



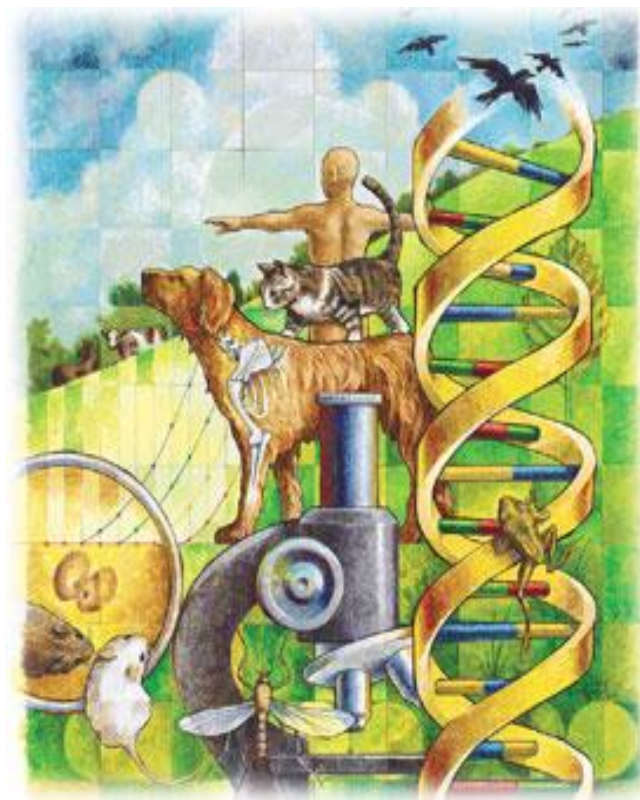
A Challenging Career: Laboratory Animal Medicine

“Mice and Monkeys and Fish and”

Jack Bley, DVM

LABORATORY ANIMAL MEDICINE
IS CLASSIC
COMPARATIVE MEDICINE

COMPARATIVE MEDICINE, ANATOMY AND PHYSIOLOGY



- “One world, one health, one medicine.”
- A field of study concentrating on similarities and differences between veterinary **medicine** and human **medicine**.
- Study of biology and diseases of animals to improve human and animal health.

= TRANSLATIONAL MEDICINE

Some Examples of Contributions by Animal Research to Human (and Animal) Health

- Grafting blood vessels and transplanting organs
- Treating diabetes with insulin
- Discovery of the function of vitamin K
- Scanning CAT (Computer Assisted Tomography)
- Open-heart surgery, coronary bypass, valves, stents
- Vaccines against, measles and **polio**:



HOW DO WE USE ANIMALS TODAY?

- **Education and training**, including veterinary schools, medical schools, and veterinary technology programs
- **Product development**, including pharmaceuticals and medical devices for both humans and animals
- **Safety testing** of pharmaceuticals, medical devices, chemicals and other products as mandated by regulatory agencies
- **Process development** such as organ transplantation and computer aided tomography (CAT) scans
- **Disease screening** including diabetes, Alzheimer's and AIDS
- **Basic science** research
- The Wake Forest Institute for Regenerative Medicine is investigating how cats with chronic kidney disease could someday help inform treatment for humans.



from Clinical Veterinary Medicine *to* Laboratory Animal Medicine???

- Clinicians (small, large, mixed) may feel a call to a new type of career challenge.
- Lab Animal field not understood well because most vet curricula don't present much on this career option.
- Never too late – may enter 20+yrs
- Join me on a walk through this exciting career option!



Laboratory Animal Medicine Worldwide



- High demand
- Diverse jobs
- Good pay
- Flexible hours
- Specialty Boards (not required/encouraged)
 - American College of Laboratory Animal Medicine (**ACLAM**)
 - European College of Laboratory Animal Medicine
 - International College of Laboratory Animal Medicine
- American Society for Laboratory Animal Practitioners (ASLAP)
- American Association of Laboratory Animal Science (AALAS)
- International Council for Laboratory Animal Science (ICLAS)

ICLAS (International Council for Laboratory Animal Science) is an scientific organization dedicated to advancing human and animal health by promoting the ethical care and use of animals in research worldwide. <https://iclas.org/>

