

Effective searching of the scientific literature for alternatives: search grids for appropriate databases

LA Hart*, MW Wood and H-Y Weng

UC Center for Animal Alternatives, School of Veterinary Medicine, University of California, Davis, CA 95616, USA

* Contact for correspondence and requests for reprints: lahart@ucdavis.edu

Abstract

Researchers searching for alternatives to painful procedures that involve animals may find that the dispersed relevant literature and the array of databases make the search challenging and even onerous. This paper addresses a significant gap that exists for researchers, in identifying appropriate databases to use when searching for specific types of information on alternatives. To facilitate the efficient and effective searching by users, and to ensure compliance with new requirements and improved science, we initiate an evolving guide comprising search grids of database resources organised by animal models and topics (http://www.vetmed.ucdavis.edu/Animal_Alternatives/databaseapproach.html). The search grids present organised lists of specific databases and other resources for each animal model and topic, with live links. The search grids also indicate resources that are freely available worldwide, and those that are proprietary and available only to subscribers. The search grids are divided into two categories: 'animal models' and 'topics'. The category 'animal models' comprises: animal model selections; mice; rodents — rats/guinea pigs/hamsters; rabbits; dogs, cats; farm animals, sheep, swine; non-human primates; fish, frogs, aquatic; and exotics. The category 'topics' comprises: husbandry; behaviour; euthanasia; toxicity; monoclonal antibodies; teaching; endpoints; disease models; analgesia/anaesthesia; emerging technologies; strategies for specific intervention procedures; and standard operating procedures (for example, drawing blood, behavioural training, transportation, handling, restraint and identification). Users are provided with a selected list of linked resources relevant to their particular search. Starting with an appropriate database that covers the type of information that is being sought is the first step in conducting an effective search that can yield useful information to enhance animal welfare.

Keywords: alternatives, animal welfare, compliance, database, Policy 11, Policy 12

Introduction

In the United States, the consideration and adoption of alternatives for painful or distressing procedures involving animals have gained emphasis because of the regulatory requirements associated with acquiring approval for protocols that use animals. The primary incentive for searching the scientific literature for alternatives is the requirement originally proposed in the Animal Welfare Act regulations: "procedures involving animals will avoid or minimise discomfort, distress and/or pain" (United States Animal Welfare Act 2002). The Animal Welfare Act regulations require the principal investigators of a study to consider alternatives to procedures that may cause more than momentary or slight pain or distress to the animals used, and to provide an account of the availability of alternatives. Initially, the stated methods for compliance with this requirement were not specific; clarification was provided in the United States Department of Agriculture (USDA) Animal Care Policy 11, where a detailed description of painful and distressing procedures was issued (United States Department of Agriculture 1997). Furthermore, investigators are to provide a written report of the methods and sources used to determine the availability

of alternatives, including the Three Rs: replacement, reduction and refinement. More detailed guidelines on conducting a database search for alternatives were included in the USDA Animal Care Policy 12 (United States Department of Agriculture 2000), suggesting that the report should also include the names of the databases searched, the date the search was performed, the period covered by the search, the keywords, and/or the search strategy used.

The increasing scientific literature, the creation of new animal strains, and the development of new technologies mean that frequent searching and consideration of alternatives are necessary to identify and consider new protocols for procedures. As improved research methods using animals become available, they offer the potential for reducing the pain or distress that may be caused by certain procedures, and for more fully implementing the concept of alternatives as exemplified by the Three Rs objectives. Imaging methods can replace surgical intervention and even euthanasia, while also permitting the ongoing monitoring of an animal's internal condition over a period of time, for example, following the growth of a tumour. Preparing projections (pre-prepared specimens of dissections to show specific structures), or using plastination, can sharply

reduce the number of animals used in teaching when effectively coordinated with the appropriate software and other experiences with animals, as in clinical or field observations. Increased knowledge of the animals' behavioural needs can lead to an improvement in husbandry methods, which results in the animals being less stressed and more consistent in their physiological responses. Keeping efficiently informed of such a dispersed literature for procedures, which is not well-indexed, can be a challenge even though the subject headings and number of journals covered by the online search database PubMed were increased in 2001 to better accommodate the literature on alternatives.

A remaining barrier inhibiting effective compliance by researchers is the multitude of databases, each indexing different lists of journals, which results in researchers using databases that do not cover their specific subject. Therefore, institutional animal care and use committees frequently see searches in PubMed for issues concerning farm animals or fish, when other databases cover that literature more comprehensively. However, no simple method is available to researchers for assessing which databases may be appropriate when searching for particular types of information. To address this gap, and to offer researchers an organised list of databases on an array of typical animal models and topics, we describe here a new guide: search grids of bibliographic databases that include live links: http://www.vetmed.ucdavis.edu/Animal_Alternatives/databaseapproach.html.

To serve all researchers, we offer links, organised by animal model or topic, to free databases that are accessible from around the world, including PubMed, AGRICOLA, PrimateLit, FishBase, TOXNET, JAX Mice Database, NIH Model Organisms, ILAR Animal Models, EcoTox, AVAR, NORINA, and Comfortable Quarters. For researchers with access to proprietary databases, we provide links to these databases that are appropriately organised by animal model or topic, including PsycInfo, Zoological Record, Fish and Fisheries Worldwide, Web of Science, BIOSIS, and CAB. The proprietary access may include the option of downloading full-text articles to an extent dependent on the institutional contract. These search grids of organised databases offer researchers convenient exposure to appropriate databases, which also serve an educational role by expanding awareness of specific databases.

