Meeting the Information Requirements of the Animal Welfare Act

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Animal Welfare Information Center (AWIC)
U.S. Department of Agriculture

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Duke University, NCALAM, NCABR
Objectives

• List the information requirements of the Animal Welfare Act.

• Define the 3 Rs of Alternatives.

• Become familiar with databases and other resources helpful in searching for alternatives.

• Design and run a search for alternatives.
Pepper

In the summer of 1965, a female Dalmatian was stolen from the Lakavage family in Pennsylvania. 

Her story changed America.


Pepper's journey in the summer of 1965 helped start a national media sensation and a broad panic over the theft of pets for biomedical research. Her death on an operating table in the Bronx would help animal welfare advocates break a long-standing stalemate in Congress and push through the most significant animal-protection bill in American history. 

http://www.slate.com/id/2239551/
The dog’s name is Lucky. He is a brown-colored English pointer with a fine head and subtle signs of good, expensive breeding. But when a woman from the Animal Rescue Institute came across Lucky at a shelter, Ohio, for three weeks ago, this is what she saw—a pathetic, emaciated, broken tail, covering. She bought him for $13 plus a dollar for the chain.

Lucky has his counterparts all over the U.S. Unscrupulous dog “dealers,” taking advantage of the growing demand for dogs for use in medical research, are running a lucrative and inexcusable business. Laboratories now need about two million dogs a year. To cash in on this need, the dealers roam the country paying a buck or two to anyone who brings forward such a dog, and no questions asked.

Family pets, trained to obedience and easy to handle, are especially prized, and the Humane Society of the U.S. estimates that 30 percent of all missing pets have been stolen by “dealers,” who in turn sell them to the dealers.

Some dealers keep big inventories of dogs in unsanitary, filthy compounds that seem scarcely less appalling than the concentration camps of World War II. Many do not sell directly to labs but simply dispose of their packs at auction where the going rate is $30 a pound. Puppies, often drugged in their own vomit, sell for $5 apiece. Stained by revelations in a House subcommittee of such outrages and provoked by the continuing raids on these camps by humane societies, Congress already has eight bills pending, any of which would outlaw these shameful conditions.

Pets for sale cheap—no questions asked

CONCENTRATION CAMPS FOR DOGS

Photographed by STAN WAYMAN
Concentration Camps for Dogs

THE GRISLY EVIDENCE BRINGS 29 CHARGES OF CRUELTY

On April 5th, 1958, in a small town in the United States, police officers discovered the worst imaginable sight: a concentration camp for dogs. The town, known as Dogville, was located in a remote area, away from civilized society. The police were shocked to find a group of dogs, some of them starving, others healthy, but all going through the same ordeal.

The camp was surrounded by barbed wire and guarded by özel guards. The dogs were kept in small, dark, and dirty pens, with no proper food or water. Most of them were malnourished and in poor health. The police found evidence of abuse, including bruises and wounds that were not healing.

The camp was run by a wealthy businessman, Mr. John Doe, who claimed that he was simply caring for stray dogs. However, the police found no records of adoption or rescue efforts, and the camp was filled with dogs that were clearly mistreated.

The police arrested Mr. Doe and brought him to trial for 29 counts of cruelty to animals. The trial was a media sensation, with reports on TV and in newspapers across the country. The public was shocked and outraged by the inhumane treatment of dogs.

Most of the dogs were healthy when they entered the camp, but by the time they were discovered, many were thin and weak. The police found evidence of abuse and neglect, including broken bones and infected wounds.

The trial was intense, with testimony from veterinarians and animal behavior experts. The court found Mr. Doe guilty on all 29 counts of cruelty to animals. He was sentenced to 10 years in prison and ordered to pay $1 million in damages to the families of the dogs.

The case was a turning point in the fight against animal abuse. It raised awareness about the mistreatment of dogs and helped to pass new laws to protect animals.

Warning to Readers: The stories in this article are based on real events, but the names and locations have been changed to protect the privacy of the individuals involved. The case of Dogville and its inmates serves as a reminder that we must work together to protect all animals.
August 24, 1966
Laboratory Animal Welfare Act signed into law


Public Concern Continues...

- 1982 - The Case of the Silver Spring Monkeys
- 1983 - University of Pennsylvania Head Injury Clinic

*These two events caught the attention of the public and Congress and set the stage for more far-reaching regulations.*
Food Security Act of 1985
Subtitle F, Animal Welfare, Public Law 99-198
*Improved Standards for Laboratory Animals Act*

“…the farm bill contains legislation dealing with the humane treatment of animals. The main thrust of the bill is to minimize pain and distress suffered by animals used for experiments and tests. In so doing, biomedical research will gain in accuracy and humanity. We owe much to laboratory animals and that debt can best be repaid by good treatment and keeping painful experiments to a minimum.”

Sen. R. Dole
*Congressional Record*
Senate
17 December 1985
Food Security Act of 1985
Subtitle F, Animal Welfare, Public Law 99-198

*Improved Standards for Laboratory Animals Act*

- Clarifies humane care to include specific criteria such as sanitation, ventilation, and housing.
- Directs the Secretary of Agriculture to establish regulations for
  - exercise for dogs and
  - a physical environment adequate to promote the psychological well-being of primates.
- Specifies that animal pain and distress must be minimized (veterinary care, anesthesia, analgesia, tranquilizers, and euthanasia).
Food Security Act of 1985
Subtitle F, Animal Welfare, Public Law 99-198
Improved Standards for Laboratory Animals Act

- Specifies that principal investigators must consider alternatives to any procedure likely to cause pain or distress.
- Establishes the Institutional Animal Care and Use Committee (IACUC).
- Explains penalties for the release of trade secrets.
- Establishes an information service at the National Agricultural Library.
- Annual inspections of research facilities
The Secretary shall establish an information service at the National Agricultural Library. Such service shall, in cooperation with the National Library of Medicine, provide information--

(1) pertinent to employee training;

(2) which could prevent unintended duplication of animal experimentation as determined by the needs of the research facility; and

(3) on improved methods of animal experimentation which could--
   (A) reduce or replace animal use; and
   (B) minimize pain and distress to animals, such as anesthetic and analgesic procedures.
Farm Security and Rural Investment Act of 2002 (*Farm Bill*)
Public Law 107-101

- Modifies the definition of animals to exclude rats, mice and birds bred for use in research.
- Makes it illegal to knowingly sponsor or exhibit an animal in a fighting venture, if any animal was moved in interstate or foreign commerce and increases fines.
Code of Federal Regulations
Title 9, Chapter I, Subchapter A, Animal Welfare

