Preparing for Certification by the American College of Laboratory Animal Medicine

“you can do this, grasshopper”
Dawn C Fitzhugh, VMD, MPH
DACLAM, DACVPM

DISCLAIMER

- This presentation is not endorsed by ACLAM
- This presentation does not represent the views of ACLAM or the US Army Laboratory Animal Medicine Residency Program
- These are suggestions from my study group, ACLAM-boarded colleagues & friends and others who’ve trained through/with the Army
- Most of the suggestions were plagiarized from others who went down this road before us

Overview

- The Certifying examination
- Charting a course
- One year out
- Six weeks out
- Exam day
- The aftermath
Exam Eligibility

- DVM/VMD
- Post-VMD training
  - Training program
    - Minimum of 2 years, completed by the application deadline
    - Recognized by ACLAM
  - Experience option
    - 6 years of relevant, full-time experience at the time of application
    - Credit is given for part-time work, experience unrelated to LAM, and for graduate work typically at a 2 for 1 ratio

Exam Eligibility

- Publication
  - First author
  - Original research demonstrating application of the scientific method
  - Peer-reviewed journal
  - Accepted for publication at the time of application

- Unacceptable
  - Review articles
  - Case reports

- Conditionally Acceptable
  - Epidemiologic research papers

Application Process

- "Early" applications
  - August for the following year

- "Final" applications
  - December for the following year

- Complete the application & pay fees
- Review by the Credentials Committee
- ACLAM Board Eligible letter
Certifying Exam

- Fees
  - Currently $200 to apply
  - $600 more once you’re eligible
- What are you then eligible for?
  - Take exam maximum of 3 times in the 3 years following your first try
  - After that you lose eligibility & must re-apply

Certifying Exam

- Lab animal biology
- Lab animal resources
- Clinical lab animal medicine & surgery
- Lab animal pathology
- Animal experimentation

Species of Interest

**Primary Species  60 - 70 %**

- Mouse (Mus musculus)
- Rat (Rattus norvegicus)
- Rabbit (Oryctolagus cuniculus)
- Macaques (Macaca spp).
- Dog (Canis familiaris)
- Pig (Sus scrofa)
Species of Interest

Secondary Species  18 - 28 %
- African clawed frog (Xenopus spp.)
- Baboon (Papio spp.)
- Cat (Felis domestica)
- Ferret (Mustela putorius furo)
- Gerbil (Meriones spp.)
- Goat (Capra hircus)
- Guinea pig (Cavia porcellus)
- Marmoset/tamarinds (Callitrichidae)
- Sheep (Ovis aries)
- Squirrel monkey (Saimiri sciureus)
- Syrian hamster (Mesocricetus auratus)
- Zebrafish (Danio rerio)

Species of Interest

Tertiary Species  7 - 17%
- Birds
- Invertebrates
- Reptiles
- Other amphibians
- Other fish
- Other livestock species
- Other mammals
- Other nonhuman primates
- Other rodents

Isn’t that EVERYTHING?
Test Domains

- 25% Manage spontaneous and experimentally-induced diseases & conditions
- 10% Manage pain & distress
- 20% Research
- 24% Animal care
- 19% Regulatory responsibilities
- 2% Education

Tasks
- What exactly is an ACLAM vet supposed to do?
- Knowledge
  - What exactly is an ACLAM vet supposed to know?

Example

- Domain: Animal Care
- Task: Manage or provide oversight of lab animal facilities
- Knowledge: Environmental monitoring
  - What are the standards for temp, humidity, light, air flow?
  - What equipment is used to assess these standards?
The early years

- Know your "enemy"
  - Review the ACLAM RDD
  - Use your Blue Books as references
- Train to fight
  - Attend blue book review
  - Read the chapter ahead of time
  - Attend journal club
  - Read the titles, read the abstracts, look at pix for all
- Repetition is key

The early years

- 2 critical mentors
  - Residency
  - Research

Mentorship

- Critical to develop early in your residency
- Residency/Career mentor
  - Someone you want to emulate professionally
  - Preferably an ACLAM-boarded or supportive
  - Points you towards the best research mentors
- Workplace buddy
  - Help each other out in the work place
  - Cover for you during seminar, JC, travel
  - Cover for you during study time
Mentorship

