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## Searching for information on 3Rs and 3Rs Resources

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In association with: H2020 VetBioNet and FRAME



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## OVERVIEW

1. Objectives
2. Why search?
3. Why is it difficult?
4. How can it be done?
5. Available resources



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1. Awareness of the need to conduct effective searches
2. Awareness of the problems associated with searching
3. Basic search skills
4. Increased knowledge of available resources

# Why Search?

“In science good planning is essential to clearly define the specific and novel scientific objectives to be pursued; to select the most appropriate research tools; to design the programme of work; and to devise and optimise the experimental design, protocols, data acquisition and data analysis systems. All of this is conditional upon your being able to find relevant information; evaluate it; and build on your experience, analysis and insights to turn that information into knowledge and effective action.”

EURL ECVAM Search Guide, 2013



“The ability to access and implement information on the Three Rs (Replacement, Reduction and Refinement) is essential for ethical and scientific reasons, because it can lead to improvements in animal welfare and scientific outcomes, as well as to the saving of resources. It can prevent the unnecessary duplication of studies, improve experimental design, and ensure that existing and new alternative methods are used as widely as possible.”

FRAME Searching for Information, 2016



“Further, the IACUC [Institutional Animal Care and Use Committee] shall determine that the proposed activities or significant changes in ongoing activities meet the following requirements:

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...”

Animal Welfare Act and Regulations, 2013



“Require all animal users to complete an animal use protocol form and ensure that the information therein includes the following points...

...information with regard to the Three Rs (replacement, reduction and refinement alternatives) of animal use, to include:

...a description of why sentient animals must be used for the project, of how the applicant arrived at this conclusion (e.g., searches of databases on alternatives), and of possible replacement alternatives...and justification if these are not to be employed...”

CCAC Guide to the Care and Use of Experimental Animals, 1993



“Member States shall ensure that, wherever possible, a scientifically satisfactory method or testing strategy, not entailing the use of live animals, shall be used instead of a procedure[involving animals]...

The project evaluation shall consist in particular of the following:

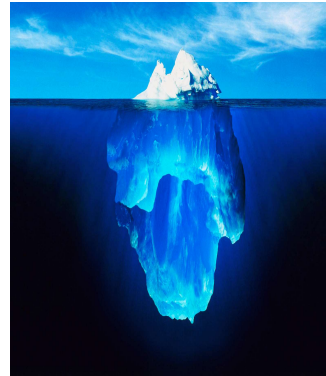
...an assessment of the compliance of the project with the requirement of replacement, reduction and refinement...”

European Directive 2010/63/EU



**Why is  
Searching  
Difficult?**

- Many times larger than the 'Surface Web'
- The part of the web not searched by standard search engines such as Google
- Material may be:
  - Encrypted
  - Subject to registration/subscription
  - Password or Captcha protected
  - Dynamic or scripted webpages
  - On intranets
  - Text in images or videos not formatted for or accessible to standard search engines
  - Unlinked content



Slide adapted from material presented by Norecopa



- Bibliographical databases inefficient (poor overlapping between the databases)
- Limited knowledge of specialist 3Rs databases
- Scientists rarely use 3Rs words in titles/abstracts or keywords of publications
- Databases rarely tag 3Rs papers with explicit thesaurus terms
- No single journal of 3Rs research/resources



Slide adapted from material presented by Norecopa



## SPARSE REPORTING

- Reporting (Materials and Methods section) should be so detailed that the study can be reproduced in another lab
- Including explicit detail about 3Rs aspects
- But this information takes space which is limited in peer-reviewed journals
- However, supplementary online space is now becoming more common



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## NEGATIVE RESULTS NOT PUBLISHED

- Bias automatically occurs if only positive results are reported
- Negative results can be just as important for the scientific community e.g.
  - Indicate what methods are effective or not
  - Prevent unnecessary duplication
  - Indicate which avenues of research to pursue further or avoid
  - Suggest opportunities to collaborate

To know what you know  
and what you do not  
know, that is true  
knowledge.  
[Confucius]