- To promote and coordinate the development of Laboratory Animal Science throughout the world and particularly in developing countries
- To promote international collaboration in Laboratory Animal Science
- To promote quality definition and monitoring of Laboratory Animals
- To collect and disseminate information on Laboratory Animal Science
- To promote world-wide harmonization in the care and use of laboratory animals
- To promote the ***humane use of animals*** in research through recognition of ethical principles and scientific responsibilities.
- To promote the ***'3R' tenets*** of Russell and Burch



North America		
national	scientific	association
CANADA	CCAL (CCMA, Canada)	Charles River Breeding Labs
USA	AAALAC	Johnson & Johnson
MEXICO	ANAL, ANA	Alimentos Cargill Nutritional
	ADLAP, ISA	Tecnic
	ICOP	Dr. Williglad, Council
	ANAL, Mexico	IB
national		scientific
COSTA RICA	COSYFACSA	
CUBA	CUBA	
national		scientific
ARGENTINA	AAOAC, Argentina	
CHILE	SNCA, Chile	
	AAVIAL, Uruguay	

national	scientific	association
AUSTRIA	ICLAS, Belgium	SmithKline
BELGIUM	FNAL, FNOMO	Boehringer Ingelheim
BRUNNEN	AFELA, France	Harlan Laboratories
FINLAND	OP-SOLA, Germany	Novo Denmark
GERMANY	ADL, Italy	Phar
GREECE	IBP-HA, The Netherlands	S.P.S.
IRELAND	ICLA, Spain	Stacion Biologica
ISRAEL	Segev LAF, Sweden	ELFEK
ITALY	SAPS, Switzerland	ESPER LABORIS
NETHERLANDS	LMA, Turkey	
NORWAY	LAF, U.K.	
POLAND		
SPAIN		
SWEDEN		

national	scientific	association
HONGKONG	CAAL, China	Johnson & Johnson, Inc.
INDIA	LAF, India	Sanofi-Sintelabo Centre (SINTEL)
JAPAN	JLAF, Japan	Chugai Pharmaceutical Co. Ltd.
KOREA	JLAF (Ap. Sec. An. Lab. An. Res.)	Chugai Japan, Inc.
DE LAO	KALAS, Korea	Sanofi-Sintelabo
THAILAND	KTAF, Korea	Sanofi-Sintelabo, Ltd.
	CUAS, Thailand, UNIA	
	TLAS, Thailand	



Oceania
IBS, Int. Union of Biological Sciences
IBL, Int. Union of Biomedical Sci.
IBP, Int. Union of Pharmacology
IBS, Int. Union of Physical Sciences
IBSD, Int. Union of Drug Toxicology

Africa	
national	scientific
TUNISIA	SAAL, Tunisia Africa

Australia & Oceania	
national	scientific
AUSTRALIA	ANAL, Australia
NEW ZEALAND	

WHAT IS ACCREDITATION??

What is AAALAC International?



AAALAC International is a private, nonprofit organization that promotes the **humane treatment** of animals in science through a **voluntary accreditation program**, a program status evaluation service, and educational programs.

AAALAC ACCREDITED ORGANIZATIONS IN **INDIA**:

https://www.aaalac.org/accreditation-program/directory/directory-of-accredited-organizations-search-result/?nocache=1#adv_acc_dir_search

EXAMPLE:

a Sanofi Company

Sanofi Healthcare India Private Limited
Hyderabad, Telangana State, India

TRAINING RESOURCES IN THE U.S.



American College of
Laboratory Animal
Medicine



American Association
for Laboratory Animal
Science



Austria	Germany	Norway
Belgium	India	Spain
Brazil	Israel	Sweden
Canada	Italy	Switzerland
China	Japan	United Arab Emirates
Denmark	Korea	United Kingdom
Finland	Netherlands	United States
France	New Zealand	

- Geographic locations of Diplomates from all CLAs

Association of Primate Veterinarians (APV)	http://www.primatevets.org/
American Society for Laboratory Animal Practitioners (ASLAP)	http://www.aslap.org/
Canadian Association for Laboratory Animal Medicine / L'association canadienne de la médecine des animaux de laboratoire (CALAM/ACMAL)	http://calam-acmal.org/
European Primate Veterinarians	http://euprimevets.eu/
European Society for Laboratory Animal Veterinarians (ESLAV)	http://eslav-eclam.org/
Japanese Association for Laboratory Animal Medicine (JALAM)	http://plaza.umin.ac.jp/JALAM/