- Research mentor
- Talk to several and pick one you see eye to eye with
- Explain your situation as a resident
- Need to start research early in residency

Publish

- Know what ACLAM expects
- Start research early
- Recommend publishing in ACLAM recognized journal
  - i.e. Comp Med, JAALAS, or Laboratory Animals
- Know journal format/expectations
- Start research early

Publish

- K.I.S.S.
- Do something you enjoy
- Use journals, new protocols for ideas
- Talk to the other vets, IACUC chair
Throughout Residency

- Memorize
  - Floor space, cage heights, temps, humidity
  - EVERY number encountered in references
  - genus, species, RNA vs DNA viruses, etc…
- Organize-put it all on one shelf, make lists

Throughout Residency

- Laboratory Animal Medicine Blue Book
- USDA Animal Care Policies (2011)
- Animal Welfare Act
- AVMA Guidelines on Euthanasia
- PHS Policy on Humane Care/Use of Lab Animals
- Occupational Health & Safety in Care/Use Research
- BMBL 5
- Guide for the Care and Use of Animals

Throughout Residency

- Pathology of Rabbits and Rodents
- Anesthesia/Analgesia BBs
- Rat, Mouse, and NHP BBs
- NHP BB
- JAX Handbook on Genetically Standardized Mice
- Guide for the Care and Use of Ag Animals
- Guide for Use of Mammals in Neuroscience & Behavior
- IACUC Handbook by Silverman
- GLP Standards
Throughout Residency

- AAALACi Standards
- AALAS website for ALAT, LAT, etc
- Animal rights’ groups websites
- NABR, FBR websites
- NIH website for types of grants & different institutes

The final year

Study Group

- JOIN ONE! MAKE ONE!
- Seek out local folks who are taking the exam the same year as you
- Make it happen via telecon, SKYPE, etc
- Size does matter (maybe)
- Everyone gets something out of a study group
- Yes, everyone!
Final year schedule

- Use others’ schedules for reference
- Primary species reviewed at least twice
- Secondary & tertiary reviewed at least once
- Plan for holidays, breaks
- Plan for trips (NC state, Chicago)
- End group study 4-6 weeks before the exam

The final year

- Summer—hunt and gather
- September-December—move steadily
  - Group study once per week
  - Individually keep up with the schedule
- January-May—pick up the pace
  - Two full days per week (1 group, 1 solo)
  - Fill all your free time with study
- Last 6 weeks—major solo crackdown

The final year

- See the forest, not the trees
  (but sometimes see the trees)
- Build and warn your support network
- Don’t freak out
- Know that you know what you know
- Take care of yourself-regular PT and good nutrition
- Minimize distractions-auto bill pay, vehicle, house
**Group Advice**
- Location, location, location..
- Hide yourselves
- No internet access
- Don’t digress; make notes & look later
- Minimize whining
- Lunch
- Stick to the schedule
- Be accountable

**Lather, Rinse, Repeat**
- Repeat “group focus/individual focus” ad nauseum
- Work on getting through all the material
- Collect new material sparingly

**Journals**
- Know pictures
- Primary focus last 3 years
- Cutoff Jan before the exam
- Read article, review abstracts
- Secondary and tertiary species
- Find what works for you
  - Group review
  - LABSG
  - Slow and steady
  - Heavy push in last 6 weeks
- Consider select ILAR issues
Mock Boards

- Take the US ARMY LAM/International coalition mock boards in December/January and April/May

The last 6 weeks

- Tap into the support of your supervisors and colleagues
- Make and stick to your own schedule
- Make your personal "notebook"
- Mock exams, mock exams, mock exams
- Yes, you can have a life, but not now
- Mock exams, mock exams, mock exams

The big day
Game plan for the big day

- Take the day off before the exam (maybe)
- Recon the site
- Think comfort
- Enter confident, stay confident
- Take breaks to center yourself
- Eat
- Leave your study material at home/in hotel
- Consider a treat for yourself the day afterwards

The Exam

- Represent expected knowledge of a newly boarded LAM vet
- Follow RDD
- Answer every question
- Higher thinking multi-step questions
- Some basic questions
- 2010 was the first "combined" written/practical
Smart Strategies
- The MOST common
- Second most common
- Genus and species for all primary & secondary species
- Know what the animals look like
- "Other" rodents
- Which one doesn’t belong