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# How to Search



## SEARCH BASICS

- Search efficiency
  - Recall ratio = relevant records retrieved/total relevant records (i.e. how comprehensive the search is)
  - Precision ratio = relevant records retrieved/total records retrieved (i.e. how accurate the search is)





- Choice of search terms
  - Case specificity
  - Spelling
  - Synonyms and related words

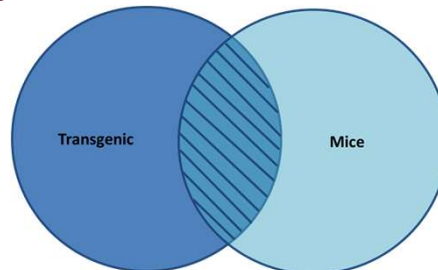


- Wildcards
  - Spelling e.g. sul\*ur retrieves sulfur and sulphur
  - Truncation e.g. sulph\* retrieves sulphuric, sulphurous, sulphate, sulphite, etc, but not sulfuric, sulfurous, sulfate, sulfite, etc.
  - You can not mix the two methods
- Stemming
  - Some search engines automatically search for terms grammatically related to the search terms
  - May be confined to singular and plural forms of common words
  - Can avoid some of pitfalls of truncation operators

- Boolean operators – define the relationship between search terms

**AND** (also be signified by &) is used to find documents which contain both of the search terms linked by the operator and to eliminate documents which contain only one or neither of the search terms, e.g. to find documents on transgenic mice:

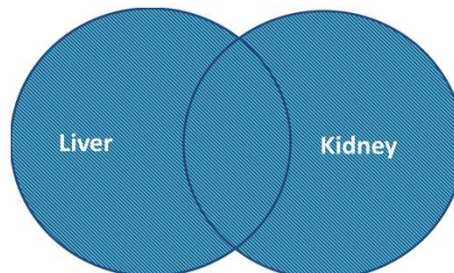
*transgenic AND mice*



- Boolean operators – define the relationship between search terms

**OR** (can also be signified by |) is used to find documents which contain either one or both of the search terms, e.g. to find all documents referring to the kidney, the liver or both organs:

*kidney OR liver*

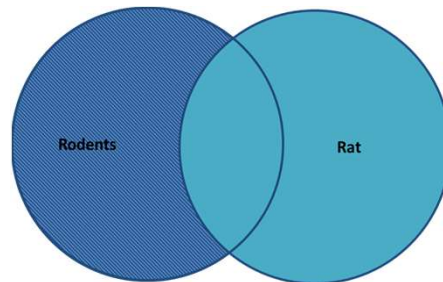


- Boolean operators – define the relationship between search terms

**NOT** (can also be signified by !) is used to exclude documents from a retrieved set, e.g. to find documents on rodents which do not deal with rats:

rodents **NOT** rats

*Should be used with care!*



- Boolean operators – define the relationship between search terms

**NEAR** is not a Boolean operator, but can be used on some search systems to indicate a requirement for proximity, where it will retrieve documents in which the key terms are within a certain number of words from each other.

- Other operators

**+** : used to specify words which must be present in the retrieved documents,

e.g.:

**+transgenic +mice** will only retrieve documents which contain both words, while **+transgenic mice** will give a higher placing to documents containing both words, but will also retrieve documents containing the word transgenic but not the word mice.



- Other operators

**-** : used to exclude documents containing the search term,  
e.g.:

**+transgenic -plants -mice** will retrieve documents which contain the word transgenic but which do not contain the words plants or mice. Similar care should be used with this operator as with the Boolean operator NOT.



- Other operators

" " : used to enclose a series of words which are to be treated as a phrase, e.g.:

*"Animals (Scientific Procedures) Act"* will find only documents containing this specific phrase.

Many search engines define a list of common stop words (e.g. and, the, of) which are stripped out of search expressions. Enclosing these words in quotation marks will ensure that they are retained.



