

Animal Research



Image: <http://www.cumc.columbia.edu/dept/iacuc/images/homePageMice.jpg>

Experimental protocols that involve the use of animals for research must be submitted to the Institutional Animal Care and Use Committee (IACUC) for approval.

A literature search along with the search strategy must be included with protocols that describe procedures which may cause more than a momentary or slight pain or distress in animals (i.e. category D + E protocols).

Below is an outline of how to conduct literature searches to address the 3 Rs:

Replacement—substitute animals used in the study with non-animal methods or lower organisms

Refinement—explore techniques that would reduce pain and distress to the animals in the study

Reduction—minimize the number of animals used in the study

Columbia University's IACUC link is as follows: <http://www.cumc.columbia.edu/dept/iacuc/>

Because protocols vary, there is no standardized way to search the literature. However, harvesting the **MeSH** (Medical Subject Headings) vocabulary for relevant terms, and using additional relevant keywords (from your protocol, especially the objectives and methods sections) to conduct the search will help uncover literature that addresses ways to find alternatives in animal research. The researcher should then review the retrieved articles and focus on the 'Materials and Methods' section for any relevant information. ALTBIB, from the National Library of Medicine, provides an extensive collection of links to key organizations providing information on alternatives to animal testing.

"**ALTBIB**, an NIH website, is recommended as the search interface for alternatives.

- In the **ALTBIB** search box, type the animal species and one or more other terms to represent methods or painful procedures performed on the animal; the general research topic/disease/condition may also be searched to determine if there are new or improved models.
- Alternatives terminology is automatically incorporated with your search terms, and the search is then transferred to and conducted within the PubMed database.

- Review articles retrieved and comment on whether any methods are identified which can be implemented in your protocol.
- Conduct a separate [ALTBIB](#) search for each procedure or group of concepts

In addition to the [ALTBIB](#) search, look at the links to specialized websites (Johns Hopkins AltWeb, UC Davis Alternatives), as well as specialized books on animal models and methods listed in other sections on this page. The alternatives search can also be conducted in other databases such as [EMBASE](#), [BIOSIS](#), ...” From: <http://health.library.emory.edu/resources/basic-sciences/animal-alternatives.html>

Please note: PubMed, Ovid Medline and ALTIBB are considered synonymous databases. You may use any **ONE** of these. For your second database, please select either [EMBASE](#) or [BIOSIS](#).

Below is another example of a suggested search strategy done in OVID Medline, however, a similar strategy can be done in PubMed or other databases such as [EMBASE](#), or [BIOSIS citation index](#). Generally, more than one database is searched and each database may have its own preferred vocabulary. Additional keywords, from the protocol objectives and method sections, can also be used as needed. In the chart below, Topic/Objective Search refers to the research topic and objective of the protocol (where keywords can be harvested). MeSH terms are utilized to create the search strategy. The “exp” or (Explode) function allows for the greatest retrieval of a search term.

OVID Medline, PubMed and other resources are available from the Health Sciences Library’s homepage at: <http://library.cumc.columbia.edu/>. Select the database under ‘Top Resources’ link.

Once the search for the 3Rs is completed, the sets for each of the 3Rs can be combined by the Boolean operator ‘OR’, so that any duplicate citations will be eliminated.

The table below displays a suggested list of MeSH terms to use when searching for the 3 Rs (keywords from sections of the protocol can also be used). The second table outlines 3Rs suggested search strategies (abstracted from Chilov, M et al.).

MeSH (keywords from protocol can also be used)	MeSH (keywords from protocol can also be used)
Aborted Fetus	Investigative Techniques/
Anesthesia and Analgesia/	Models, Theoretical/
Animal use Alternatives/	Pain
Animal Experimentation/	Perioperative Care/
Animal Testing Alternatives/	Peripheral Nervous System Agents/
Animal Welfare/	Postoperative Complications/
Animals/	Specimen Handling/
Cadaver	Surgical Procedures, Minimally Invasive
Cells, Cultured/	Surgical Procedures, Operative/
Central Nervous System Depressants/	Veterinary Drugs
Computer Simulation/	
Euthanasia, Animal	