Smart Strategies
- Guide, AWA and whether or not something is covered in them
- Guide, AWA & housing requirement differences
- Know WHO has responsibility for WHAT
- IO vs IACUC vs AV
- Interpret laws-Silverman book

Smart Strategies
- Gestation lengths, ovulatory cycles
- Cage sizes, heights
- Don’t confuse common practice as a requirement
- Review pictures from Journals
- Know things that have multiple references
- Pathology—recognize the organ
Plan Your Attack
Stick to Your Plan
Stay focused

After the Exam
- Do NOT go home and think about the exam
- Do NOT go back to your hotel room and think about the exam
- Call your loved ones and say it’s over, but leave it at that
- Unwind – quiet time alone or join your colleagues for dinner and beverages of your choice in Bethesda and blow off some steam
  - Profanity and crying are both O.K.

Summary
- Must publish to become eligible
- Prioritize passing the exam the first time
- Use every day as an opportunity to learn
- Focus on the “must know” list
- Know that you’ll get your life back
ACLAM Certification Requirements

Certification candidates must be graduate veterinarians (DVM) qualified to practice in some state, territory, or country. Graduates of foreign schools not accredited or approved by the American Veterinary Medical Association (AVMA) should submit an Educational Commission for Foreign Veterinary Graduate (ECFVG) certificate, or evidence they are qualified to practice veterinary medicine. Candidates must also meet rigorous training/experience and publication requirements, outlined below.

After meeting these requirements, candidates take the certifying exams. The exams cover laboratory animal biology, laboratory animal resources management, clinical laboratory animal medicine and surgery, laboratory animal pathology, and animal experimentation.

Post-graduate Training

Training Program Option

Candidates must have completed a training program in laboratory animal medicine. The training program must be completed by the application deadline, and must:

• meet the ACLAM Training Program Minimal Standards,
• be at least two years in duration, and
• be recognized by ACLAM, with a Diplomate serving as director.

Experience Option

Candidates may qualify to take the examination after 6 years of relevant, full-time experience in laboratory animal medicine following receipt of a veterinary medical degree. Experience duration is calculated up to the time of the application deadline.

Experience comprises both a time and quality component. It is defined as the direct performance or participation in activities that characterize the laboratory animal specialist. These activities include:

• clinical medicine involving laboratory animal species
• animal resource management
• technician/investigator teaching and training
• consultation on laboratory animal medicine topics
• formal teaching and research
• participation in organized laboratory animal medicine

To qualify for experience credit, 20% of an activity’s focus must be on laboratory animal medicine. Qualifying experience need not include all these activities, but engaging in only one or two of the activities may not be enough to qualify a candidate.

Part-Time Experience: Part-time experience is calculated based on the portion of time spent in laboratory animal medicine-related work, based on the following formula:

1 year in a part-time (50%) laboratory animal medicine-related position = 6 months experience credit

Other Professional Experience: Up to 1 year of credit is given for experience from activities outside of the laboratory animal medicine field (such as private veterinary practice, meat inspection, or teaching subjects unrelated to laboratory animal medicine) using the following formula:

6 months of non-laboratory animal medicine professional experience = 1 month experience credit
Up to 2 years of experience credit will be given for graduate or post-veterinary medical degree research programs (other than formal laboratory animal medicine programs) that include the use of animals, based on the following formula:

2 months of program participation = 1 month experience credit

**Publication**

The publication requirement demonstrates that candidates have a clear working knowledge of the scientific method used to explore questions in the biological sciences. Serving as first author of an original research article demonstrates application of the scientific method in the biological sciences or other scientific areas relevant to laboratory animal medicine. This article must be published in a peer-reviewed journal and be fully accepted at the time of application. Submitting work that is in the review process, even if conditionally accepted with revisions, does not fulfill the requirement, as the peer-review process is not complete until the paper has been accepted for publication.

By convention, first authorship denotes the individual who was primarily responsible for the conduct of the study and the preparation of the paper resulting from the study. Even though others may have contributed to the study, only the first author will be credited with the publication for the purposes of the ACLAM credentialing process.

**Required Components of Research Papers**

All papers must include the components described below. These six sections can be found in any original research article. However, it should be noted that some scientific journals may not always have these items in separate, named sections. For example, some scientific journals have “brief communication” or other formats that require all of these elements within the text of the paper, but do not have the elements as separate, named sections. Other journals may have sections with these basic components which are named slightly differently. In these cases, the ACLAM Credentials Committee will determine that these elements are indeed present within the text.

