

ACLAM Veterinary Curriculum Working Group

**Recommendations for Teaching Laboratory Animal Medicine to Veterinary
Students in North America**

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ACLAM Veterinary Curriculum Working Group Introduction

Concern for an inadequate supply of trained specialists in the field of laboratory animal medicine has existed for many years. Although a study in 1997 suggested an adequate supply of laboratory animal veterinarians through the year 2005, actual experience has shown a growing shortage of trained individuals entering the field.^{1-7, 10,11} Organizations such as the American College of Laboratory Animal Medicine (ACLAM), the American Society for Laboratory Animal Practitioners (ASLAP), and the Canadian Association for Laboratory Animal Medicine (CALAM) provide education in and information about laboratory animal medicine to veterinary students and veterinarians to promote the field. Outreach to veterinary students is a fundamental mission of ASLAP and active outreach programs have become a focus of effort for ACLAM for the past 4 years as a major initiative of the 2002 strategic plan. Although these efforts may have been helpful, the shortage has not been resolved.

Mechanisms for financial support of specialized training in laboratory animal medicine have contracted with changes over the past decade in U.S. federal funding opportunities, specifically elimination of funding by the National Center for Research Resources for training for biomedical support roles. Guaranteed stipend support never existed for laboratory animal veterinary trainees in Canada. Consequently, the number of training positions offered annually has stagnated or declined at the same time that the need for laboratory animal specialists has grown considerably (Figure 1). The shortage of veterinarians in laboratory animal medicine and other biomedical research fields has recently been explored in detail by a study sponsored by the National Research Council of the National Academy of Science in their publication "National Need and Priorities for Veterinarians in Biomedical Research."⁸ This report recommends that veterinary students become acquainted with non-traditional practice areas such as laboratory animal medicine during veterinary school and recommended changes in veterinary school curricula to this end.

Veterinarians providing care to laboratory animals include individuals with and without formal training (ie, residency, diploma, and degree programs). Board certification by ACLAM, a recognized specialty board within the American Veterinary Medical Association (AVMA) documents knowledge of the diseases, care and use of a wide variety of animal species used in experimentation. Qualification to sit for ACLAM Board examination eligibility can be gained without formal training for individuals with at least 6 years of relevant experience or following completion of an ACLAM-recognized training program (<http://www.aslap.org/residencies.php>). Regardless of the route a veterinarian takes to enter the field of laboratory animal medicine, they must be aware that this field exists within veterinary medicine to even consider it as a tenable career pathway. Because more extensive and effective measures are needed to increase the numbers of veterinarians entering laboratory animal medicine, including changes to curricula, we have surveyed all 32 veterinary colleges in North America. This is the first such effort since Leathers and Bustad recommended curricular exposure of veterinary students to laboratory animal medicine in 1978.⁹

ACLAM Veterinary Curriculum Working Group Philosophy Statement

Laboratory animal medicine supports the use of experimental animals and the research essential for progress in biomedical science and health care for humans and animals. The laboratory animal veterinarian plays an essential role on behalf of society ensuring that experimental protocols maximize animal well-being and minimize pain and distress. On behalf of the research community, laboratory animal veterinarians ensure that healthy animals are used to produce reliable research results, assist the research team to develop relevant models for study, and seek refinements in animal use such that humane and scientific endpoints are approximated. Experimental animals will remain a critical tool for bridging basic sciences research via translational studies leading to improvements in health care for humans and animals. Factors such as public concern regarding animal welfare and increased regulatory scrutiny, along with the rapidly expanding use of genetically engineered mice as research tools, have increased the need for veterinarians with expertise in laboratory animal medicine in all employment sectors (ie, academia, government, regulatory, and industry).

The American College of Laboratory Animal Medicine recognizes laboratory animal medicine to be a post-graduate specialty. The College strongly supports broad, science-based training of North American veterinary students in core areas of science, medicine, surgery, pathology, and epidemiology, as this provides the solid foundation of knowledge required by all veterinarians, regardless of their area of practice. The College believes that it is critical for all veterinary students in North America to have exposure to the field of laboratory animal medicine within their curriculum.