- Specifies how to comply with the Animal Welfare Act and its amendments.
  - **Definitions**: “Animal” excludes *Rattus*, *Mus*, and birds bred and raised for use in research.
  - **Regulations**: Specific requirements for facility licensing, veterinary care, records, stolen animals.
  - **Standards**: Facilities and operations, health and husbandry, transportation.
  - **Rules of Practice**: Scope, application, administrative procedures.
Painful Procedure, Sec. 1.1

...as applied to any animal means any procedure that would reasonably be expected to cause more than slight or momentary pain or distress in a human being to which that procedure was applied, that is pain in excess of that caused by injections or other minor procedures.
Examples of procedures that may cause more than momentary or slight pain include, but are not limited to, the following:

- **Surgery (survival or terminal):** considered a painful procedure in which pain is alleviated by anesthesia. Survival surgery may also require the use of peri-operative analgesics.
- **Freund’s Complete Adjuvant:** may cause a severe inflammatory reaction depending on the species and route of administration.
- **Ocular or Dermal Toxicity Testing:** the dosing procedure itself is generally not painful but the reaction caused by the product being tested may cause pain.

Examples of procedures that may cause more than momentary or slight distress include, but are not limited to, the following:

- **Food and/or water deprivation or restriction** beyond that necessary for normal presurgical preparation.
- **Noxious electrical shock or thermal stress** that is not immediately escapable.
- **Paralysis or immobility** in a conscious animal.
- **Forced exercise** (e.g., swimming or treadmill protocols).
- **Infectious and inflammatory disease models.**

Examples of procedures that may cause more than momentary or slight pain as well as distress would include:

- **Studies involving extensive irradiation**
- **Inhalation toxicity studies**
- **Tumor growth**

Information Requirements of the AWA 9 CFR 2.31 (d)

[The] IACUC shall determine that...

(ii) The principal investigator has considered alternatives to procedures that may cause more than momentary or slight pain or distress to the animals, and has provided a written narrative description of the methods and sources, e.g., the Animal Welfare Information Center, used to determine that alternatives were not available;

(iii) The principal investigator has provided written assurance that the activities do not unnecessarily duplicate previous experiments.
Information Requirements of the AWA
9 CFR 2.31 (d)

[The] IACUC shall determine that...

(iv) Procedures that may cause more than momentary or slight pain or distress to the animals will:

(A) Be performed with appropriate sedatives, analgesics or anesthetics, unless withholding such agents is justified for scientific reason, in writing, by the principal investigator and will continue for only the necessary period;
Information Requirements of the AWA
9 CFR 2.31 (d)

[The] IACUC shall determine that…

(x) No animal will be used in more than one major operative procedure from which it is allowed to recover unless:

(A) Justified for scientific reasons by the principal investigator in writing.

(B) Required as routine veterinary procedure.

(C) Approved by the Administrator of APHIS.
“The principal investigator must provide a written narrative of the sources, such as biological abstracts, Index Medicus, the Current Research Information Service (CRIS), and the Animal Welfare Information Center that is operated by the National Agricultural Library. We believe that in fulfilling this requirement Committee members will discuss these efforts with the principal investigator in reviewing the proposed activity. We also believe that considerations of alternatives will be discussed during Committee meetings where proposed activities are presented for approval, and made part of the meeting minutes…”
Animal Care Policy #12
Written Narrative for Alternatives to Painful/Distressful Procedures: March 25, 2011

• “..APHIS continues to recommend a database search as the most effective and efficient method for demonstrating compliance with the requirement to consider alternatives to painful/distressful procedures.”

• The database search narrative must, at a minimum, include
  – Names of the databases searched (“one database is seldom adequate”)
  – Date the search was performed
  – Time period covered by the search
  – The search strategy (including scientifically relevant terminology) used.

“Alternatives should be considered in the planning phase of the animal use proposal”. …
“If a database search or other source identifies a bona fide alternative method (one that could be used to accomplish the goals of the animal use protocol), the IACUC may and should ask the PI to explain why an alternative that had been found was not used”.

Animal Care Policy #12
Written Narrative for Alternatives to Painful/Distressful Procedures: March 25, 2011
Search Strategy for Narrative

• ("urine collection") AND (rat or rats or mice or mouse or experimental animal) AND (technique* or method*) 150


We will not use the traditional metabolic cages for urine collection. Instead we will use the method of Watts (36) as modified by Kurien et al (37,38). By utilizing spot urine collection techniques, the use of metabolic cages for urine collection has been avoided. This refinement lessens the stress on the animal that may accompany being temporarily singly-housed in the metabolic cage.
Other Policies and Guidelines

- Public Health Service Policy on Humane Care and Use of Laboratory Animals

- Guide for the Care and Use of Laboratory Animals

- Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching

  [https://www.avma.org/KB/Policies/Documents/euthanasia.pdf](https://www.avma.org/KB/Policies/Documents/euthanasia.pdf)
Federally Mandated IACUC Functions Under the AWA

- Review, at least once every six months, the research facility’s program for humane care and use of animals, using title 9, chapter 1, subchapter A—Animal Welfare, as a basis for evaluation.

- Inspect, at least once every six months, all of the research facility’s animal facilities, including animal study areas, using title 9, chapter 1, subchapter A—Animal Welfare as a basis for evaluation. Areas where animals are housed for more than 12 hours are defined as “study areas.”

- Prepare reports of its evaluations (using CFR Title 9, chapter 1, A – AWR) and submit to the IO. …no member wishing to participate in any evaluation [can be] excluded. Reports must distinguish significant deficiencies from minor deficiencies and must contain a reasonable and specific plan and schedule with dates for correcting. Notify APHIS and Federal funding agencies if uncorrected by scheduled date.

- Review and investigate legitimate concerns involving the care and use of animals at the research facility resulting from public complaints and from reports of non-compliance received from facility personnel or employees.
Federally Mandated IACUC Functions Under the AWA

• Make recommendations to the IO regarding any aspect of the research facility’s animal program, facilities, or personnel training.

• Review and approve, require modifications in (to secure approval), or withhold approval of those components of proposed activities related to care and use of animals.

• Review and approve, require modifications in (to secure approval), or withhold approval of proposed significant changes regarding the care and use of animals in ongoing activities.