**Introduction:** The introduction supports and serves as a basis for the study, usually in the form of a concise review of the pertinent literature that surrounds the question to be explored. Key studies are cited and summarized, helping the reader understand what has led up to the question to be studied and indicating the relative importance of that question to the current literature. The introduction may point out flaws in these previous studies or confounding variables that will be addressed in the present study.

**Hypothesis:** The introduction is concluded by a hypothesis that states the question that the study will address. The hypothesis may mention key measures critical to answering the question, the groundwork for which may have been laid in the introduction. The hypothesis clearly shows that data will be compared between groups and analyzed to provide original information that will lead to the understanding of the subject at hand. The hypothesis should be clearly stated (“The hypothesis of this study was ...”) or otherwise evident.

**Materials and Methods:** The materials and methods section provides a clear description of the experimental design. The design should take into account likely confounding variables, measure relevant parameters, and include adequate numbers of observations to discover statistical significances between groups. This section should also describe in sufficient detail the subjects of the investigation, how samples were collected and analyzed, and the necessary quality controls that were in place to ensure that the analysis/data collection yielded accurate results/measurements. Statistical methods, including types of primary and secondary determinations as well as levels of significance by which statistically significant differences would be ascribed, should also be included.
Results: The results section presents the study results as well as the supporting statistical analyses used to determine whether observed changes were significant and not due simply to chance. All data and comparisons described in the materials and methods section should be accounted for.

Discussion: The discussion section relates the study results back to the existing literature. The interpretation of the results should be clearly stated in light of their statistical significance. Commonly, the relative importance of the findings is discussed, particularly as the findings would relate to normal metabolism, physiology, or other bodily processes. In some cases interrelationships and mechanisms of action are hypothesized, but only to the extent that they can be supported by the data.

Conclusion, Summary, or Abstract: The paper should also include a conclusion, summary, or abstract. These sections should concisely state the findings of the study and place those findings into perspective. Abstracts should contain a concise statement of introductory materials, the hypothesis, a few points about the study design or methods, and a few key results coupled with the concise statement of the findings in the study and their significance.

Collectively, the presence of these items serve as the basis for decisions rendered by the ACLAM credentialing process as to whether the paper represents an original research article.

Acceptable Publication Topics
As the investigation of biological processes by the scientific method is similar regardless of the organism or system studied, ACLAM will accept publications relating to a variety of subjects, such as molecular mechanisms, cultured cells, human subjects, or other organisms (including invertebrates and single-celled organisms) outside of the animal species most commonly used in biomedical research.

Publications in the physical sciences or other scientific area may also be acceptable. However, these publications must meet the additional test of relevance to laboratory animal medicine. For example, a study examining temperature and humidity monitoring and control systems might be acceptable if it is in the context of a laboratory animal facility or housing system design. In all cases, the scientific method must be followed.

Unacceptable Publication Types
Certain publication types do not meet the requirements for ACLAM certification, as they do not demonstrate the required mastery of the scientific method.

Review Article: A review of the existing literature on a subject, organized so that the important components of individual studies are compiled into a realistic picture of the subject being reviewed. Such articles do not demonstrate many of the components of the scientific method; there is no single hypothesis or question to be answered, no study design, and no data collected in a form that can be statistically analyzed or otherwise compared.

Case Report: Case reports present information gleaned from clinical observations or a collection of diagnostic information which characterize a clinical condition in one or more individuals. They lack a clearly stated hypothesis and concurrent controls used for comparison to affected or treated groups. Conclusions are usually presumptive; there is no statistical basis for establishing that they do not occur by chance or due to causes that could not be ruled out by the conditions under which the data was collected.

Conditionally Acceptable Publication Types
Epidemiologic Research Paper: Epidemiologic research papers, such as prospective cohort studies or retrospective studies, may contain all of the elements of a scientific paper. However, retrospective studies cannot be considered acceptable unless they contain
ACLAM Board Prep Tips
Fitzhugh
CLASS 2011

all of the elements listed above and have a clearly stated or inferred hypothesis that is examined by comparison of case and control groups with statistical analysis and comparisons of those groups. If these elements are clearly present, then epidemiologic studies are considered acceptable for the purposes of ACLAM credentials.