The goals of this exposure are to:

- Introduce veterinary students to a vitally important, and challenging non-traditional area of veterinary medical practice,
- Provide information regarding pathways for pursuing specialization in laboratory animal medicine,
- Reinforce the critical role of biomedical research for furthering advances in animal and human health,
- Instil an awareness of the significant ethical and regulatory oversight for research involving animal subjects, and
- Inform students about the key role of the laboratory animal veterinarian for overseeing the health and welfare of animals used in research.

ACLAM Veterinary Curriculum Working Group Statement of Purpose

This guide for North American veterinary curricula has been designed to serve as a framework for presenting instructional information relevant to laboratory animal medicine to veterinary students. In writing this curriculum, we have researched and considered various materials, including:

- Surveys of all veterinary colleges in North America regarding current instructional requirements for laboratory animal medicine and related subject matter,
- Review of relevant syllabi from these institutions,
- Discussion of needs and resources with educators at North American veterinary colleges,
- Surveys of perceived knowledge and instruction in laboratory animal medicine amongst new veterinary graduates, new ASLAP and CALAM members, and laboratory animal medicine residents and graduate students in North America,
- Surveys of current laboratory animal medicine curricula outside of North America, and
- Review of expected performance parameters for small mammal medicine knowledge for the North American Veterinary Licensing Examination (NAVLE).

Recommendations have been divided into required and elective elements, in recognition of the diversity of veterinary programs, including early specialization and streaming/tracking, and the difficulty of adding more material into an already full curriculum. Where appropriate, suggestions are offered for presenting this material to students, including means of assessments. The subject topics and recommendations contained within this report will complement material currently being taught to veterinary students and enhance post-graduate professional flexibility. The overall curriculum recommendations are summarized in Table 1 and expected core competencies in this area are summarized in Table 2.

ACLAM Veterinary Curriculum Working Group Recommendations and Objectives

Required curriculum elements

A) Objectives related to laboratory animal medicine as an area of veterinary medical practice.

Veterinary medical graduates will be able to:

1. describe career opportunities in this field, and
2. be knowledgeable about post-graduate opportunities for pursuing a career in laboratory animal medicine.

Exposure of veterinary students to this topic should occur within the first year of the veterinary program, preferably within the first semester as it is consistently mentioned by educators and residents/graduate students as being the most successful tool for engaging student interest and awareness of this field. Exposure to non-traditional practice areas must occur early in the veterinary program before students are required to declare or select an area of specialization. To engender interest and excitement about this field, the seminar should be given by an experienced laboratory animal specialist and resources should be made available by veterinary colleges to bring in a laboratory animal veterinarian for this purpose if one is not available locally. Many veterinary schools in the U.S. and Canada have already incorporated this element into freshman 'Career Day' seminars or first year Health Management courses. A minimum of one hour is recommended to adequately cover this material and to provide time for a question and answer session at the end. This may be combined with some preliminary regulatory information to instill an awareness of ethical oversight for animals used in teaching, research, and testing. A list of relevant local and web resources could be given to veterinary students as part of this instruction or used to develop this teaching material (Table 3). Specific examples of career options within the specialty should be discussed to provide students with an idea of what a career in laboratory animal medicine entails.

Suggested activity or formative evaluation: prior to or following didactic delivery, students could be given an online multiple choice quiz related to this material and the websites. Suggested reading material for students to review includes the ACLAM Role Delineation Document (http://www.aclam.org/gen_rdd.html) and the CALAM/ACMAL Standards of Veterinary Care (<http://www.uwo.ca/animal/website/CALAM/Content/StandardsVetCare.pdf>).

In addition, with respect to the practice of medicine for rodents, lagomorphs, ferrets, nonhuman primates, veterinary graduates will know how to:

3. handle and restrain animals safely and humanely, provide common methods of treatments, and obtain diagnostic specimens,
4. diagnose, clinically and at necropsy, major diseases of these species,
5. offer appropriate advice on management, treatment, and prevention of major diseases and zoonotic risks related to these species, and
6. be able to locate specialists in the field, if consultation is needed.