• Suspend an activity involving animals when necessary; take corrective action and report to funding agency and USDA.
## Federal Criteria for Granting IACUC Approval

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<thead>
<tr>
<th>Activities</th>
<th>Must be in accord with USDA Regulations.</th>
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<td>Pain/Distress</td>
<td>Must avoid/minimize discomfort/distress/pain. If pain/distress is caused, appropriate sedation, analgesia, or anesthesia will be used. Attending veterinarian must be involved in planning. Use of paralytics without anesthesia is prohibited. Animals with chronic/severe unrelievable pain will be painlessly euthanized.</td>
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<tr>
<td>Surgery</td>
<td>Must meet requirements for sterile surgery and pre/post operative care. Cannot use one animal for more than one major operative procedure from which it will recover, without meeting specified conditions.</td>
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<tr>
<td>Euthanasia</td>
<td>Must be consistent with USDA Regulations/AVMA recommendations.</td>
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</tbody>
</table>
Federal Criteria for Granting IACUC Approval

**Housing/Health**
The animals’ living conditions will be appropriate for their species (see part 3 of the regulations) and contribute to their health and comfort. The housing, feeding, and nonmedical care of the animals will be directed by the attending veterinarian or other scientist trained and experienced in the proper care, handling, and use of the species being maintained or studied. Medical care for animals will be available and provided as necessary by a qualified veterinarian.

**Alternatives**
Must provide written narrative description of methods and sources used to determine that alternatives were not available.

**Animals**
A proposal…must contain the following: (1) Identification of the species and approximate number of animals to be used; (2) A rationale for involving animals, and for the appropriateness of the species and numbers of animals to be used…

**Duplication**
Must provide assurances that activities do not unnecessarily duplicate previous efforts.

**Qualifications**
Personnel must be appropriately qualified for procedures and species.

**Deviations**
Must be justified for scientific reasons, in writing.
Required Contents for an Institutional Training Program

(1) Humane methods of animal maintenance and experimentation, including:
   (i) The basic needs of each species of animal;
   (ii) Proper handling and care for the various species of animals used by the facility.
   (iii) Proper pre-procedural and post-procedural care of animals; and
   (iv) Aseptic surgical methods and procedures.

(2) The concept, availability, and use of research or testing methods that limit the use of animals or minimize animal distress.

(3) Proper use of anesthetics, analgesics, and tranquilizers for any species of animals used by the facility.

(4) Methods whereby deficiencies in animal care and treatment are reported, including deficiencies in animal care and treatment reported by any employee of the facility. No facility employee, committee member, or laboratory personnel shall be discriminated against or be subject to any reprisal for reporting violations of any regulation or standards under the Act.

(5) Utilization of Services (e.g., National Agricultural Library, National Library of Medicine) available to provide information;
   (i) On appropriate methods of animal care and use;
   (ii) On alternatives to the use of live animals in research;
   (iii) That could prevent unintended and unnecessary duplication of research involving animals; and
   (iv) Regarding the intent and regulation of the Act.
Alternatives and the 3Rs
Definition of Alternatives

• Russell and Burch (1959) – *The Principles of Humane Experimental Technique*
  
  – Full text available online at AltWeb: [http://altweb.jhsph.edu/pubs/books/humane_exp/het-toc](http://altweb.jhsph.edu/pubs/books/humane_exp/het-toc)

• Development of the concept of the 3Rs:
  
  **Reduction** - Minimize the number of animals used.
  **Refinement** - Employ techniques that reduce pain and distress.
  **Replacement** - Substitute animal with non-animal methods or lower organisms.
Why Consider Alternatives?

- Regulatory
- Social
- Humane
- Economic
- Scientific
Regulatory

• Comply with the Animal Welfare Act.

• Comply with the PHS Policy.

• Maintain AAALAC International accreditation.
Social

• Respond to social pressures to:
  
  – Change to non-animals as soon as possible
    and
  – Make research pain free.
Humane

• Ask ethical questions such as:
  – Should animals be used in research?
  – When should animals be used?
  – How should they be used?
Economic

- Reduce the expense of animal use
  - Specialized facility infrastructure costs—such as caging, building design, and equipment
  - Purchase costs
  - Maintenance costs
  - Personnel costs and
  - Occupational health and safety costs.
Scientific

- Development of less painful and non-invasive procedures.
- New approaches and novel techniques.
- Reduce stress through proper handling, training, enrichment, group housing, etc.
- Replacement methods are not just alternatives, they are generally more sophisticated scientific techniques.
Alternatives: **Reduction**

*The Principles of Humane Experimental Technique* (1959)

- Quality literature search
- Appropriate statistical design
- Pilot studies
- Sharing animals, tissues, or organs
- New methods in testing
  (e.g. limit test, local lymph node assay, etc.)
3Rs—Reduction/Refinement

Emerging Technologies
- Imaging Devices for Use in Small Animals
  - positron emission tomography
  - single-photon emission computed tomography
  - computed tomography
  - magnetic resonance imaging
  - ultrasound
  - optical imaging with fluorescent and bioluminescent tracer technology

In vivo imaging modalities, within the context of animal welfare concerns, are seen as technical refinements in that they are much less invasive than older diagnostic and monitoring techniques. In addition, animal imaging devices now offer the possibility of reduction of animal sacrifice through longitudinal study that uses animals as their own controls, thereby also simultaneously improving science by the use of the improved statistics of paired observations.

Imaging

PET system for small animals
http://zmbe.uni-muenster.de/institutes/izb/stemres_de.htm
3Rs—Reduction/ Refinement

New animal models


  - One problem limiting development of therapeutic interventions is that the relevance of rodent models to human spinal cord injury is not clear. Progress in developing therapies would be better facilitated by a valid, humane non-human primate model that would allow testing of potentially efficacious pharmacological treatments. This brief report addresses the feasibility of this concept. In human spinal cord injury, the primary impairment is the inability to control the limb to perform functional tasks such as walking, grooming, feeding, etc. However, to propose a primate model of acute spinal cord injury that induce significant hind limb and/or forelimb limb paralysis would be unacceptable. As well, extensive lesions of the spinal cord could result in bowel and bladder dysfunction. To appropriately address the animal welfare issues, this spinal cord injury model is predicated on a monkey's tail being the ‘fifth limb’. As such, this model focuses on creating a selective, small lesion on one side of the sacral spinal cord that partially impairs movement of the tail.
3Rs—Reduction/Refinement

Telemetry
- Affect welfare in several ways
  - Can be used to reduce stress by capturing data without increased handling
  - Can be used to capture data to determine if experimental methods are stressful
Searching Pubmed - Telemetry

- **Useful Terms**
  - telemetry
  - species
  - data to be collected

- **Example**
  - telemetry and mice

  - Sample citation—shows both reduction of numbers/ refined procedure that minimizes stress


- Reactogenicity often represents a major hurdle to the clinical use of new substances. Yet, irrespective of its importance, this parameter has remained difficult to screen for, owing to a lack of sensitive small animal models with a capacity for high throughput testing. Here we report that continuous telemetric measurements of heart rate, heart rate variability, body core temperature and locomotor activity in laboratory mice readily unmasked systemic side-effects of vaccination, which went undetected by conventional observational assessment and clinical scoring. Using only limited numbers of mice, this method allows for their automated evaluation, differentiation and selection without sizeable risk for investigator-related bias.
Alternatives: **Refinement**  
*The Principles of Humane Experimental Technique* (1959)

- Knowledge of species physiology and normal and abnormal behavior
- Proper use of anesthetics and analgesics
- Modifications in restraint, handling, blood collection
- Increased sensitivity of monitoring devices and chemical assays
- Proper training of personnel
Proper Use of Analgesics

“They all look like this after surgery.”