National and regional associations for laboratory animal veterinarians

The Laboratory Animal Veterinarian's Role – from **ACLAM**



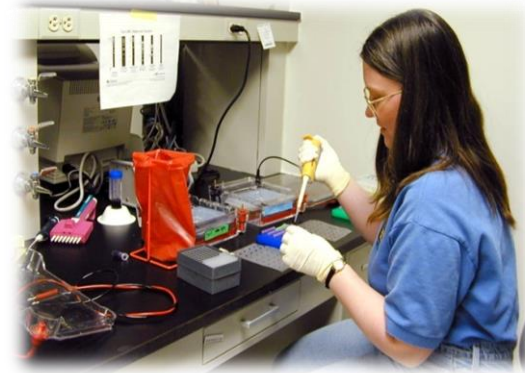
- Provide for the **health AND well-being** of research animals. This is accomplished with a wide variety of activities:
- **Clinical** medicine and surgery,
- Design and implementation of **preventive veterinary** programs,
- Monitoring of **animal husbandry** programs,
- Participation in **institutional animal care**,
- **Consultation** and **training** of biomedical researchers and technicians,
- Independent **research** plus as consultants and collaborators for a wide range of research investigators.

WHERE ARE VETERINARIANS NEEDED AND/OR REQUIRED IN BIOMEDICAL RESEARCH TODAY?

- Manage **genetically engineered rodents** (mice)
- Monitor and prevent of the introduction of **infectious agents** into laboratory animal facilities
- Assist with the growth of **translational research**
- Work to minimize or eliminate **pain** and/or **distress** in research animals
- Provide **regulatory compliance** oversight
- Support research involving zoonotic agents in **biodefense** and **bioterrorism** research
- **Clinical** veterinary medicine



Diverse career opportunities



- Clinical Veterinary Medicine
- Surgery
- Administration
- Research
- Public Health – MPH
- Teaching and Training
- Pathology
- Regulatory oversight (IACUC = Institutional Animal Care and Use Committee)
- **Public education to thwart animal activism**

Clinical Veterinary Medicine

- Provides **health care** for variety of species.
- Expertise in **model development & review** of research protocols for animal welfare.
- Provides **technical support** for research – x-rays, ultrasound, biopsy sampling.
- No 2 days are alike!

Attending Veterinarian = USDA term for vet with authority for animal care and use program.

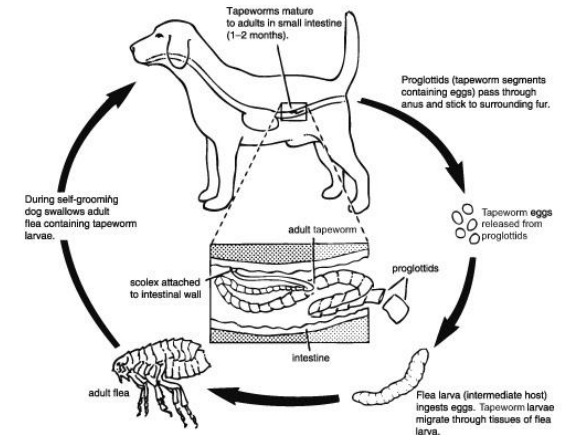


TRANSGENICS



- The use of **genetic engineering** for animal research has increased in biomedical research.
- While the manipulation of the DNA of these animals allows for very specific models for study, the publication of the mouse genome allowed for a tremendous expansion in **functional genomics**.
- Currently, there is the potential for tens of thousands of phenotypes and genotypes allowing for an almost limitless amount of research to be performed in the near future.
- Knock-outs, knock-ins, CRISPR/CAS9 and.....