Application to sit for the Exam:
The qualifications of individuals desiring certification will be reviewed by the Credentials Committee and must be approved before the candidates may take the certifying examination. Additional details on credentials requirements, the examination procedure, and applications for the examination may be obtained from the Executive Director.

Fees
Payments can be made by check, VISA, MasterCard, or AMEX.

<table>
<thead>
<tr>
<th>Service</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>$200</td>
</tr>
<tr>
<td>Examination</td>
<td>$600</td>
</tr>
</tbody>
</table>

NOTE: One is entitled to take the examination up to a maximum of three times during the next three years after becoming Board eligible. Failure to successfully pass the exam after three consecutive attempts results in one no longer being ACLAM Board eligible, and will require that you submit another application, pay another application and examination fee, and pass the examination before you can be certified as a Diplomate. Opting out of the exam for other than a medical emergency or in the case of the military an overseas deployment will result in the loss of that year of eligibility.

Camp ACLAM
To the best of my knowledge, this is the only ACLAM-sanctioned workshop.

Camp ACLAM is a day-long workshop for veterinarians who are considering or preparing for the ACLAM certification exam. Annually, the workshop draws approximately 50-60 veterinarians and has consistently received favorable evaluations by attendees.
Members of the committee present helpful hints on preparation for the exam as well as a mock exam. Dr. Mel Balk will open the workshop with background information on ACLAM and the benefits of Diplomate status. The day is concluded with a roundtable session which provides attendees the opportunity to ask pertinent questions to new and “seasoned” Diplomates.

The Test Template was approved by the ACLAM Board of Directors in August, 2008. The content portion of the examination is organized into six domains. Each domain contains tasks deemed important by the RDD task force based on the Role Delineation Survey results. These tasks provide the context for the knowledge topics to be tested. The Test Template Panel reviewed each of the knowledge statements in the RDD and identified the knowledge statements included in this document as those that are to be tested. Note: In order to simplify the classification of test items, the knowledge statements have been identified with the code Test Template Domain Number. Unique Number (e.g., TT1.1) The percentage of test questions assigned to each Domain will serve as the guide for the creation of each of the examinations. The final number of items with each form will be within ±/− 1%.

The content portion of the examination is organized into six domains. Each domain contains tasks deemed important by the RDD task force based on the Role Delineation Survey results. These tasks provide the context for the knowledge topics to be tested. The Test Template Panel reviewed each of the knowledge statements in the RDD and identified the knowledge statements
included in this document as those that are to be tested. Note: In order to simplify the classification of test items, the knowledge statements have been identified with the code Test Template Domain Number. Unique Number (e.g., TT1.1)

The percentage of test questions assigned to each Domain will serve as the guide for the creation of each of the examinations. The final number of items with each form will be within ± 1 percent.

Domain 1: Management of Spontaneous and Experimentally Induced Diseases and Conditions 25%

Tasks
T1. Prevent spontaneous or unintended disease or condition
T2. Control spontaneous or unintended disease or condition
T3. Diagnose disease or condition as appropriate
T4. Treat disease or condition as appropriate

Knowledge Topics
TT1.1. diagnostic procedures as they apply to the laboratory research environment
a. conduct of a physical examination
b. clinical pathology (e.g., hematology [CBC]; clinical chemistries and urinalysis)
c. other diagnostic procedures (e.g., imaging techniques; EKG)

TT1.2. immunobiology (e.g., antibody responses; cellular immunity; species-specific immune responses) as it applies to laboratory animals

TT1.3. nutrition with emphasis on effects of deficiency or toxicity as it applies to the laboratory research environment

TT1.4. anatomy with emphasis on features which have significance with regard to clinical medicine (e.g., rat Harderian gland) or experimental medicine (e.g., coronary artery anatomy of the pig, which allows use for induced infarcts; Circle of Willis anatomy in gerbils, which allows use in stroke models)

TT1.5. physiology with emphasis on normative data and characteristics (e.g., seasonal changes in squirrel monkeys; coprophagia in rabbits), metabolic differences (e.g., hypoglycemia in squirrel monkeys) or metabolism of induced disease (e.g., streptozotocin-induced diabetes mellitus), reproductive physiology, and clinically significant physiological features