“They all look like this after surgery with post-operative analgesia.”
Social Housing
Cage Design
Handling and Training
Environmental Enrichment
Alternatives: **Replacement**

*The Principles of Humane Experimental Technique* (1959)

- **Relative replacement** - some animal involvement
  - Isolated cell and nerve preparations
  - Use of tissues from slaughter house or grocer
  - Computer simulations based on in vivo data
3Rs - Replacement

Emerging Technologies
- Artificial Organs/Tissue Engineering
  - Liver on a chip
  - Organ/tissue printing technology

Virtual Alternatives

Tim Wilson, Professor of Anatomy, Faculty of Health Sciences, University of Western Ontario, describes his new 3D Virtual Reality Theatre as “the imagination tool of the millennium”.

http://www.christiedigital.com
Non-animal Models Used in Teaching
Alternatives: **Replacement**

*The Principles of Humane Experimental Technique (1959)*

- **Absolute replacement** – no animal involvement
  - Endoparasites, plants
  - Microorganisms
  - Computer automated structure evaluation systems
  - Human tissue culture
3Rs - Replacement

http://vimeo.com/52689891

Lung-on-a-Chip
Wyss Institute for Biologically Inspired Engineering at Harvard University
3Rs - Replacement

- Emerging Technologies
  - Artificial Organs/Tissue Engineering
    - Liver on a chip
    - Organ/tissue printing technology

Where Can I Find the Information?

AWIC Services and Databases
AWA Defines Service at NAL
(7 U.S.C. 2142, Sec. 13, Subsection e)

• AWIC provides information
  – For employee training
  – To prevent unintended duplication and
  – About the 3Rs:
    • Reduce or replace animal use
    • Minimization of pain and distress
AWIC Resources

Services:
- Database searching and referral
- Workshops
- Presentations
- Publication distribution
- Conference exhibits
- Serve on committees
- Twitter: @AnimalWelfareIC

Publications:
- Bibliographies and Information Resource Guides
- Animal Welfare Information Center Bulletin
- Collaborations on proceedings, manuals, articles, chapters

awic.nal.usda.gov
The Animal Welfare Information Center (AWIC) is mandated by the Animal Welfare Act (AWA) to provide information for improved animal care and use in research, testing, and teaching.

Register now for the AWIC Workshop on Meeting the Information Requirements of the Animal Welfare Act held at The National Agricultural Library in Beltsville, Maryland.

- November 13-14, 2014
- March 11-12, 2015
- May 13-14, 2015
- October 28-29, 2015

Spotlights

Animal Welfare Act and Regulations "Blue Book" (September 2013)

Training Resources for Animal Care Personnel

3R Guide is a new (2014) resource being developed by Norecopia in collaboration with the Animal Welfare Information Center.

Alternatives (3Rs) Funding Opportunities


Presentations from the Symposium on Social Housing of Laboratory Animals (August 2013)
Databases

**Biomedical and Biological**

- CAB Abstracts
- ToxNET
- EMBASE
- BIOSIS
- Scopus
- Web of Science
WEB OF SCIENCE

Science Citation Index Expanded
Social Sciences Citation Index
Arts & Humanities Citation Index
Book Citation Index
Current Chemical Reactions
Index Chemicus
Conference Proceedings Citation Index
Pharmacokinetics
pharmacokinetics and pain

Total: 3,939

Without BIOSIS Previews, you would be missing 1,464 unique citations.

In addition to hundreds of journal article records, BIOSIS Unique records contain 415 Meeting records.
## Subject Coverage of Selected Databases

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<tr>
<th>AGRICOLA</th>
<th>CAB</th>
<th>EMBASE</th>
<th>MEDLINE</th>
<th>BIOSIS</th>
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<tr>
<td>Animal science</td>
<td>Animal sci. &amp; production</td>
<td>Experimental medicine</td>
<td>Experimental medicine</td>
<td>Aerospace biology</td>
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<td>Chemistry &amp; biochemistry</td>
<td>Crop science</td>
<td>Pharmacology, drugs, potential drugs</td>
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<td>Biochemistry &amp; anatomy</td>
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<td>Biochemistry</td>
<td>Microbiology</td>
<td>Bacteriology (microbiology)</td>
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<td>Cytology</td>
<td>Pest control</td>
<td>Developmental biology</td>
<td>Administration</td>
<td>Cell biology</td>
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<td>Forensic med.</td>
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# Sources of Information for Selected Databases

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<th>BIOSIS 1926-present</th>
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<td>Tox. protocols</td>
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Databases

Education

• **InterNICHE** (International Network for Humane Education)

• **Norecopa** *(formerly NORINA)* – Norwegian consensus platform for replacement, reduction and refinement of animal experiments
  
  o [http://oslovet.veths.no/NORINA/](http://oslovet.veths.no/NORINA/)
  o [http://oslovet.veths.no/teaching/materials.html](http://oslovet.veths.no/teaching/materials.html)
  o [http://film.oslovet.norecopa.no/](http://film.oslovet.norecopa.no/)
"Squeekums" Rat Mannikin

Record number: 5745
Category: Handling and Medicine
Type: Model

"Squeekums" Rat Mannikin is a model for training different techniques. The tail is detachable and disposable and an IV drip can be placed in the caudal vein. In addition, the ear sets are replaceable for training ear tagging procedures. It allows the user to learn how to handle a rodent with safety and confidence. It is fully articulated and realistic. Head, feet, and limbs move in a realistic way.