Infectious Diseases in Laboratory Animals - 1



- As has been demonstrated by significant research, infectious diseases in laboratory animals can adversely affect the research performed in and results obtained from those animals. This results in a waste of time, money, effort, and animals.
- Laboratory animal veterinarians are at the front line in preventing research animals from acquiring infectious diseases and are the main resource involved in eradicating animal facilities of infectious agents.
- Subclinical diseases make detection more difficult.
- AND subclinical diseases are a **research variable** that may result in bogus results that *may never be discovered!!*

Infectious Diseases in Laboratory Animals - 2

- **Globalization** of biomedical research means that animals and their genetic material (e.g., cell lines and tissues) are shared around the world as never before.
- Additionally, as colonies expand to ever increasing sizes, one outbreak can have devastating effects as it spreads through a colony.
- The risk of disease transmission is also higher in **genetically engineered** animals due to altered immune function, increased incidence of tumors, and compromised bodily functions.
- **QUARANTINE, QUARANTINE, QUARANTINE!!!!**

Cellular and Molecular Biomedical Research



- Cellular and molecular biomedical research is essential. However, there is a growing interest and a need to bring those discoveries into play with body systems, thus the term translational research. “From the bench to the body!”
- **Translational research** applies findings from basic science to enhance human health and well-being. In a medical research context, it aims to "translate" findings in fundamental **research into medical practice** and meaningful health outcomes.
- **Laboratory animal veterinarians** are uniquely poised to assist with this imperative research. Veterinarians serve as an excellent resource regarding **physiology, animal models, and comparative medicine**.



Surgery & Postop Care

- Veterinarians with a love of surgery, anesthesia, analgesia can have a challenging career in lab animal programs to develop surgical programs and **teach** research staff (esp. rodent surgery!)
- MDs doing surgery on animals can be a problem (don't recognize species differences) – Vets doing surgery on people is illegal!
- Surgical vets add excellence, depth & diversity to a lab animal program.

Anesthesia, Analgesia and Surgery

- ***Experimental*** vs **Humane** Endpoints
- Types of **pain**
- Behavioral indicators of pain in rodents
- Scoring sheets are used to track clinical signs.
- ***Who better than a veterinarian to be available to assess pain and distress in an animal??***

Pain and Distress - 1



- Increased **societal demand** for higher standards of laboratory animal care and use, as well as well-being, has resulted in the need for more laboratory animal veterinary support to reduce the levels of pain and distress experienced by animals used in biomedical research.
- Individual animals need to have their condition assessed and diagnosed, pain and/or distress relieved, and their well-being assured by properly trained veterinarians.

Pain and Distress - 2

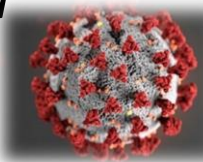


- Along with providing hands-on care to laboratory animals needing veterinary treatment, clinically oriented laboratory animal veterinarians are essential to the **continuing investigation** into animal pain and distress relief.
- **If in doubt: if you think a procedure would be painful to you (or your child) than start with that assumption for the animals in your study.**
- **Can the pain be relieved without altering the outcome of a study?**

Biodefense and Bioterrorism Research



- Due to the world events involving terrorism, funding for biodefense, bioterrorism, and emerging infectious diseases has substantially increased since 2001.
- As part of national defense and funding initiatives, the Centers for Disease Control identified 18 biological agents that could potentially be used as bioweapons. Of those 18 agents, 11 are zoonotic. Example zoonotic agents are *Bacillus anthracis* (anthrax), *Francisella tularensis* (tularemia), and *Burkholderia mallei* (glanders).and COVID – 19?
- Because of the significance that this research poses both to human and animal health, and the potential transmission of these deadly diseases from animals to humans, veterinarians are involved heavily with this research and developing applicable safety guidelines for animal care and use.



Facility Design and Maintenance

- Designing/maintaining specialized animal facilities such as transgenic mouse facilities, nonhuman primate facilities, and surgical facilities.
- Designing specialized areas within animal facilities including MRI and other imaging suites and biohazard areas.
- Ensuring that major fixed equipment such as rack washers are operating properly.
- Ensuring that the physical facility is maintained properly (e.g. walls are painted, floors are sealed).
- Ensuring that an appropriate pest control program is in place.

= **IPM** – integrated pest management



Teaching & Training

- LAM vets needed to teach in veterinary schools, veterinary technician schools, graduate programs.
- Veterinarians can serve as trainers for other veterinary residents, graduate students, research staff, animal care staff.
- A well-developed training program is an essential part of a good lab animal program.