TT1.6. parasitology with emphasis on parasitic diseases that can become established in a colony and zoonotic parasitic diseases

TT1.7. microbiology with emphasis on organisms of clinical significance; subclinical infections that cause physiologic, biochemical, and/or immunologic alterations; zoonotic disease organisms; organisms used experimentally to induce infection and unintended infections (e.g., infections associated with chronic vascular cannulation); and sampling and culture techniques for such organisms

TT1.8. anatomic pathology including pathogenesis of significant naturally occurring (e.g. tuberculosis) and experimentally induced (e.g. collagen induced arthritis) diseases; typical gross and histopathologic lesions (e.g., age-related changes, or pathologic changes of adverse phenotypes associated with genetically modified rodents); and pertinent anatomic pathology techniques (e.g., Steiner's stain)
TT1.9. pharmacology with emphasis on drugs used to treat spontaneous or induced disease (e.g., indications, use and contraindications of drugs; adverse reactions; adverse interactions; mechanisms of action; species-specific toxicity), and drugs used to induce disease (e.g., azoxymethane to induce neoplasia, or DSS to induce colitis)
TT1.10. epidemiology including species-specific susceptibility to induced disease (e.g., modes of disease transmission; latency; persistence; prevalence; incidence)
TT1.11. preventive medicine (e.g., immunization; quarantine; prescreening tests)
TT1.12. diagnostic procedures
a. species-specific behavioral assessment
b. serologic, cytologic, and molecular diagnostic tests (e.g., PCR; ELISA; IFA; HAI; MAP) and proper sampling techniques
TT1.13. genetics with emphasis on control and treatment of naturally occurring and experimentally induced disease, predisposition to disease, and modes of inheritance related to diseases or conditions

Domain 2: Management of Pain and Distress 10%

Tasks
T1. Recognize pain and/or distress
T2. Minimize or eliminate pain and/or distress
T3. Euthanatize (Euthanize)

Knowledge Topics
TT2.1. anatomy and physiology of pain and distress as they pertain to laboratory animals
TT2.2. patient monitoring as it pertains to laboratory animals
TT2.3. critical and post-procedural care techniques as they pertain to laboratory animals
TT2.4. assessment of pain and distress (e.g., behavior which is a sign of pain and/or distress; physiologic changes; pain and distress scoring systems)
TT2.5. causes of pain
TT2.6. causes of distress
TT2.7. effects of pain and distress on normative physiology and on research studies
TT2.8. pharmacological interventions for pain and distress and their effects on physiology, including age and species differences for such interventions, and depth and duration of analgesia provided by such interventions
TT2.9. nonpharmacological interventions for pain and distress and their effects on physiology, including age and species differences for such interventions
TT2.10. euthanasia
TT2.11. humane endpoint criteria

Domain 3: Research 20%

Tasks
T1. Facilitate or provide research support
T2. Advise and consult with investigators on matters related to their research
T3. Design and conduct research

Knowledge Topics
ACLAM Board Prep Tips
Fitzhugh
CLASS 2011

TT3.1. biomethodology techniques (e.g., collection of blood and other body fluids and tissues; handling and restraint; administration of compounds and treatments)
TT3.2. research methods and equipment (e.g., antibody production; adjuvants; tumor induction; imaging; data collection techniques such as telemetry; observation; behavioral assessment methods)
TT3.3. animal models (spontaneous and induced) including normative biology relevant to the research (e.g., background lesions of common strains)
TT3.4. genetics and nomenclature
TT3.5. genetic modification/engineering technology including application of molecular biology techniques
TT3.6. characterization of animal models (e.g., phenotyping, behavioral assessment)
TT3.7. gnotobiotics
TT3.8. experimental surgical techniques and instrumentation
TT3.9. principles of experimental design and statistics including scientific method
TT3.10. Replacement, Reduction and Refinement techniques
TT3.11. aseptic requirements for performing surgery

Domain 4: Animal Care 24%
Tasks
T1. Develop animal husbandry programs
T2. Manage or provide indirect management/oversight of animal husbandry programs
T3. Manage or provide indirect management/oversight of laboratory animal facilities

