

# Alternatives Literature Searching Worksheet

USDA, ARS, NAL,  
Animal Welfare Information Center (AWIC)  
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This worksheet is designed to help individuals during the initial phase of an alternatives literature search by identifying the information needed to successfully develop a search strategy and run a multi-database literature search for alternatives. Be sure to conduct your literature search early in your protocol's planning phase to ensure you are addressing all animal-use requirements of the [Animal Welfare Act Regulations \(9 C.F.R. 2.31 \(d\)\(ii-iii\) \(2021\)\)](#). For additional information about conducting an alternatives literature search, visit [AWIC's Alternatives Literature Searching](#) webpage or [contact AWIC](#) for free literature searching training opportunities.

## Sections 1 & 2 of this worksheet are used to:

1. Identify keywords and concepts that are important in the development of search strings.
2. Confirm that your research is not unnecessarily duplicative of another research protocol.
3. Identify [3Rs alternatives](#) (replacement, reduction, and refinement of animal use) that can be incorporated into your research— especially where animals might experience pain and/or distress.
4. Aid in the selection of appropriate [databases](#) for your research topic and finding 3Rs alternatives.

This worksheet is **not** designed as a replacement for communication between information providers, investigators, veterinarians, and Institutional Animal Care and Use Committee (IACUC) members. Direct dialogue is recommended between the researcher and the person conducting the search.

## Section 1

**Directions: Use information from your research protocol to complete the following worksheet. Additional information for each number can be found on pages: 6-7**

Upon completion of section 1, there should be a basic understanding of:

- Keywords and concepts that are important in the development of your search strings
- Potential areas within your protocol where alternatives can be incorporated

- 1. Title of animal study protocol:**
- 2. General area of study:** (e.g., drug testing, cardiology, toxicology, immunology)
- 3. Type of protocol:** Is the proposed study a research, teaching, or testing protocol?
- 4. Proposed animal species and number of animals required:** (e.g., swine, rats, dogs, primates, etc.)
- 5. Describe all objectives and endpoints (a targeted outcome configured to determine when a study will end e.g., mortality, survival rates, resolution of clinical signs, etc.) of this protocol.** Are there any humane endpoints (defined on page 6) that can be incorporated if not already?
- 6. Identify the systems or anatomy involved in the protocol** (e.g., lung, central nervous system, kidney, etc.)



**9. Describe how the animals used in this protocol will be housed and handled/restrained (e.g., individual vs. group or with vs. without enrichments) and how/how often they will be handled and/or restrained (e.g., mouse tail handling daily, cattle squeeze chute weekly)**

**10. List keywords/concepts related to your research/protocol using 1-9 above.** When listing keywords, group them by concept (i.e., topic area; see examples below). Grouping keywords by concept will help you create a productive search string.

*e.g. Concept 1: species keywords – mice, mouse, murine, mus  
(i.e., the ‘concept’ is species)*

*Concept 2: imaging keywords – radiograph, x-ray, MRI, CT Scan  
(i.e., the ‘concept’ is imaging)*

*Concept 3: 3Rs alternatives keywords – “animal welfare”, “less invasive”, analgesia  
(i.e., the ‘concept’ is “3Rs alternatives”)*

11. List any potential 3Rs alternatives methods or terms that could be used. (e.g., organoids, pair/group housing, tunnel handling, in vitro methods, computer simulations, etc.). Visit AWIC's [3Rs keywords](#) webpage for additional 3Rs terms.