Veterinarians Conduct Research

- Independent or Collaborative research
- Provide hands-on assistance in research procedures
- Assist in grant writing and article publication
- Serve as the principal investigator on a study
- Participate in study design and model development



Veterinary Care - 1



- Establish programs of **detection, surveillance, diagnosis, and treatment** of diseases whether naturally occurring on research induced in laboratory animals.
- Provide and/or coordinate holiday, weekend, and after-hours veterinary coverage for laboratory animals. = 24/7
- Advise and participate in surgical and perioperative care of the animals.
- Become a resource of veterinary-related information for researchers and animal care technicians, and other personnel within the animal care and use program.
- Provide hands-on veterinary care as necessary.

Veterinary Care - 2

- Report any problems to the **IACUC** or other groups as necessary.
- Ensure accuracy and appropriateness of **medical records**.
- Approve and coordinate **importation** and **exportation** of animals to and from the animal facilities.
- Participate in research **protocol review**.
- Advise scientists about the appropriate methods for **minimizing pain and distress**.
- **Promote animal well-being at all times.**
- **ENVIRONMENTAL ENRICHMENT??**



Environmental Enrichment

Animals are also provided enrichment in the form of exercise, toys, music, group housing, videos and other food treats.





Pathology and Preventive Medicine and

- Lab animal vets may become dual boarded in pathology which enables them to work in a toxicology group to diagnose toxic effects from drugs.
- Pathologists that understand lab animal diseases and species/strain differences, will add strength to a lab animal program.
- Veterinary preventive medicine/Public Health
- Microbiology, surgery, and

VETERINARIANS ADVISE:

- **Animal model selection**
- Anesthesia and analgesia
- Anatomy
- Physiology
- Nutrition
- Techniques/biotechnology
- **Euthanasia**
- Providing expert advice on the alleviation or elimination of pain and distress in research animals.
- Informing the PI about non-animal **alternatives** or less painful and/or distressful **alternatives** to current research processes.
- Providing training as necessary.
- Providing information on refining techniques and other procedures to enhance research outcomes.
- Assisting with colony management.



Alternatives (the 3 Rs)

3 Rs = **R**educe, **R**efine, **R**eplace

Reduction of animal numbers

- Better statistics, less redundancy.

Refinement of animal models

- Less invasive, less pain/distress.

Replacement of animal models

- Cell culture, computer modeling, etc.

THE FOURTH R IS RESPONSIBILITY

Becoming a Lab Animal Veterinarian Where Do I Begin?

Training Route

2-3 years of training*

First author scientific publication

Eligible for ACLAM boards

Experience Route

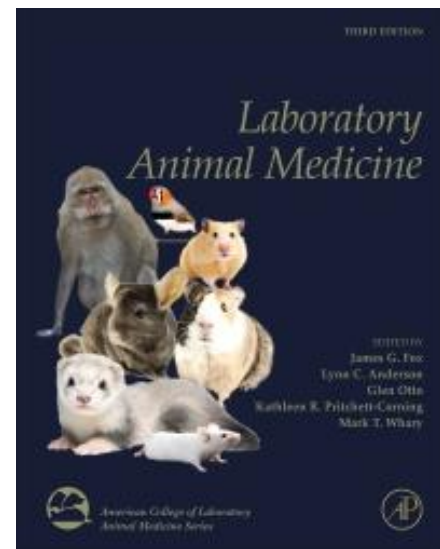
6 years of full-time experience*

First author scientific publication

Eligible for ACLAM boards

*at time of application

1. Training Route



Commonly – enter career through a postdoctoral “residency” training program.

- Clinical focus: learn LAM & administration of running an animal research program.
- Research focus (NIH): may pursue an MS or PhD
- Combination program: learn lab animal medicine, administration and research.

Finding a Training Program

- Visit the ASLAP web site

<http://www.aslap.org>

- Visit the ACLAM web site

<http://www.aclam.org>

- Talk to a lab animal vet

- Do an externship...more info later.

