Searching for Alternatives to Painful Procedures Used on Research Animals

NIH Principal Investigators (PIs), IACUC reviewers, and ARAC members are encouraged to use this guide when considering research alternatives to painful or distressful procedures on animals.

This guide serves as a tip sheet for preparation of the Literature Search for Alternatives Worksheet. NIH Librarians can assist in the creation of search strategies and use of databases available through the NIH Library website, as well as conduct searches on the Web or in fee-based databases.


Distress
“A state in which an animal cannot escape from or adapt to the external or internal stressors or conditions it experiences, resulting in negative effects upon its well-being.”

Painful Procedure
Code of Federal Regulations, Title 9, Chapter I, Subchapter A, Animal Welfare
“…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.”

Alternatives
3 R’s of Russell and Burch
The Principles of Humane Experimental Technique (1959)

Reduction - Minimize the number of animals used.
Refinement - Techniques to reduce pain and distress.
Replacement - Substitute animal with non-animal methods.
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 non-animal or alternative animal models.

Searching for Alternatives

Alternative Terms

The following words may help narrow your alternatives search. Choose words for your particular study. Place the truncation symbol where the parentheses () are, for a specific database, to get variant endings of terms.

**Commonly used truncation or wildcard symbols:**
- EMBASE via Elsevier - exclamation point (!)
  - behav! finds behave, behavior, behavioral, behaviour, behavioural, etc.
- PubMed, Scopus, and Web of Science - asterisk (*)
  - bacter* finds bacteria, bacterium, bacteriophage, etc.
- Scopus - a question mark (?) is the wildcard that replaces one letter
  - analy?e finds analyse or analyze, etc.

Reduction and Refinement

- advers()
- analges()
- anesthe(), anaesthe(), anaesthesia()
- anxioytic
- environment(), enrich()
- euthanasia, euthanize()
- handl(), hous(), cag()
- monitor(), device()

- pain(), distress(), stress(), welfare
- positive reinforce()
- reduc(), refin()
- restrain(), restrict(), immobil()
- technique(), method(), procedur(), assay()
- train(), educat(), teach(), instruct()
- tranquiliz()

Replacement

- alternative()
- animal testing alternative()
- animal use alternative()
- assay(), technique(), method()
- bacterc
- cadaver()
- culture() (cell, tissue, organ)
- fish(), cephalopod()
- handl(), hous(), cag()
- invertebrate()

- isolated (cell, tissue, organ)
- mannequin() or manikin()
- model()
- replac()
- simulat()
- software, computer()
- train(), educat(), teach(), instruct()
- video()
- virtual (surgery, reality)
- vitro (method, model, technique)

AWIC Tips for Searching for Alternatives

- General area of study
- Species being used
- Describe protocol
- Organ systems involved
- Acronyms
- Names of hormones, enzymes, CAS#, trade names, etc.
- Prominent authors in field including work published by investigator
- How is the proposed study unique?
- Is the investigator aware of any possible alternatives?
- Any previous searches conducted—keywords used

Databases

**Biomedical and Biological**

- AGRICOLA*
- ASFA
- BIOSIS+/Biological Abstracts*
- CAB Abstracts
- Current Contents
- EMBASE*+
- Life Sciences

* = Available NIH-wide+/ Request librarian-mediated search

**Pharmaceutical and Technological**

- Compendex Plus
- Gale Group Computer Database
- INSPEC
- International Pharmaceutical Abstracts
- Japanese Science and Technology
- Micro Software Guide
- NTIS
- Pharmaceutical News Index

**Additional Websites and Databases**

- Defense Technical Information Center (DTIC) [http://www.dtic.mil/](http://www.dtic.mil/)
- NIH Office of Animal Care and Use (OACU) [http://oacu.od.nih.gov/index.htm](http://oacu.od.nih.gov/index.htm)
- Norwegian Reference Centre Alternatives Database [http://oslovet.veths.no/databasesintro.html](http://oslovet.veths.no/databasesintro.html)