- Parenthesis - can be used together with Boolean operators to construct more-complicated search profiles. The operators within a pair of parentheses are treated as a single unit which is processed first, e.g.:

*cultur\* AND (cell\* OR tissue)* finds documents which mention cell culture or tissue culture

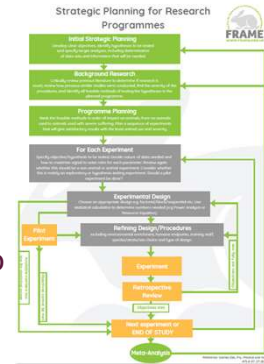
*(cultur\* NEAR (cell\* OR tissue)) OR ((cell\* OR tissue) NEAR cultur\*)* will find documents mentioning cell culture or tissue culture and also documents referring to cultured cells, etc.

*transgenic AND (mice OR rats OR (pigs NOT guinea))*, will find documents on transgenic mice, transgenic rats and transgenic pigs, but not transgenic guinea pigs.



### • Planning a search

- Literature search is the first step in planning any research programme
- Systematic review
  1. Formulate a focussed research question
  2. Identify appropriate databases and sources of studies
  3. Transform the research question into a search strategy
  4. Collect search results and remove duplicates
  5. Identify potentially relevant papers



### • Designing a search strategy and defining search terms

- Can be complex, dependent on specific search terms and capabilities of database used
- May be necessary to take a specific course on the use of the major electronic bibliographic databases
- Leenaars et al 2012 give a good example of transforming a research question → a search strategy for PubMed

- Designing a search strategy and defining search terms

- Generally:

1. Define subject specific search terms
2. Combine into a search filter using Boolean or other operators
3. This can be complete (long and complex)
4. If the system allows do in a series of steps instead
5. If too many irrelevant documents make the filter more precise
6. If too few documents remove very specific parts of the filter OR explode the search
7. Obtain full copies of papers and exclude irrelevant ones (always keep a note of exclusion criteria and number excluded under each criterion)



- Subject-specific terms

- Identify a set of core papers about the subject
  - Use review journals
  - Follow older references forward
- Extract relevant words from the full texts inc. keywords



- Subject-specific terms
  - Consider:
    - the field of interest: e.g. cardiology, pharmacology
    - the species/technique used in the reported studies
    - the systems or anatomical structures that are studied
    - any pathological or physiological processes that might be involved;
    - any hormones, enzymes or chemicals of interest or relevance to the study
    - 3Rs terms

- Three Rs terms example

R being addressed	Primary terms	Combination term or related term	
General	Alternatives or animal testing alternatives or non animal combined with:	assay Method Model replace replacement	surrogate system technique biomarker
Replacement	Computer or in silica combined with:	aided assisted instruction learning image imaging interactive model (modelling) prediction simulation expert system theoretical	model (modelling) teaching mathematical model (modelling) QSAR SAR structure-activity relationship software virtual



- **Subject-specific terms**
  - Include synonyms
  - Include commonly used acronyms
  - May be important to include variants in British and US spellings e.g. tumour vs. tumor
  - Use 1 or 2 databases to retrieve the full records for some of the core papers
    - Will show the words used to index the article
    - Ideally consult the indexing thesaurus for the database to obtain the preferred terms or indexing codes and also narrower and/or broader terms/codes for these concepts.

- **Generally include:**
  1. all databases and other sources searched
  2. the dates of the last search for each database and the period searched
  3. full search strategies (including all search terms/filters)
  4. any language or publication status restrictions used
  5. exclusion criteria
- Whether publishing the search strategy or not it is important to save this information for you own future use.



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# Available Resources




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## ACCESSING THE INVISIBLE WEB

- About.com:  
[http://websearch.about.com/od/invisibleweb/a/invisible\\_web.htm](http://websearch.about.com/od/invisibleweb/a/invisible_web.htm)
- Yippy: <http://yippy.com/>
- InfoMine: <http://infomine.ucr.edu/>
- Library Spot: <http://www.libraryspot.com/>
- OmniMedicalSearch:  
<http://www.omnimedicalsearch.com/>
- SurfWax: <http://lookahead.surfwax.com/>
- Virtual Library: <http://vlib.org/>




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## FREE SEARCHABLE DATABASES

- **ALTBIB:** <https://toxnet.nlm.nih.gov/altbib.html>






Screenshot of the ALTBI B website (Alternatives to Animal Testing) from the National Library of Medicine. The page features a search bar for animal alternatives literature and news, along with a list of additional resources.