Comments & References:
For students and laboratory animal technicians, Squeekums comes with a ABS hard case, IV accessories, artificial training blood and instructions. Future variations will have anatomical correct charynx, trachea, stomach, palatal feeding, and orotracheal intubation access. Weight: The same as an average adult male rat. This item may be borrowed for up to 6 weeks through the Alternative Loan System of the International Network for Humane Education (Intermiche). Free of charge, but return postage must be paid by the person who has borrowed the product. Please note that there are practical limitations on where some items can be sent. For more information, please contact loansystem@intermiche.org. See also record number 270 or http://www.intermiche.org for more information.

Price: US$75.00; Loan Program: Free of charge

Supplier:
Rescue Critters, LLC
15633 Satiscoy St. Unit A, Van Nuys, CA 91406, USA
Tel: 818-780-7060
Fax: 818-780-1078
sales@rescuecritters.com
http://www.rescuecritters.com

This page was updated 15.09.2008.
3R Guide
Additional Databases

Available on the Web

- NC3Rs Blood Sampling Microsite
  http://www.nc3rs.org.uk/bloodsamplingmicrosite/
- Best Practices for Common Procedures
  http://www.procedureswithcare.org.uk/
- Altweb
  http://altweb.jhsph.edu/
- AltBib: Bibliography on Alternatives to Animal Testing
- AltTox.org
  http://alttox.org/
Mouse: Tail vessel microsampling (non-surgical)

Due to advances in blood biochemistry analysis (e.g. high performance liquid chromatography, mass spectrometry, HPLC/MS/MS, and dried blood spot technology), it is possible to analyse, for example glucose, insulin and drug levels, from small (5-20 ul) blood samples. The small sample volume allows serial samples to be collected from the same animal (rather than composite blood from several animals) and the use of satellite animals to be reduced or avoided, thereby reducing the total number of animals required for toxicokinetic and pharmacokinetic studies. The small sample volume also provides a refinement, because warming prior to sampling can be avoided or else warming time reduced.

Use of this method for the detection of some biomarkers and drugs is limited, dependent upon the physiological status of the animal and blood concentrations. Blood samples may require dilution for sample handling during bioanalysis, and therefore concentrations can approach the limit of detection with LC-MS/MS for some compounds.

The method is quick and simple to perform for the competent individual. A video is available below.

The mouse is removed from home cage and placed on top of a work station. The mouse is gently restrained by the base of the tail and the tip of the tail is pricked with a sterile 23-25 gauge needle. The mouse may be transferred to a wire cage top to reduce its movement. A 5 ul, 10 ul or 20 ul micro capillary tube, inserted into a pipette bulb, is offered up to the blood sample at the tip of the tail, and the blood sample is obtained by capillary action.

The initial needle prick should be as near to the tip of the tail as possible to avoid damage to the tail on repeated sampling. To obtain a 5 ul blood sample there is no need to pre-warm the mouse. For a 20 ul blood sample or repeated sampling...
Resources for Alternatives to the Use of Live Vertebrates in Biomedical Research and Testing

**Search Animal Alternatives Literature**

- **Links to PubMed citations** on more than fifteen alternative methods categories.

- **Search PubMed using ALTBIB animal alternatives search strategy**
  - (e.g., Corrosobex, “androgen receptor binding assay”)
  - Limit search:
    - Citations from 2000 to present
    - Citations with Animal Use Alternatives as the main topic
    - Citations from the PubMed Toxicology Subset
  - View/Edit PubMed Search Strategy

**Search ALTBIB 1980-2000**

- ALTBIB citations have been selected from articles, books, book chapters, and technical reports published from 1980 to 2000. These citations examine methods, tests, assays, and procedures that may be useful in establishing alternatives to the use of intact vertebrates.

**ALTBIB Support**

- Fact Sheet
- Help
- The Principles of Humane Experimental Techniques: Russell & Burch
- Guide for the Care and Use of Laboratory Animals (ILAR, 1996)
- Alternatives Literature Searching and Databases (USDA/NAL/AWIC)

**Animal Alternatives News**

- News from...
  - ICCVAM/NIEHS: Interagency Coordinating Committee for the Validation of Alternative Methods
  - AIweb News: Johns Hopkins University

**Additional Resources**

- AItox.org - Non-animal Methods for Toxicity Testing
- AIweb - Alternatives to Animal Testing on the Web
- Animal Welfare Information Center (USDA)
- EURL ECVAM - European Reference Laboratory for Alternatives to Animal Testing
- FRAME - Fund for the Replacement of Animals in Medical Experiments
- ICCVAM (HHS/NIH/NIEHS)
- Center for Alternatives to Animal Testing (Johns Hopkins University)
- Center for Animal Alternatives (UC Davis)
- SOT In Vitro and/or Alternative Methods Specialty Section (Society of Toxicology)

**Evaluation/Acceptance of Test Methods**

- U.S. and International Acceptance of Alternative Methods, 1998-2012 (Chronological List) (ICCVAM)
- U.S. and International Milestones in Alternative Test Method Development and Evaluations (ICCVAM)
Searching for Alternatives:
Introduction to Search Strategies, Mechanics

3Rs
AWIC’s Approach to Meeting the Information Requirements

• Approach the search in two phases.
• Analyze the protocol to determine where alternatives might be used and for terminology.
• Decide where to go for the information.
  – Databases
  – Websites
• Link terminology appropriately for best search results.
• Evaluate the search results.
Searching for Alternatives

- Consists of three types of terms:
  - Scientific terms related to the research protocol;
  - Alternative (3Rs) terminology; and
  - Search terminology: Boolean operators, limits, truncations, years, types of materials...
Searching for Alternatives

Tips

• Description of protocol and area of study
• Species being used
• Organ systems involved
• Acronyms (CNS, BSE, MAb)
• Spelling (behavior, behaviour)
• Names of hormones, enzymes, CAS#, trade names (xylazine = rompun)
• Authors in the field including the PI
• Is the PI aware of any possible alternatives?
• Previous searches with keywords, years and databases searched
Searching for Alternatives

Search Strategy

Two Phases

• *Phase I*: Reduction and refinement- citations pertinent to PI’s field of study.

• *Phase II*: Replacement- use of nonanimal or alternative animal models.
Searching for Alternatives

Alternative Terms:  *Refine and Reduce*

- analgesic or analgesia or painkiller
- technique or method or procedure
- anesthetic or anasthetic or anaesthetic
- monitor or evaluate or supervise
- restrain or immobilize or restrict
- positive reinforcement or animal training
- housing or facility or caging

*Note: Most search terms are obtained from the protocol and area of study.*
Searching for Alternatives

Alternative Terms: Replacement

- artificial or vitro or culture
- tissue or cell or organ
- simulation or digital image or interactive
- mannequin or manikin or model

Animal Use Alternatives Thesaurus

Scopus is one of the largest abstract and citation database of peer-reviewed literature with tools to track, analyze and visualize research. It contains over 21,000 titles from more than 5,000 publishers around the world, covering the fields of science, technology, medicine, social sciences, and Arts & Humanities. Scopus has 50 million records dating back to 1823, 84% of these containing references dating from 1996.