It is recommended that comparative medicine instruction covering these specific elements be mandatory for all veterinary students. This information is currently required for successful completion of the NAVLE and it provides an introduction to nontraditional veterinary species, including aspects related to public health. The above listed species form the core of animal populations present in most biomedical research facilities and are also being seen with increased frequency in traditional veterinary practice. Practitioners must be aware and be able to advise clients and other veterinary care workers of potential zoonotic diseases and health risks associated with these species.

The majority of veterinary schools in North America offer some form of comparative medicine coursework; however, in many colleges this is elective material. Several schools incorporate medicine and disease of laboratory animals into the small mammal portion of the comparative medicine course or offer these as separate standalone electives. Many educators interviewed reported a lack of resources for teaching this material and insufficient time to develop new or more complete material covering these objectives. Few schools offer hands-on opportunities within formal didactic courses to practice applied skills, such as anesthesia, with these species. This is a common complaint from recent veterinary graduates and new laboratory animal medicine residents and graduate students. Because this material is required for successful completion of the NAVLE, it is recommended that a summative evaluation be administered for the didactic material.

B) Objectives related to regulatory oversight of animal use in teaching, research, and testing.

Veterinary medical graduates will be able to:

1. describe applicable state/provincial and national regulatory oversight for research animal use,
2. describe local institutional oversight for animal use in teaching, research, and testing (ie, institutional policies and IACUC/ACC function), and
3. define the role of the laboratory animal veterinarian in overseeing the care and welfare of research animals.

This instruction may occur at any time within the veterinary curriculum and should be mandatory for all veterinary students. This information may be administered in modular format, via web-based self-study material, case discussions and scenarios that require application of regulatory knowledge, more formal, didactic seminars or a combination of any of these.¹² A minimum of one hour should be assigned to this topic within the curriculum to be followed by a formative or summative evaluation or activity. In addition to providing more complete curriculum coverage of veterinary-specific regulations and legislation, coverage of this subject matter will sensitize veterinary students to the rigors of animal use oversight and public interest in research animal welfare. Community veterinary practitioners will be expected to answer questions from clients pertaining to advances in animal and human medicine made through research, and regarding the humane care and use of animals in biomedical research.

While the majority of medical schools in North America provide some form of regulatory instruction specific to the use of animals in research, teaching, and testing, only 5 of 32 schools provide this as a mandatory component of the curriculum for all veterinary students and it is not uncommon for veterinary graduates to be unaware of regulations and controls governing research animal care and use.

Recommended curriculum elements

Veterinary colleges should:

A) Strive to provide a research experience to all veterinary students prior to graduation.

Research-based learning engages students in a different, discovery-oriented form of active learning and problem solving, and assists students to develop critical thinking and communication skills. The benefits of this experience are not specific to laboratory animal medicine and are expected to positively impact all veterinary disciplines. This is not a new recommendation as it was advocated originally in the Pew Report in 1989, but it is inconsistently applied. Specific to laboratory animal medicine and the science of comparative medicine, encouraging veterinary student participation in research sensitizes students to the use of animals for this purpose. This includes issues such as practical application of institutional and other regulatory requirements related to animal use, encouraging creativity in considering refinement of animal use, providing insight into research-based post-graduate careers, providing insight into the benefits that may accrue to animals and humans from this work, and ideally, projecting a view of the laboratory animal veterinarian as an essential member of the research team.

A number of veterinary colleges have instituted formal “summer leadership-type” programs to encourage veterinary students to explore applied and basic science research projects, particularly following their first and second year of education. Some summer programs additionally offer weekly seminars that explore nontraditional practice areas such as laboratory animal medicine and biomedical research. Two veterinary colleges report offering a research elective for credit to veterinary students during the regular academic year. Although many veterinary colleges offer summer research positions for students, these may not be geared specifically to veterinary students and cannot be expected to introduce veterinary students to the breadth of opportunities in the field of laboratory animal medicine.

Resources to support student employment are available at numerous campuses through an array of programs including the Merck-Merial Summer Scholarship program, the ACLAM externship program, and research scholarships offered specifically to veterinary students by the National Institutes of Health (NIH), US Department of Agriculture (USDA), and Canadian Food Inspection Agency (CFIA). Veterinary students should be made aware of and encouraged to take advantage of these opportunities by frequent email and in-class announcements and hard copy postings of potential summer research employment competitions and opportunities.