Knowledge Topics
TT4.1. species-specific husbandry (e.g., nutrition, housing, exercise)
TT4.2. environmental enrichment
TT4.3. methods of sterilization, sanitation, and decontamination
TT4.4. quality assurance techniques for animal care-related equipment (e.g., verification of effective cage sanitation) and supplies (e.g., water, food, bedding)
TT4.5. animal procurement considerations (including sources, vendor surveillance, genetic monitoring, transportation)
TT4.6. breeding colony management (e.g., systems and records, genetic monitoring)
TT4.7. animal identification systems
TT4.8. pest control (e.g., methods, hazards and toxicity)
TT4.9. pathogen-free barriers (exclusion)
TT4.10. containment facilities (inclusion)
TT4.11. environmental causes of physiological alterations in animals and their effects on research (e.g., sound, light, temperature, humidity, housing systems)
TT4.12. environmental monitoring
TT4.13. watering and feeding (e.g., automated watering, liquid diets, ad lib or restricted diets, troubleshooting)

Domain 5: Regulatory Responsibilities 19%
Tasks
T1. Perform direct or delegated Attending Veterinarian responsibilities
T2. Advocate for humane care and use of animals
T3. Provide advice to occupational health and safety programs
T4. Provide advice on biological, chemical and radiation hazards in an animal research program
T5. Serve as a member of an IACUC
T6. Review protocols and provide advice to investigators and the IACUC

Knowledge Topics
TT5.1. laws, regulations, policies and standards
   a. Animal Welfare Act, USDA regulations, Animal Care policies
   b. Health Research Extension Act, Public Health Service Policy on Humane Care and Use of Laboratory Animals, OLAW interpretive guidance
   c. Guide for the Care and Use of Laboratory Animals (ILAR/NRC)
   d. Report of the AVMA Panel on Euthanasia
   e. Biosafety in Microbiological and Biomedical Laboratories (CDC/NIH)
   f. Good Laboratory Practices (FDA/EPA)
   g. Endangered Species Act/CITES
   h. Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching (FASS)
   i. USDA and CDC animal importation regulations
   j. NIH Recombinant DNA Guidelines
   k. Occupational Health and Safety in the Care and Use of Research Animals (ILAR/NRC)
   l. Occupational Health and Safety in the Care and Use of Nonhuman Primates

TT5.2. role and function of the IACUC
TT5.3. protocol review
TT5.4. facility inspection and program review
TT5.5. occupational health and safety (e.g., ergonomics; OSHA; allergens; blood-borne pathogens; radiation and chemical hazards; MSDS)
TT5.6. role and function of the Institutional Biosafety Committee (IBC)
TT5.7. role and function of the Association for Assessment and Accreditation of Laboratory Animal Care – International (AAALAC)
TT5.8. responsible conduct of research

Domain 6: Education 2%
Tasks
T1. Train personnel in animal care and use
T2. Maintain current knowledge and continued competence in laboratory animal medicine

Knowledge Topics
TT6.1. societal issues involving use of animals:
   a. organizations related to and/or supportive of laboratory animal medicine and animal research (e.g., AALAS, ASLAP, ILAR, NABR, AMP)
   b. organizations opposed to animal research (e.g., PETA, HSUS) including their philosophy and opposition strategies
   c. philosophy and ethics of animal use
   d. history and value of animal research
ACLAM 2009 Certification Examination Reference List

The ACLAM website says this is the most recent exam given, but it’s not they just haven’t updated the list). The examination questions are written from generally the same sources each year. This list is arranged in alphabetical order. It is advisable to use the most current editions of textbooks when studying for the certification exam; since the listed references were used for the previous year’s exam, they may not be the most current reference for the upcoming year’s exam. Journal articles used for the exam are typically those published within the last 5 years.

This list is not meant to be all-inclusive (i.e., it does not indicate the only resources candidates should use to prepare for an upcoming examination). Note that the ACLAM Series Blue Books are heavily referenced and are considered core references.

ACLAM 2009 Certification Examination Reference List

Journals
Comparative Medicine (formerly Laboratory Animal Science), bimonthly publication of the American Association for Laboratory Animal Science, Memphis, TN.

Journal of the American Association for Laboratory Animal Science (JAALAS) (formerly Contemporary Topics in Laboratory Animal Science), the bimonthly publication of the American Association for Laboratory Animal Science (AALAS), Memphis, TN.

Institute for Laboratory Animal Research (ILAR) Journal (formerly Institute of Laboratory Animal Resources), a quarterly publication of ILAR, the National Academies, Washington, DC.