Table 1: MeSH terms

<p>I. Topic/Objective (Search terms from the protocol topic, objective sections, endpoint or outcome, etc.; MeSH, keywords, also from the protocol and any synonyms for your terms)</p>	<p>Search for REPLACEMENT (replacement of animals; consider any non-live animal models you may apply, such as cells, aborted fetus, computer simulation, etc.)</p>	<p>Combine your set results</p>
<p>1. Topic/Objective (Search terms, MeSH, keywords)</p>	<p>2. exp Animals/ or exp Models, Animal/ 3. Humans/</p>	<p>4. 2 or 3 5. 1 not 4 (see the set numbers going across each row; i.e. 1. Refers to Topic/Objective; etc.)</p>
<p>1. Topic/Objective (Search terms, MeSH, keywords)</p>	<p>2. exp Models, Theoretical/ 3. exp Disease Models, Animal/ 5. Computer Simulation/ or Cadaver/ or Aborted Fetus/ 6. exp In Vitro Techniques/or exp Cells, Cultured/ or exp Culture Techniques</p>	<p>4. 2 not 3 7. 4 or 5 or 6 8. 1 and 7</p>
<p>1. Topic/Objective (Search terms, MeSH, keywords)</p>	<p>2. exp Mammals/</p>	<p>3. 1 not 2</p>
<p>II. Topic/Objective (Search terms, MeSH, keywords from protocol topic, objective, endpoints or outcome, etc. include synonyms)</p>	<p>Search for REFINEMENT (reduce pain, distress, humane endpoints; such as use of analgesics, etc.)</p>	<p>Combine your set results</p>
<p>1. Topic/Objective (Search terms, MeSH, keywords)</p>	<p>2. exp Animals/ 3. exp Models, Animals/</p>	<p>4. 2 or 3 5. 1 and 4</p>
<p>1. Search on animal type and/or search on a procedure</p>	<p>2. exp "Anesthesia and Analgesia/ 3. exp "Central Nervous System Depressants/ 4. exp "Sensory System Agents/</p>	<p>5. 2 or 3 or 4 6. 1 and 5</p>
<p>1. Search on animal type</p>	<p>2. exp Animal Welfare/</p>	<p>3. 1 and 2</p>
<p>1. Search on animal type</p>	<p>2. Euthanasia, Animal/</p>	<p>3. 1 and 2</p>

III. Topic/Objective	Search for REDUCTION (reduce the number of animals used)	Combine your set results
1. Search for studies that are similar to the experimental protocol—similar objectives, outcomes, methodology, etc.	There is no direct MeSH term used to describe the exact number of animals used in research. The closest term that comes up in the MeSH hierarchy is Animal Experimentation/sn (statistics & numerical data). This term can be used in the search strategy, however, it is still best to scan through the 'Materials & Methods' section of similar studies to see if smaller number of animals were used to conduct those studies.	When done with searching for the 3Rs, combine your search results using the Boolean 'OR' operator. This way you will remove any duplicate results from your strategy. Search more than just one database.

Table 2: Searching for the 3Rs

Additional Resources and References:

- ALTBIB: Alternatives to Animal Testing (search box): <http://toxnet.nlm.nih.gov/altbib.html>
To search ALTBIB, place your topic search terms (such as terms from your protocol's topic/objectives sections) into the search box, limit the search by any of the suggested parameters such as: Citations from 2000 to present; Citations with Animal use Alternatives as Main Topic; Citations from the PubMed Toxicology Subset. Click the search box and ALTBIB will launch a search in PubMed and display the results.
- Chilov M, Matsoukas K, Ispahany N, Allen TY, Lustbader JW. [Using MeSH to search for alternatives to the use of animals in research](#). Med Ref Serv Q. 2007 Fall; 26(3):55-74. PubMed PMID: 17915631
- Columbia University's Institutional Animal Care and Use Committee (IACUC): <http://www.cumc.columbia.edu/dept/iacuc/>
- Consideration of Alternatives to Painful/Distressful Procedures http://www.aphis.usda.gov/animal_welfare/downloads/Animal%20Care%20Policy%20Manual.pdf
- Emory's Animal Alternatives page: <http://health.library.emory.edu/resources/basic-sciences/animal-alternatives.html>
- Guide for the Care and Use of Laboratory Animals 2011 (National Research Council, National Academy of Sciences) <http://www.nap.edu/read/12910/chapter/2>

- Newer (2013) edition of the *Animal Welfare Act and Animal Welfare Regulations* is available from the U.S. Department of Agriculture at this link:
https://www.aphis.usda.gov/animal_welfare/downloads/Animal%20Care%20Blue%20Book%20-%202013%20-%20FINAL.pdf
- Principles of Humane Experimental Technique (edited by W.M.S. Russell and R.L. Burch)
http://altweb.jhsph.edu/pubs/books/humane_exp/het-toc
- USDA's website with information on the Animal Welfare Act (includes a search box on left of page): <http://awic.nal.usda.gov/government-and-professional-resources/federal-laws/animal-welfare-act>

Please fill out this brief survey, regarding this PDF tutorial. Thank you!

<https://www.surveymonkey.com/r/BYSJQDD>

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