B) Provide internal or external experiential opportunities for veterinary students to shadow and be mentored by laboratory animal veterinarians.

All Colleges are strongly encouraged to develop and offer practical electives or externships in laboratory animal medicine of at least one week in duration, particularly for veterinary students in their final clinical rotation year. Experienced laboratory animal

practitioners should oversee these electives. If opportunities and/or expertise are not available in-house, colleges should provide recommendations to veterinary students for these experiences to be obtained externally, ideally within a reasonable commuting distance.

The objectives of these applied experiences are to introduce veterinary students to the range of issues and species typically encountered by a laboratory animal veterinarian. In addition to participating in clinical rounds, this type of experience may include discussion of surgical or anesthetic issues related to animal modeling, ethical issues related to the various research projects, such as the creation of genetically engineered mice, biosafety and occupational health and safety concerns for facility personnel, and health management problems in colony animals. One-on-one or small group learning opportunities allow veterinary students to discuss concepts and issues in-depth, gain a greater appreciation for the complexities of this practice area, and instill confidence when working clinically with these species.

C) Provide core or elective internal didactic opportunities to apply basic veterinary medical concepts to laboratory animal medicine-specific problems or health management issues.

Colleges are encouraged to offer formal core or elective instruction on subject matter related to laboratory animal species as part of streaming/specialization programs. The purpose of this instruction is to encourage students to explore issues and concepts that lie outside of the boundaries of traditional practice and to 'plant a seed' regarding nontraditional practice areas that students may return to at or following graduation. This might include material on nonhuman primate medicine, pathology of nondomestic species, herd/health management as applied to laboratory species, emerging zoonoses of laboratory animals, etc. These modules or electives should be offered to veterinary students within the first 3 years of their training and should be taught by laboratory animal medicine specialists.

D) Incorporate instructional examples involving laboratory animal species more generally into the veterinary medicine curriculum.

Case-based use of laboratory animal species as examples within other courses will promote awareness amongst veterinary students of how alike these species are to more traditional veterinary species (ie, promote concept of comparative medicine) and is beneficial for reaffirming algorithms and approaches to diagnostic problem-solving in a new setting (eg, 'if this were a dog or cat, how would you approach your work-up?'). Occasional use of these species in other disciplines permits generalization of basic principles to new problems and species, and assists with resource management and time constraints, as other veterinary faculty may provide these instructional examples. Areas in which this type of modular instruction would be particularly well suited include: problem- or case-based learning sessions, anatomy, anesthesia, dermatology, ophthalmology, radiology, and clinical and anatomic pathology. Material could be provided during in-class discussions or as web-based material for self-study.

Implementing Curriculum Recommendations

Throughout the process of developing and articulating these recommendations, two recurrent problem areas emerged from discussions with veterinary faculty responsible for delivering this instruction: curriculum space and resources for developing instructional materials.

With the exponential information explosion in veterinary medicine and recent availability of electronic instructional aids to supplement formal in-class delivery of course content, it has become a real and constant challenge for veterinary educators to balance delivery of an appropriate amount of information to students to ensure clinical competency while avoiding information overload. In addition, there is an increasing trend amongst North American veterinary colleges to permit veterinary students to select an area of practice specialty, also known as streaming or tracking, which limits the amount of time available for core instruction. For that reason, recommendations for formatting instructional delivery of laboratory animal medicine-related material have been kept to the absolute essential elements. Faculty are encouraged to be creative with electronic information technology tools for developing efficient methods of teaching, recently reviewed by Bernardo and Malinowski.¹³

Resources for developing much of the material outlined above are readily available free of charge or for a nominal fee (Table 2). Several 'Introduction to Laboratory Animal Medicine' Powerpoint presentations are freely available on the ACLAM website (http://www.aclam.org/gen_careerpath.html) and are easily modified to suit an institution or an individual. ACLAM also provides some funds to support lunchtime seminars on laboratory animal medicine at veterinary schools through its Career Pathways Committee. To support future veterinary education in this field, professional interest groups such as ACLAM, ASLAP, and CALAM should consider developing and making available additional presentations on topics related to the described curriculum for classroom use, to assist veterinary colleges with limited resources.

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