Regulatory/Guidance Documents


Good Laboratory Practice Standards, 7 U.S.C., 21 CFR (Food and Drugs), Part 58 (Good Laboratory Practice for Nonclinical Studies). Most current version can be found on: http://www.fda.gov/default.htm, or: http://www.gpoaccess.gov/CFR/


Guidelines for the Use of Mammals in Neuroscience and Behavior Research, 2003, National Research Council, National Academy of Sciences, Washington, DC.


Books


All of the above are listed on the ACLAM website as Primary References. You will very likely NOT pass the exam unless you REALLY know the references below. These are your “MUST KNOWS”

- Laboratory Animal Medicine Blue Book
  - do NOT forget the back chapters
- USDA Animal Care Policies (2011)
- Animal Welfare Act
- AVMA Guidelines on Euthanasia
- PHS Policy on Humane Care/Use of Lab Animals
- Occupational Health & Safety in Care/Use Research
- BMBL 5
- Guide for the Care and Use of Animals

You should carefully manage your time to “cover”

- Pathology of Rabbits and Rodents
- Anesthesia/Analgesia BB
  - especially the early chapters
- Rat, Mouse, and NHP BBs
- NHP BB
- JAX Handbook on Genetically Standardized Mice
- Guide for the Care and Use of Ag Animals
- Guide for Use of Mammals in Neuroscience & Behavior
- IACUC Handbook by Silverman
- GLP Standards
These are resources NOT listed on the ACLAM website directly, but you **must know**
- AAALAC website for mission, accreditation status, etc
- AALAS website for ALAT, LATG, etc qualifications
- Animal rights’ groups websites
- NIH website for types of grants & names/# of the different Institutes

**Smart study strategies**
- Memorize all numbers
- Know the MOST common and the second most common,
- Know the BEST method
- Know the scientific and common names for all primary and secondary species
- Know what each of these species looks like
- Know what all behavioral equipment looks like and what it tests
- Take every mock exam that you can and learn from it
- Tap into LABSG for study material ([www.labs.org](http://www.labs.org))
- Don’t waste time on COMPMED—information is valuable, but NOT necessarily relevant to the exam

**The final year**

**Summer one year out**
- organize all of your study material or at least be sure you have the most current version of the items you REALLY MUST know.
- Form your study group
  - Agree upon one day each week for everyone to meet
  - Consider limiting group size to no more than 6
  - Assign roles such as timekeeper, person to look up lingering questions, lunch duty, snack duty, etc.
- Plan a schedule that everyone agrees upon

**September-December**
- Try to meet once/week for the entire day
- Focus on the item on your schedule
- Be sure to have read all primary references related to the topic before you meet with your group

**January-May—pick up the pace**
- Two full days per week (1 group, 1 solo)
- Fill all your free time with study

**Last 6 weeks—major solo crackdown**
- Mock exams
- Blue book
- AWA
- USDA policies
Sample Individual Study Schedule for the last 6 weeks before the exam

<table>
<thead>
<tr>
<th>June</th>
<th>Subject</th>
<th>July</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>rabbits, dogs</td>
<td>1 macaques</td>
</tr>
<tr>
<td>3</td>
<td>rats &amp; mice</td>
<td>2 rats</td>
</tr>
<tr>
<td>4</td>
<td>macaques</td>
<td>3 mice</td>
</tr>
<tr>
<td>5</td>
<td>xenopus, zebrafish</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>AAALAC, AALAS, grants</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>7 PHS</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>8 Guide</td>
</tr>
<tr>
<td>10</td>
<td>AAALAS inspection</td>
<td>9 AWA</td>
</tr>
<tr>
<td>11</td>
<td>pigeons, chickens</td>
<td>10 USDA policies</td>
</tr>
<tr>
<td>12</td>
<td>anesthesia/analgesia</td>
<td>11 cage sizes, review</td>
</tr>
<tr>
<td>13</td>
<td>epi and stats</td>
<td>12 review</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>facilities</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>sheep/goats</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>zoonoses</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>occ health BB</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>BMBL</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>xenopus, zebrafish</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>hamsters, gerbils, 3 rodents</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>rabbits, guinea pigs</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>swine</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>dogs, cats, ferrets</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>other NHPs</td>
<td></td>
</tr>
</tbody>
</table>