12. Database selection. We suggest searching more than 1 database since no one database holds all information on a given topic. Ideally, at least 3 databases are searched. (Choose those that are appropriate for the area of study):

<input type="checkbox"/>	Medline	<input type="checkbox"/>	Biological Abstracts	<input type="checkbox"/>	Biosis
<input type="checkbox"/>	Agricola	<input type="checkbox"/>	CAB	<input type="checkbox"/>	Zoological Record
<input type="checkbox"/>	Scopus	<input type="checkbox"/>	Web of Science	<input type="checkbox"/>	Other (write below)

13. What range of years are you going to search in the databases? We suggest including at least the past 5-10 years.

Year(s): \_\_\_\_\_ to \_\_\_\_\_

14. List any additional sources you used to determine that alternatives are/are not available: It is encouraged to complete this step **after** a thorough literature search has been completed. Examples of other sources include conferences, committee/council membership, professional expertise, training, the [Animal Welfare Information Center \(AWIC\)](#), etc.

*For additional information on completing this form contact your information specialist, librarian, veterinarian, or the AWIC team at [awic@usda.gov](mailto:awic@usda.gov).*

**Directions:** Use the additional information below to assist you in completing Section 1.

1. **Protocol Title.** Providing the title of the protocol may provide some keywords.
2. **General area of study.** These keywords can be used to focus the search on the desired subject area. Examples are cardiac, anesthesia, bacteria, transgenics, etc.
3. **Type of protocol.** Search strategies for research, teaching, or testing protocols differ. In a teaching protocol, for example, keywords such as "teach", "educate", or "instruct" might be included, whereas in a testing protocol, keywords such as "safety", "efficiency", and "test" might be used.
4. **Proposed animal species.** Is there a unique quality or usefulness that warrants use of your chosen species? Providing this information may provide additional keywords or eliminate the need to search for other possible models being used.  
  
(\*At times the animal species is not initially used in the search to determine if the study can be done in alternate models.)
5. **Objectives and endpoints.** This section should succinctly outline the scientific plan and goal(s) of the protocol. A complete description of the proposed use of animals (including specific endpoints) should be included as well. When establishing a protocol's endpoints, humane endpoints should be considered, especially when pain or distress is a necessary part of the protocol. A [humane endpoint](#) is the point at which an animal's pain and/or distress is terminated, minimized, or reduced using methods such as euthanasia, terminating the painful procedure, relieving the pain with treatment, or restoring a basic requirement (e.g., returning an animal to social housing if isolation causes distress).
6. **Systems or anatomy.** Providing specific systems, parts of the anatomy, or structures may assist in limiting the search (i.e., cerebellum, arterial, nephrons, etc.)
7. **Drugs or compounds.** Give specific names of **all** drugs being used in your study, including those being used for anesthesia and/or analgesia (e.g., Isoflurane, Xylazine, Buprenorphine, etc.). Remember to include the scientific and generic name of the drugs. This is helpful for when you search the literature for specific drugs.
8. **Methods and procedures.** You can discover 3Rs alternatives in your research by providing details on the methods and procedures you're using (e.g., handling/restraint techniques, blood collection, surgical procedures, etc.). It's important to identify any potentially painful procedures within your protocol and determine how that pain will be relieved or reduced. The law defines a painful procedure as one that would "reasonably be expected to cause more than slight or momentary pain or distress in a human being to which that procedure is applied" ([9 C.F.R. § 1.1 \(2021\)](#)). If a procedure involves pain or distress, the PI must consult with the Attending Veterinarian ([9 C.F.R. § 2.31 \(d\)\(1\)\(iv\)\(B\) \(2021\)](#)).
9. **Animal housing and handling methods.** A detailed description of how animals will be housed and handled makes it easier to search the literature and determine whether there are better housing and/or handling methods that would benefit the animals, while still providing relevant research results. Visit AWIC's [Housing, Care, and Welfare](#) webpage for additional housing and handling information.
10. **Keywords, concepts.** When listing keywords, group them by concept (i.e., topic area). Grouping keywords by concept will make it easier to create productive search strings. Also, use as many synonyms (e.g., cardiac and heart) as possible. Include acronyms and complete spellings (e.g., GH and "growth hormone"). Also include all possible spellings of a word (e.g., anesthesia, and anesthetic, and

anesthesia). Including words that make your study unique will also help detect unintentional duplication and refine the scope of the search.