- Visit the AALAS site for technologist and technician training

<https://aalaslearninglibrary.org/app/dashboard>



FROM THE

AALAS
LEARNING LIBRARY



AN EXAMPLE:

Post-Procedure Care of Mice and Rats in Research: Minimizing Pain and Distress

AALAS CEUs: 1 for completing course and passing exam

- 1. Introduction
- 2. Investigator Responsibility
- 3. Study Planning
- 4. Approaches for Detecting Clinical Signs of Pain and Distress
- 5. Physical Exam for Clinical Condition
- 6. Strategies to Prevent and Minimize Post-Procedural Pain and Distress
- 7. Alleviation of Pain and Distress
- 8. Documentation of Post-Procedure Care
- 9. Summary and References
- 10. Final Exam

अनसंधान में चूहे और चूहों की बाद की प्रक्रिया: दर्द और संकट को कम करना

- AALAS CEUs: 1 पाठ्यक्रम पूरा करने और परीक्षा उत्तीर्ण करने के लिए
- 1 परिचय
- 2. अन्वेषक की जिम्मेदारी
- 3. अध्ययन योजना
- 4. दर्द और संकट के नैदानिक संकेतों का पता लगाने के लिए दृष्टिकोण
- 5. नैदानिक स्थिति के लिए शारीरिक परीक्षा
- 6. पोस्ट-प्रक्रियात्मक दर्द और संकट को रोकने और कम करने के लिए रणनीतियाँ
- 7. दर्द और संकट का उन्मूलन
- 8. पोस्ट-प्रोसीजर केयर का दस्तावेजीकरण
- 9. सारांश और संदर्भ
- 10. अंतिम परीक्षा
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- [नियम एवं शर्तें](#)



National Centre for Biological Sciences
Tata Institute of Fundamental Research

National Centre for Biological Sciences
Tata Institute of Fundamental Research,
Bellary Road,
Bangalore 560065,
Karnataka, India

<https://www.ncbs.res.in/contact-us>

Externships

- Typically 2-12 weeks
- Usually summer programs but can be throughout the year.
- Flexible experience depending on interest.
- Room and board may be covered (depends on program).
- May receive a small stipend for living expenses.



Externships

- Where?
 - academia –
 - LAM training programs
 - Academic medical centers – medical schools, graduate schools
 - biotechnology & pharmaceutical companies
 - NIH, USDA
 - National Primate Research Centers (8)
- Visit the ACLAM web site
 - <http://www.aclam.org> or
 - <https://www.aclam.org/education-and-training>

2. Experience Route

- Part-time LAM job – good way to start.
 - Many options at small colleges, contract labs
- Full-time lab animal job – ready to plunge.
 - Be ready to spend a lot of time reading & learning to become a proficient LAM vet.

CAUTION: Always best to have an experienced LAM mentor to learn from!

2. Experience Route (cont.)

Must get involved in C.E.** for best learning:

- American Assoc. for Lab Anim. Sci. (AALAS)
- American Coll. Of Lab Anim Med (ACLAM)
- American Soc of Lab Animal Practitioners (ASLAP)
- Local branch AALAS meetings
- Public Responsibility in Med & Research (PRIM&R)
- IACUC 101 training
- American Veterinary Medical Assoc. (LAM session)
- Others – focus on surgery or research interests

**CONTINUING EDUCATION

Lab Animal Work

Extremely varied depending on program

- Large University
 - Large diversity of species – mice to monkeys
 - Research areas span broad base
 - Many LAM vets and techs to work with/learn from.
- Small College
 - May be rodent only or few species
 - May be only one area of research – neuroscience
 - May work alone as consulting vet

Lab Animal Work

Extremely varied depending on program

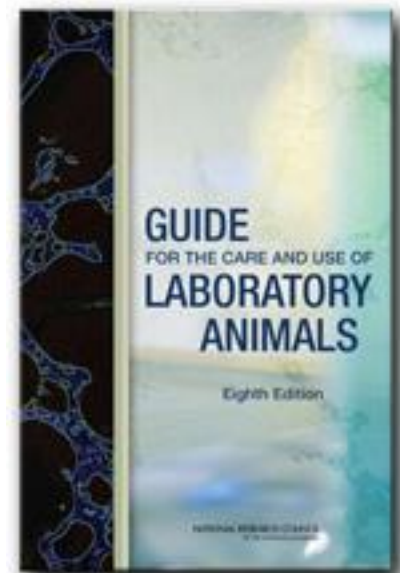
- Large Pharmaceutical Company
 - Large diversity of species
 - Research areas focused on drug/device discovery
 - Many LAM vets and techs to work with/learn from.
- Small Contract Laboratory
 - May be rodent only or few species
 - Research depends on client base – toxicology, etc
 - May work alone or with one other vet