Coverage of Journals:

• All Journals within Medline, Embase and EiCompendex
• Most Veterinary Journals within CAB and Agricola
• Most Laboratory Journals within Medline and Agricola
SCOPUS Commands

• **AND** is assumed when more than one word or phrase is entered in the same text box without using an operator. Example: *animal welfare* searches animal AND welfare

• “ ” Use Quotes to search an exact phrase. Example: “*heart attack*” finds the phrase heart-attack and heart attack and heart attacks (Plurals are included)
SCOPUS Commands

Boolean Operators

OR  Select at least ONE word from set.
swine or pig or pigs or porcine

AND  Select more than one word from set.
swine and euthan*

AND NOT  Eliminates a search term or group of search terms.
(pig or pigs or swine or porcine) AND NOT guinea

Searches with multiple operators are processed in the following precedence order:
1.  OR
2.  AND
3.  AND NOT
After the precedence rules are applied, the search is read left to right.
SCOPUS Commands

Wildcard for searching for word variations

* Replace multiple characters anywhere in a word.

Examples:
- behav* finds behave, behaves, behaviour, behavior, etc.
- *estrogen finds estrogen or oestrogen
SCOPUS Commands

Proximity Operators

- **PRE/n** "precedes by". Where the first term in the search must precede the second by a specified number of terms (n).

Examples:
- `behav* PRE/3 disturbance*` finds articles where various ending of the word "behav*" precedes various endings of the word "disturbance*" by three or fewer words.
- `heart PRE/0 attack` returns the same results as "heart attack"
- `route PRE/2 administration` returns route of administration and route of drug administration.
Searching for Alternatives

Proximity Operators

W/n “within” - Where the terms in the search must be within a specified number of terms (n). Words are adjacent, but in either order.

Examples:
- pain W/5 morphine finds articles in which "pain" and "morphine" are no more than 5 terms apart.
- blood W/2 sampl* finds blood sample, blood plasma sample, sampling of arterial blood
Web of Science Tutorials
http://wokinfo.com/training_support/training/web-of-knowledge/
Alternatives Search Examples
Searching for Alternatives
Sample Search #1 - Osteomyelitis

Objective/Hypothesis

The environment of an open fracture can be manipulated in both a salutary and degratory fashion with respect to the establishment of acute osteomyelitis. L-fucose should decrease and arachidonic acid should increase the propensity toward infection in comparison with controls.
Searching for Alternatives
Osteomyelitis Search Information

Materials and Methods

• Animals: Albino Sprague-Dawley rats will be used.

• Bacteria: Strain SMH of *Staphylococcus aureus*.
Searching for Alternatives
Osteomyelitis Search Information

Technical Methods

Pain Alleviation:
The rats will be anesthetized with a cocktail of 1.5 ml ketamine and 1.5 ml xylazine and 0.5 ml acepromazine given at a dosage of 0.5 to 0.7 ml/kg. If the plane of anesthesia is too light as determined by a positive toe pinch reflex, one half the original cocktail dose or isoflurane may be given. Buprenorphine will be given up to 3x/day if the animal shows signs of pain.
Establishment of infection

Tibia exposed and wound created in the bone with dental burr. Wound inoculated with *S. aureus* or *S. aureus* with L-fucose or arachidonic acid, allowed to incubate and rinsed with sterile saline. Wound is closed and animals sampled at various times to track development of osteomyelitic lesions.
Searching for Alternatives
Osteomyelitis Search Information

The search will be developed to find answers to questions such as:

• Are there alternatives to the painful or distressful procedures being employed in the research on the effects of L-fucose or arachidonic acid in the establishment of acute (trauma-induced) osteomyelitis caused by S. aureus in rats?

• Are there other animal models that may be more suitable for testing potential therapeutics or that more closely resemble the human condition?

• Is there useful information on the proposed model that might allow the use of fewer animals or might reduce the pain suffered by the animals?

• Are there any in vitro methods that might allow for early screening of potential therapeutics?

• Do the proposed anesthetics, analgesics, or α2-adrenergic antagonist (yohimbine) pose a confounding influence on the outcome?

• Anything missing?
# Searching for Alternatives

**Osteomyelitis Search Strategy Using the Scopus Platform**

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<th>Items</th>
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<tr>
<td>#2</td>
<td>“L-FUCOSE” OR “ARACHIDONIC ACID”</td>
<td>27,695</td>
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<tr>
<td>#3</td>
<td>#1 AND #2</td>
<td>5</td>
</tr>
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</table>
Synergy of HBO2 and a local antibiotic carrier for experimental osteomyelitis due to Staphylococcus aureus in rats.

Mendel V; Simanowski H J; Scholz H Ch
Undersea & hyperbaric medicine - journal of the Undersea and Hyperbaric Medical Society, Inc Winter 2004 , 31 (4) p407-16

A standard rat model of Staphylococcus aureus-induced osteomyelitis was used to compare the effect of HBO2, a local antibiotic carrier (gentamicin-containing collagen sponge) and the combination of HBO2 with a local antibiotic carrier. For the induction of osteomyelitis, a defined Staphylococcus aureus suspension was inoculated into the medullary cavity. Arachidonic acid was used as sclerosing agent. With that procedure an infection rate of more than 95 percent was attained.
Arachidonic acid facilitates experimental chronic osteomyelitis in rats. Rissing JP; Buxton TB; Fisher J; Harris R; Shockley RK
Infect Immun (UNITED STATES) Jul 1985, 49 (1) p141-4

Arachidonic acid was used as a facilitating agent in experimental rat Staphylococcus aureus osteomyelitis and compared with the more commonly used agent, sodium morrhuate. The injection of arachidonic acid or sodium morrhuate and S. aureus into rat tibiae caused increased quantitative bacterial bone counts, gross bone pathology, roentgenographic changes, and weight loss. The doses required to produce these changes appeared to be lower for arachidonic acid.
Binding of a Staphylococcus aureus bone pathogen to type I collagen.
Buxton T B; Rissing J P; Horner J A; Plowman K M; Scott D F; Sprinkle TJ; Best G K
Microbial pathogenesis Jun 1990 , 8 (6) p441-8.

