 - Look for *proven, beyond a shadow of a doubt information:*
- “Neural Stem Cell Niches and Homing: Recruitment and Integration into Functional Tissues”
- The mammalian brain harbors NSCs (neural stem cells) throughout life mainly in the subventricular zone (SVZ) as well as the subgranular zone

The natural question to ask yourself.....

- Where does the mammalian brain contain neural stem cells throughout life?
 - a. mainly in the subventricular zone (SVZ) and the subgranular zone
 - b. Easy to come up with 3 other options in an exam question

- Methicillin-Resistant Staphylococcus aureus in Animals
- A Global Veterinary Medical Perspective on the Concept of One Health: Focus on Livestock
- Understanding Risk Perceptions to Enhance Communication about Human-Wildlife Interactions and the Impacts of Zoonotic Disease

What questions could be asked based on article titles?

- Can you define the words in the title?
 - Phenotype Acquisition
 - Diabetes Mellitus
 - Preclinical Assessment

Volume 51 Number 2

DISASTER PLANNING AND MANAGEMENT

Disaster Management and Study Survival Materials

- Caffeine
- NSAIDS
- Vitamins
- Donuts
- Adult Beverages

Journal Article Titles

- Disaster Preparedness in Biocontainment Animal Research Facilities: Developing and Implementing an Incident Response Plan (IRP)
- Management of Rodent Viral Disease Outbreaks
- IACUC Considerations: You Have a Disaster Plan But Are You Really Prepared?

- Management of Rodent Viral Disease Outbreaks: One Institution's (R)Evolution
 - "The Two Viruses" mentioned in this article
 - Other "Key" paragraphs within the article

- Mouse hepatitis virus (MHV1) is a coronavirus that infects wild and laboratory mice. Although the name suggests a single agent, it is actually a group of viruses that, due to their RNA genomes and high mutation rates, comprise multiple strains.
- Although MHV does not cause clinical signs in most mice, it can induce functional defects in the immune system and interfere with tumor biology and many other types of studies (see Barthold and Smith 2007 for a review).

- Epizootic diarrhea of infant mice (EDIM1) virus is a group A rotavirus that shares with MHV the fecal-oral route of transmission and causes clinical disease only in mice less than 2 weeks of age, although mice can be infected at any age (Ward et al. 2007).
- Rotaviruses are generally highly transmissible among members of the natural host species and, as nonenveloped viruses, are very stable in the environment (Ward et al. 2007).

So what questions should you ask yourself?

- What type of virus is EDIM and how is it transmitted?
- What type of virus is MHV?
- What effects does MHV have on mice?
Clinical disease?
- What effects on research?

Volume 51 Number 3

**ONE HEALTH: THE INTERSECTION OF
HUMANS, ANIMALS, AND THE
ENVIRONMENT**

Methicillin resistance in *Staph aureus* is conferred by the *mecA gene*, which encodes for production of an altered penicillin binding protein (PBP2a or PBP2'). Which of the following antimicrobials does not bind at this site and is therefore most likely most likely to be an effective antimicrobial?

- a. penicillins
- b. cephalosporins
- c. tetracyclines
- d. carbapenems

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Volume 51 Number 4

BIRDS AS ANIMAL MODELS IN THE BEHAVIORAL AND NEURAL SCIENCES

- The Use of Passerine Bird Species in Laboratory Research: Implications of Basic Biology for Husbandry and Welfare
- Japanese Quail as a Model System for Studying the Neuroendocrine Control of Reproductive and Social Behaviors
- Guidelines and Ethical Considerations for Housing and Management of Psittacine Birds Used in Research
- The Songbird as a Model for the Generation and Learning of Complex Sequential Behaviors
- Guidelines and Ethical Considerations for Housing and Management of Psittacine Birds Used in Research

Passerine Points

- Passerines living at temperate latitudes breed in a seasonal pattern based on fluctuations in temperature and food availability. They differ markedly from tropical passerine species such as the zebra finch (an opportunistic breeder), domesticated galliform birds, and common laboratory rodents.
- Seasonality is associated with profound changes in behavior, physiology, and morphology, resulting in circannual cycles of breeding, molt, and migration.

Passerine Points

- Passerine Birds provide some of the best examples of intersexual selection, since many species exhibit sexual dimorphism of appearance and behavior
- Sexually dimorphic passerines such as the zebra finch have been widely used to study female choice for complex sexually selected traits such as plumage, song, and other behavioral displays

Psittaciform Shorts

- Psittaciform birds have distinct morphological traits, such as a stout curved beak topped by a cere (the bump where the nostrils are located), zygodactyl feet (two toes pointing forward and two backward), and colorful plumage
- Parrots and Cockatoos!

Psittaciform shorts: Zoonosis

- *Chlamydophila psittaci* is the etiologic agent of the human disease psittacosis (also called parrot fever and ornithosis). Parrots can be asymptomatic carriers and shedders of chlamydia.
- In birds the disease is usually a subclinical infection but may be associated with nonspecific clinical signs such as dyspnea, anorexia, lethargy, diarrhea, biliverdinuria (yellow to green urates), and oculonasal discharge (Gould 1995; Greenacre 2003; Turner 1987).
- In humans the infection usually also passes subclinically, but clinical signs may vary from mild respiratory disease to pneumonia, nausea, vomiting, hepatitis, myocarditis, disorientation, mental depression, delirium, and even death.
- Possible transmission routes of *C. psittaci* from birds to humans include, in order of importance, inhalation of contaminated air; direct contact with birds, feathers, excreta, oculonasal discharge, or infected tissue; and bites or other open wounds. The incubation period is 1 to 4 weeks.

- Which types of birds have the following characteristics: stout curved beak, cere, zygodactyl feet, and feather coloration which is not influenced by dietary supplements?
 - Passerines
 - Psittacines
 - Galliformes
 - Columbiformes

CITES Info

- Convention on International Trade in Endangered Species (CITES), an international treaty that classifies endangered species and regulates the import and export of wild flora and fauna, including animals (alive or dead) and their products and tissues.
- CITES Appendix I (also called CITES I) lists species at risk of global extinction
- CITES Appendix II includes
 - (1) species that may become threatened with extinction in the absence of international trade restrictions,
 - (2) nonendangered species that may be in danger because of their resemblance to specimens listed in the appendices, and
 - (3) second-generation captive-born offspring of Appendix I species (CITES 1973, 2009)
- Appendix III lists species for which trade is regulated in specific countries.

- **The US Fish and Wildlife Service, through a permit system, governs the import, export, and interstate trade of species listed as endangered or threatened in the United States or elsewhere under the Endangered Species Act and is also responsible for CITES administration (NRC 2006).**
 - Import or export of Appendix I specimens is allowed under very strict permitting requirements only for scientific purposes, education, or conservation, but not commercial trade (ARENA/OLAW 2002; NRC 2006).
 - In Europe, CITES I specimens may be used in animal research only if
 - (1) the objective is to preserve the species or
 - (2) the species is the only available model in fundamental biological studies (European Community 1986).

- A new researcher will bring her small group of aged cynomolgus monkeys from a nearby university to your animal facility this fall. The research staff and IACUC are very excited, since your facility has not ever housed nonhuman primates. Which permits will you need to maintain compliance with state and federal regulations?

Which Permits will you need?

- USDA registration
- US Fish and Wildlife permit
- Any others?

Good Luck on the test!