Regulatory Oversight & THE IACUC

- Institutional **A**nimal **C**are and **U**se **C**ommittee (**IACUC**) is mandated by USDA regulations & PHS.
- Must include a veterinarian w/ LAM exp.
- Responsible for reviewing and approving all animal use protocols.
- Review animal program/facilities ea. 6 months.
- Responsible for investigating animal concerns.
- Veterinary leadership enhances animal welfare.
- **The IACUC is a SELF-regulating body!!**

The Guide to the Care and Use of Laboratory Animals

- First published in 1963 by the US Public Health Service. This publication established standards and appropriate criteria for the care of laboratory animals.
- NIH, the Federation of American Societies for Experimental Biology, the Association of American Medical Colleges, the American Heart Association
- Later versions have been produced by the Laboratory Animal Research Institute (ILAR), the Life Sciences Commission and the National Research Council.
- The most recent edition was published in 2011.



Laboratory Animal Welfare Act (AWA)

- In 1966, the US Congress passed the **Laboratory Animal Welfare Act** , which set standards for the purchase and care of research animals, as well as stating that certain research animals receive adequate veterinary care under certain special circumstances. Since 1966, there have been several amendments in the law to broaden the scope.
- Currently, the [Animal Welfare Act \(AWA\)](#) has called for the most used in research covers vertebrates except cold-blooded animals, mice, rats, and birds. It also includes sections related to non-research activities such as: animal breeding and care of marine mammals.
- The Animal Welfare Act established the important role of the **attending veterinarians**. In this situation vet provides adequate veterinary care in animal care and utilization programs. The attending vet may be a full-time employee or consultant, depending on the size of the facility and the complexity of the animal care required. The responsibilities and duties of the attending veterinarian has been explained throughout this presentation.

The Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA)



- India is one of the pioneering countries to institute Prevention of Cruelty to Animals Act in **1960** .
- Acts were instituted in France in 1963 and in USA in 1966.
- The detailed rules for experimentation on animals were first enacted by the Ministry of Agriculture in 1968.

United States Department of Agriculture Animal and Plant Health Inspection Service



- APHIS is the enforcement agency for the Animal Welfare Act. Veterinary Officers (VMOs) from the USDA will make unannounced inspections of facilities to implement the Animal Welfare Act and its regulations (AWR). Inspections are conducted at least once a year, and inspection findings by the USDA
- Today, the Animal Welfare Act covers adequate veterinary care, IACUC functions, housing and care standards, animal procurement, animal shipment, anesthesia and analgesia requirements, surgical standards and other areas of laboratory animal use

Public Health Service Policy



- The Health Research Extension Act of 1985 provided a mandate for the production [and use of laboratory animals](#). The Office of the NIH handles and coordinates the Office of Laboratory Animal Welfare (OLAW) policy. Currently, the *policy* further sets guidelines that institutions receiving **NIH grants** must follow for the use of animals in research. These guidelines include an institution's Institutional Animal Care and Use Committee, requirements for recordkeeping and reporting. Additionally, the *policy guides* the National Research Council for specific principles for the care and use of animals.
- Institutions indicate adherence to the PHS *policy* by completing the "**OLAW Assurance**" and revising it on a regular basis . An OLAW Assurance Number is required to receive a grant from NIH.

HEROES OF MEDICINE AND PHYSIOLOGY



Pasteur



Hallen



Joshi



Reed



Carson



Nightingale



Hilleman

THE REAL HEROES OF MEDICINE AND PHYSIOLOGY



AND LEST WE FORGET....

zebrafish



fruitflies



These share 70% of our genome!

Where are the jobs?

- Anywhere biomedical research is performed
 - Academia – both large and small programs
 - Pharmaceutical Companies
 - Biotech Companies
 - Hospitals
 - Government-Military-NIH
 - Public health
- Throughout the US / world
- In India [https://www.aaalac.org/accreditation-program/directory/directory-of-accredited-organizations-search-result/?nocache=1#adv acc dir search](https://www.aaalac.org/accreditation-program/directory/directory-of-accredited-organizations-search-result/?nocache=1#adv_acc_dir_search)

Animals Benefit Too!!!