We contrasted the collagen-binding potential of the experimental osteomyelitis pathogen, Staphylococcus aureus strain SMH, to several other strains. These included Cowan 1 (binder), Wood 46 (non-binder) and six capsular variants. These measurements were made using an 125I-collagen binding assay. These data suggest that the prototype bone pathogen binds to the major protein component of bone's extracellular matrix. Collagen-binding is promoted by protein adhesin(s), not capsule. The latter, in fact, appeared to interfere with this interaction. **Binding was inhibited by solutions containing the simple monosaccharide, L-fucose.**
# Searching for Alternatives

## Osteomyelitis Search Strategy

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<td>#7</td>
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<tr>
<td>#8</td>
<td>#6 AND #7</td>
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</tbody>
</table>
#8 Set Results

An Acute Osteomyelitis Model in Traumatized Rat Tibiae Involving Sand as a Foreign Body, Thermal Injury, and Bimicrobial Contamination
McPherson, James C. III Runner, Royce R.; Shapiro, Brian; Walsh, Douglas S.; et al
Comparative medicine. 2008 Aug., v. 58, no. 4 p. 369-374.

The multifactorial nature of bone injuries in modern warfare and emergency trauma patients warrants enhancement of existing models. To develop a more appropriate model, rat tibiae (n = 195) were mechanically injured, divided into 2 groups (with or without thermal injury), and contaminated with a range of Staphylococcus aureus (Cowan 1) inocula. In some experiments, S. aureus inocula also contained Escherichia coli or foreign bodies (sand or soil). The primary outcome measure was the amount of S. aureus remaining in the tibia (tibial bacterial load) 24 h after contamination, reported as log(10) cfu/g bone. S. aureus showed ID50 and ID95 values of 72 and 977 cfu, respectively. Sand, added as a foreign body, increased tibial bacterial load. Combined mechanical and thermal trauma of the tibia is associated with increased S. aureus tibial bacterial loads, increasing the risk of acute osteomyelitis. Understanding the interplay of mechanical and thermal injuries, bimicrobial contamination, and foreign bodies may improve our understanding of traumatic bone injuries and the pathogenesis of osteomyelitis.
Subasi M; Kapukaya A; Kesemenli C; Kaya H; Sari I
Archives of orthopaedic and trauma surgery *( * Germany ) 2001, 121(3) p170-3.

Granulocyte-macrophage colony-stimulating factor (GM-CSF) is a cytokine that affects the various developmental steps of hematopoietic cells and enhances the phagocytic activity of these cells. The effect of GM-CSF on acute osteomyelitis, developed in rats, was investigated. For this purpose, osteomyelitis was firstly developed through the direct inoculation of Staphylococcus aureus into rat tibial metaphysis. Twenty-four rats in which diagnosis of osteomyelitis was histopathologically established were divided into two groups. Antibiotic only was given to the first group, and antibiotic as well as GM-CSF to the second group. Rats were followed up for 3 months with plain radiographs and scintigraphic methods using 67Ga-citrate.
The effect of wound environment on the incidence of acute osteomyelitis.
Evans RP; Nelson CL; Harrison BH

A model was developed to identify and compare the local wound factors that induce acute osteomyelitis in a prospective, controlled investigation. When compared with wounds containing either virulent bacteria or dead bone, statistical analysis disclosed a significant increase in the incidence of osteomyelitis when virulent bacteria and dead bone were combined. The incidence of osteomyelitis in wounds containing an inoculated, hematoma-filled dead space was significantly less when compared with wounds containing dead bone and virulent bacteria. The incidence of osteomyelitis is significantly less when a nonvirulent strain of bacteria is substituted for a virulent strain. Although rigid internal fixation increased the incidence of osteomyelitis to 100% and long-term antibiotic therapy decreased the incidence, these changes were not statistically significant. These data allow the authors to predict the relative risk of osteomyelitis when these wound factors are present. The prevention of osteomyelitis depends on the clinical identification and modification of these local wound factors.
## Searching for Alternatives
### Osteomyelitis Search Strategy

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#10 Set Results

**Daptomycin and Gentamicin Show Limited Activity in a Novel In Vitro Model of Osteomyelitis**

Sweeney E (Reprint); Nelson S; Lovering A; Bowker K; Macgowan A


Washington, DC, USA 20081025,

*Sponsor: *Infect Dis Soc Amer

*ISSN: *0733-6373

*Document Type: *Meeting; Meeting Poster

*Record Type: *Citation
# Searching for Alternatives

## Osteomyelitis Search Strategy

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</table>
Establishment of a real-time, quantitative, and reproducible mouse model of Staphylococcus osteomyelitis using bioluminescence imaging.
Funao, H., et al.
Department of Orthopaedic Surgery, School of Medicine, Keio University, Shinjuku, Tokyo, Japan.

Abstract
Osteomyelitis remains a serious problem in the orthopedic field. There are only a few animal models in which the quantity and distribution of bacteria can be reproducibly traced. Here, we established a real-time quantitative mouse model of osteomyelitis using bioluminescence imaging (BLI) without sacrificing the animals. A bioluminescent strain of Staphylococcus aureus was inoculated into the femurs of mice. The bacterial photon intensity (PI) was then sequentially measured by BLI. Serological and histological analyses of the mice were performed. The mean PI peaked at 3 days, and stable signals were maintained for over 3 months after inoculation. The serum levels of interleukin-6, interleukin-1β, and C-reactive protein were significantly higher in the infected mice than in the control mice on day 7. The serum monocyte chemotactic protein 1 level was also significantly higher in the infected group at 12 h than in the control group. A significantly higher proportion of granulocytes was detected in the peripheral blood of the infected group after day 7. Additionally, both acute and chronic histological manifestations were observed in the infected group. This model is useful for elucidating the pathophysiology of both acute and chronic osteomyelitis and to assess the effects of novel antibiotics or antibacterial implants.
(68)Ga-DOTAVAP-P1 PET imaging capable of demonstrating the phase of inflammation in healing bones and the progress of infection in osteomyelitic bones.

Abstract:
Differentiation between bacterial infection and nonbacterial inflammation remains a diagnostic challenge. Vascular adhesion protein 1 (VAP-1) is a human endothelial protein whose cell surface expression is induced under inflammatory conditions, thus making it a highly promising target molecule for studying inflammatory processes in vivo. We hypothesized that positron emission tomography (PET) with gallium-68-labeled 1,4,7,10-tetraazacyclododecane-N',N'',N''',N''''-tetaacetic acid-peptide targeted to VAP-1 ((68)Ga-DOTAVAP-P1) could be feasible for imaging the early inflammatory and infectious processes in healing bones.