11. **Potential alternatives.** Listing terms to describe any potential alternatives, such as in vitro, tissue culture, positive reinforcement, alternative animal models, tunnel handling, non-invasive, etc. is helpful in addressing the alternatives aspect of the search. As you find citations, you can determine additional terms that you can use as keywords for your search. Visit AWIC's [3Rs keywords](#) webpage for additional 3Rs terms.
12. **Database selection.** This worksheet lists some of the most popular databases for biomedical research topics. Although there is some overlap in journals and other publications covered by databases, each database is unique regarding the information it holds. Therefore, make sure you search across multiple databases to ensure your search is comprehensive. Also, keep in mind what *type* of protocol you have when choosing databases, because not all databases cover the same topics. For example, a protocol involving toxicity testing should include databases such as Biosis, Embase, and Medline. Whereas a protocol involving Veterinary Medicine should include databases such as Agricola, CAB, and Medline. For additional information, visit the AWIC's [Database](#) webpage.
13. **Years of coverage.** Many databases allow you to specify what years you want covered in your search. The individual should record the years searched (e.g., 1998-2016).
14. **Additional sources.** The Animal Welfare Act regulations and policies allow individuals to use various sources to determine the availability of alternatives. However, all sources must be provided in a written narrative to the IACUC ([9 C.F.R. § 2.31 \(d\)\(1\)\(ii\) \(2021\)](#)). Examples of other methods include conference attendance, committee/council membership, professional expertise, training courses, the [Animal Welfare Information Center \(AWIC\)](#), etc.

## Section 2

**Directions: After completing section 1, review section 2 for information on creating your search strategy.**

Upon completion of section 2, there should be a basic understanding of:

- Creating a search strategy to confirm the research isn't duplicative
- Creating a search strategy to find 3Rs alternatives

Your search strategy should consist of search strings that address 2 parts:

- 1) Confirming that your research is not unnecessarily duplicative of another research protocol and
- 2) Identifying 3Rs alternatives that can be incorporated into your research.

**Part 1: Creating search strings to confirm research is not duplicative**—To confirm your research is not unnecessarily duplicative of another research protocol, keywords and concepts from the area of research are used. As a result, the search can provide a comprehensive look at the field of study and address whether the protocol is duplicative of other research protocols.

The information from **numbers 1-8 & 10 in section 1** can be used to create strings of keywords (using search syntax like: Boolean operators, truncation, proximity operators, etc.) based on the main concepts or topics areas that you have identified from your protocol (reference number 10 above)

**Part 2: Creating search strings to find 3Rs Alternatives**—To identify 3Rs alternatives that can be incorporated, terms that describe potential 3Rs alternatives should be used (e.g., organoid, “tissue culture” or “virtual reality”). As you review citations, you may identify additional terms, not found within your protocol, that can be used as keywords in your search strings.

When creating search strings to find potential 3Rs alternatives, many people make the mistake of only adding the terms “alternatives”, “replacement”, “reduction”, or “refinement” to the search strings and expect to get productive results. However, because these terms can be used in varying contexts, it's important to include keywords that are examples of the 3Rs (e.g., in vitro, simulation, tunnel handling, analgesics, anesthetics, social housing, tissue culture, organoid, environmental enrichment) as well.

The information from **numbers 4-11 in section 1**, can be used to create strings of keywords (using search syntax like: Boolean operators, truncation, proximity operators, etc.) that focus on searching for 3Rs alternatives that could be incorporated (reference numbers 10-11 above).

## **Additional Resources:**

- [AWIC Alternatives Literature Searching Web Page](#)
- [The Principles of Humane Experimental Technique](#)
- [AWIC Database Web Page](#)
- [Why Conduct an Alternatives Literature Search](#)
- [3Rs Keyword Examples](#)
- [AWIC Database Search Operator Reference Guide](#)
- [Alternatives Request Form](#)
- [3Rs Alternatives Literature Searching Brochure](#)
- [Animal Use Alternatives Thesaurus](#)