Animal models

For some scientists involved in biomedical research, it may appear that PubMed is all-inclusive in covering the research literature. However, as with other databases, PubMed only indexes articles published in a certain list of journals, emphasising those that primarily pertain to biomedical work. For example, a scientist who elects to use a mouse, bird, or fish model, may miss most of the published literature if they only search in PubMed. For accessing the animal science and veterinary literature, AGRICOLA may be effective; however, AGRICOLA emphasises journals published in the United States, and may not cover the European veterinary literature, for which CAB would

provide better coverage. Therefore, multiple databases may be useful in yielding different information to attain a more comprehensive search.

Certain species require specialised databases more than others. For example, exotic species are covered poorly in the more conventional databases, but can be searched effectively in the proprietary databases, Zoological Record and BIOSIS. Searching the literature that deals with fish requires consulting a variety of databases, depending on the type of procedures in use; many of these are freely accessible, such as ZFIN, FishBase, Fish and Wildlife Reference Service, AGRICOLA, TOXNET, and oneFISH.

Selecting an appropriate animal model for a particular disease or question is an important process supported by several specialised, free resources, including NIH Model Organisms, ILAR Animal Models, International Mouse Strain Resource, Mouse Models of Human Cancer, and PubMed Clinical Queries. Mice are the most common species used in laboratories, representing many strains and disease models; several specialised databases deal specifically with mice and can help researchers to identify appropriate strains for their interests, including those mentioned above, as well as the JAX Mice Database and AltBib.

For searching the literature on a particular species, identifying the years indexed is important as classical work may still be relevant. For example, anatomical studies of elephants conducted decades ago still have merit in current biological studies. In this regard, some databases that cover a wide range of years include Zoological Record (1978–present) and PsycInfo (1840–present).

Topics

The search grid contains a concise list of topics that provides links to databases that are in highest demand in the search for alternatives. Emphasised are searches for refinements by improving care, with databases listed under the topic headings 'husbandry' and 'behaviour'. Databases dealing with discomfort associated with specific disease states or painful/distressing procedures are listed under the topic headings 'disease models' and 'toxicity'. Identifying humane 'endpoints' helps shorten the period of an animal's discomfort, whereas developing further improvements in procedures for 'analgesia/anaesthesia' and 'euthanasia techniques' assures greater comfort for animals. Emerging technologies, which lend themselves to the reduction and replacement of animal use, are addressed in the topic 'imaging and cell culture'. Reductions and replacements are also facilitated by the topics of 'teaching' and 'monoclonal antibodies' ('MAbs'). Another important source of information is the body of standard operating procedures by which other facilities address these topics, especially concerning 'transportation, behavioural training, handling, restraint, and identification' of animals.

Specialised resources that might be missed in a conventional search are included in this search grid. For example, links are provided to special documents on husbandry (Animal Welfare Institute 2002), euthanasia (American

Veterinary Medical Association Panel on Euthanasia 2001) and monoclonal antibodies (Institute for Laboratory Animal Research 1999).

The working list of topics and associated databases included in this search grid will evolve and be updated in response to feedback from users. In addition to tracking the number of visitors, the site's use of statistics provides a valuable insight into the subjects being searched, the search terms used and the links that are selected. The librarian at the UC Center for Animal Alternatives oversees the website's content, considering and reviewing both its quality and usability. The link to our main web page, http://www.vetmed.ucdavis.edu/Animal_Alternatives/main.htm, provides access to additional information and representative searches, identifying search terms as well as databases. We anticipate that the search grid will be an educational tool that increases the searching proficiency of users by introducing them to less well-known databases.

Conclusions

Effective searching of the scientific literature requires the researcher to begin by using a database that covers the relevant body of research. The search grids we describe here allow users to select databases that are appropriate for searching the scientific literature for their particular subject, thereby removing a frustrating barrier currently limiting searching effectiveness. Searching appropriate databases offers the possibility of identifying new procedures and research findings that can serve as alternatives and enhance the welfare of animals.

Acknowledgements

The extensive electronic library holdings of the University of California make it possible to explore, identify, and distinguish the unique features of the resources presented in these search grids.

References

- American Veterinary Medical Association Panel on Euthanasia** 2001 2000 report of the AVMA panel on euthanasia. *Journal of the American Veterinary Medical Association* 218: 669-696. <http://www.avma.org/resources/euthanasia.pdf> (accessed 24 July 2005)
- Animal Welfare Institute** 2002 *Comfortable Quarters for Laboratory Animals, 9th Edition*. <http://www.awionline.org/pubs/cqindex.html> (accessed 25 March 2005)
- Institute for Laboratory Animal Research** 1999 *Monoclonal Antibody Production: Committee on Methods of Producing Monoclonal Antibodies*. National Academy Press: Washington DC, USA. <http://www.nap.edu/books/0309064473/html/R1.html#pagetop> (accessed 24 March 2005)
- United States Animal Welfare Act** 7USC 2131-2159, adopted 1966, amended 2002. <http://www.aphis.usda.gov/ac/awa.html>
- United States Department of Agriculture** 1997 *Animal and Plant Health Inspection Service Animal Care, USDA Animal and Plant Health Inspection Animal Care Policy Manual Policy #11 — Painful Procedures* — April 14 1997. <http://www.aphis.usda.gov/ac/policy/policy11.pdf> (accessed 24 March 2005)
- United States Department of Agriculture** 2000 *Animal and Plant Health Inspection Service Animal Care, USDA Animal and Plant Health Inspection Animal Care Policy Manual Policy #12 — Consideration of Alternatives to Painful/Distressful Procedures* — June 21 2000. <http://www.aphis.usda.gov/ac/policy/policy12.pdf> (accessed 24 March 2005)