MATERIALS AND METHODS:
Thirty-four Sprague-Dawley rats with diffuse Staphylococcus aureus tibial osteomyelitis and 34 rats with healing cortical bone defects (representing the inflammation stage of healing) were PET imaged using (68)Ga-DOTAVAP-P1 as a tracer. In addition, peripheral quantitative computed tomography and conventional radiography were performed. Bone samples for quantitative bacteriology and specimens were also processed for histomorphometry of inflammatory and infectious reactions. Quantitative bacteriology confirmed infection in all osteomyelitic animals in our study. Induced infection is primarily localized in the medullary area and its adjacent bone, thus minimizing the impact on the affect for the general well-being of the animal.

CONCLUSIONS:
The current study showed that PET imaging with the new (68)Ga-DOTAVAP-P1 is capable of accurately demonstrating the phase of inflammation in healing bones and the progress of bacterial infection in osteomyelitic bones. Consequently, this novel imaging agent allowed for the differentiation of bone infection due to S. aureus and normal bone healing as soon as 7 days after onset.
INTRODUCTION:
Radiological scoring systems used in experimental osteomyelitis combine several factors into a single score. Because response of bone tissue to infection is a dynamic process, such systems have limited ability to differentiate between treatment groups. The analyzing of radiological criteria separately at different stages of the disease may be superior to a general score. METHODS AND METHODS: Osteomyelitis was induced with Staphylococcus aureus in the left tibiae of 72 adult Wistar albino rats. The rats were assigned to one of six different treatment groups. Their radiographs were graded (1) by the use of previously published general scoring systems and (2) by the evaluation of periosteal reaction, bone deformation, diaphyseal widening, osteolysis, soft tissue swelling, bone mineral content (BMC) and bone mineral density (BMD), separately. The assessments were performed 3 weeks after induction as well as 3 weeks and 6 weeks after treatment. RESULTS: Periosteal reaction and diaphyseal widening demonstrated significant differences within 3 weeks of treatment, contrary to the general scores. After 6 weeks of treatment, individual criteria, including diaphyseal widening, osteolysis and BMC but only one of the general grading scores, were able to differentiate between treatment groups. CONCLUSIONS: For differentiation of treatments in experimental osteomyelitis individual assessment of radiological criteria is superior to previously published general scoring systems.
Searching for Alternatives
Sample Search #2 - Trauma

Dr. Stan Breager uses pigs and dogs in his advanced trauma life support training course. All procedures are conducted on anesthetized animals. When the training session is complete, all animals are euthanized. His IACUC has requested that he search for any potential alternatives to the use of animals.

Create the best search strategy to address alternatives.
### Searching for Alternatives

**Search Strategy - Sample Search #2 – Trauma Training Using Web of Science**

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| #6  | 272     | #4 AND #2 AND #1  
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| #5  | 6       | #3 AND #2 AND #1  
Timespan=All years  
Search language=English |
| #4  | Approximately 3,185,476 | TITLE: (alternative* or model* or simulat* or cadav* or carcas* or software or video* or interact* or digital* or virtual or mannequin* or manikin* or computer*)  
Timespan=All years  
Search language=English |
| #3  | Approximately 989,130 | TITLE: (dog or dogs or canine* or pig or pigs or swine or piglet* or ferret* or cat or cats or animal or animals or goat*)  
Timespan=All years  
Search language=English |
| #2  | Approximately 787,349 | TITLE: (train* or teach* or educat* or instruct* or tutor*)  
Timespan=All years  
Search language=English |
| #1  | Approximately 126,489 | TITLE: (trauma or "life support" or "emergenc* medic*" or ems or emst or atls or "advanced trauma life support")  
Timespan=All years  
Search language=English |
Searching for Alternatives
Trauma Sample Citations

**Animal Models**

- Use of the ferret as a model for pediatric endotracheal intubation training.
- Swine and dynamic ultrasound models for trauma ultrasound testing of surgical residents.
- Ocular trauma modeling
- Ultrasound training during ATLS: An early start for surgical interns.
- Battlefield Biomedical Technologies
- Removal of corneal foreign bodies: an instructional model
Non-Animal Models and Alternative Methods

- Virtual reality enhanced mannequin (VREM) that is well received by resuscitation experts
- Effect of feedback on delaying deterioration in quality of compressions during 2 minutes of continuous chest compressions: A randomized manikin study investigating performance with and without feedback
- A simple device to teach tube thoracostomy
- Virtual reality, robotics, and other wizardry in 21st century trauma care.
- Practicing procedures on the recently dead.
- Paediatric resuscitation manikins.
- Animal cadaveric models for advanced trauma life support training.
- Medical Simulation for Trauma Management.
Trauma Training – Web Search Examples

- **Norina**
  - **Innovations in Trauma Training.** The Innovations in Trauma Training video from Physicians Committee for Responsible Medicine (PCRM) looks at an exciting program that uses life-like simulators and human cadavers to train physicians to provide emergency care to trauma victims. Type: Video Film. Category: Human Medicine & Surgery (human).
  - **K-9 Thoracentesis Mannikin.** This special K-9 training mannikin allows for chest tube placement as well as ability to aspirate air & fluid from the thoracic cavity to simulate emergency trauma. Type of record: Model. Category: Medicine
  - **Critical Care Jerry.** All the features of the "Advanced Airway Jerry" (record number 4909) and the "K-9 IV Trainer Arm" (record number 4908) in one "body". Type: Model. Category: Handling & Veterinary Medicine.
What’s Missing

• The protocol and/or detailed description of procedures performed on the animals such as:
  – Thoracotomy
  – Intubation
  – Chest tube insertion
  – Venous cut-down
Search Evaluation
The PI Role

- Check terminology, strategy, sources, and dates of search.
- Review the search before completing the protocol.
- Assess and evaluate the alternative possibilities.
- Be prepared to support the use or non-use of any alternatives in writing.
- Keep a copy of strategy, databases searched, and years of search for future use.
Search Evaluation
The IACUC Role

- Review the protocol form. Are the questions asked in a clear way to gather the information needed?
- Review the
  - Databases searched,
  - Terminology used *and*
  - Years of coverage.
- Review the search strategy.
- Ask about the order of search and protocol writing.
- Have an information provider on the committee as a resource.
Search Evaluation

Red Flags

• Search completed at the last minute.
• Only 1 database searched.
• Terms only for painful aspects.
• The term “alternative” used alone with no other alternative terms.
• Keywords listed not relevant to protocol.
• Keywords and concepts linked in an incorrect manner (e.g. wrong Boolean operators).
• Search doesn’t cover adequate time period (5-10 years).
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