Pookie: Living with diabetes



Maggie: Breast cancer survivor

Buddy: After his heart surgery

Lucy: After her kidney transplant

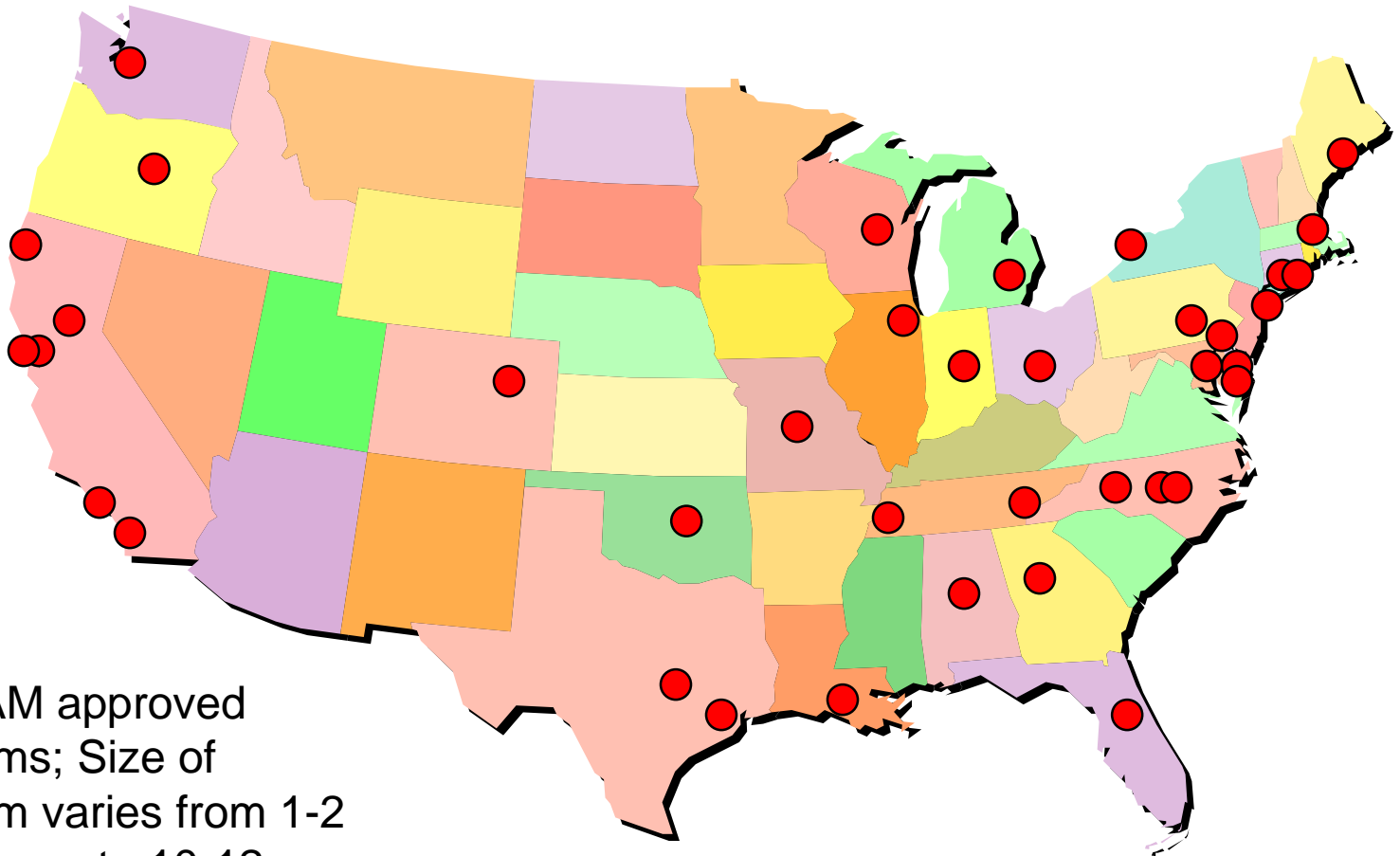
Highlights of my veterinary career in the lab

- Exciting/diverse career - improving both animal & human lives in biomedical research and practice.
- Job security and good positions in a range of experience & skills.
- Constant learning.
- Lucrative – good pay/benefits.
- Great environments – flexible hours.
- Great colleagues.
- Worldwide travel.
- Never a dull moment: constant challenges.

THANKS!!

- **ACLAM**
- **AALAS**

Where are U.S. training* programs?



* ACLAM approved programs; Size of program varies from 1-2 trainees up to 10-12 trainees!