- **AGRICOLA:** <https://agricola.nal.usda.gov>





Screenshot of the AGRICOLA website (National Agricultural Library). The page shows a search bar and various filters for searching agricultural literature.



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## FREE SEARCHABLE DATABASES

- **ATCC (American Type Culture Collection):**  
[https://www.lgcstandards-atcc.org/?geo\\_country=gb](https://www.lgcstandards-atcc.org/?geo_country=gb)
- **CRIS:** <https://cris.nifa.usda.gov/>
- **EURL ECVAM DB-ALM:** <https://ecvam-dbalm.jrc.ec.europa.eu/>
- **HsVma Alternatives in Education Database:**  
<http://www.hsvma.org/alternatives>
- **PubMed:** <http://www.ncbi.nlm.nih.gov/pubmed>
- **Toxnet:** <https://toxnet.nlm.nih.gov/>
- **UCSC Genome Bioinformatics:**  
<http://genome.ucsc.edu/index.html?org=Human&db=hg18&hgside=93614374>



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### •Mailing lists

- Made up of a group of people who send messages to a computer known as a list server.
- List server distributes each message to every person on the list by e-mail.
- Mailing Lists were more popular in the 1990s and early 2000s but usage has declined in favour of Discussion/ Web Forums
- However, some lists are still active and very useful such as those on the AALAS website: <https://www.aalas.org/get-involved/listservs#.V5n5LzXW1sk>



- Serve the same function as mailing lists, but the messages appear on a web site and are not sent out to individuals
- Access to the site may be open or require registration
- The messages are displayed in threads according to subject
- Responses and new messages are posted from the web site
- Usually, only the newest messages are displayed but an archive might be available



- For example:
  - The Science Forum:  
<http://www.thescienceforum.com/>



- PiLAS: <http://pilas.org.uk/>

**PILAS**  
A discussion forum for bio-science topics



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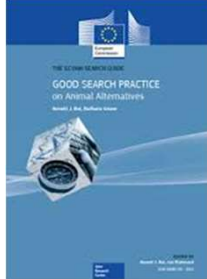
LinkedIn



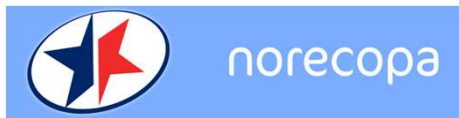
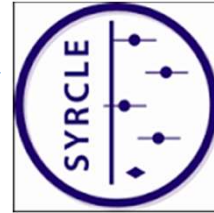
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## SEARCH TOOLS/GUIDES

- The EURL ECVAM search guide: <https://publications.europa.eu/en/publication-detail/-/publication/8835aa05-f780-454a-ac43-7752b38b394e/language-en>



- SYRCLE Tools and guidelines: <https://www.radboudumc.nl/en/research/departments/health-evidence/systematic-review-center-for-laboratory-animal-experimentation/tools>

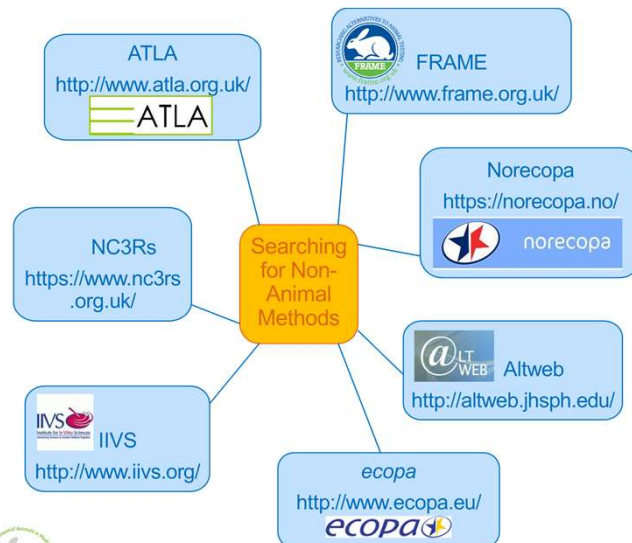


- Norecopa literature searches & systematic review: <https://norecopa.no/more-resources/literature-searches-and-systematic-reviews>

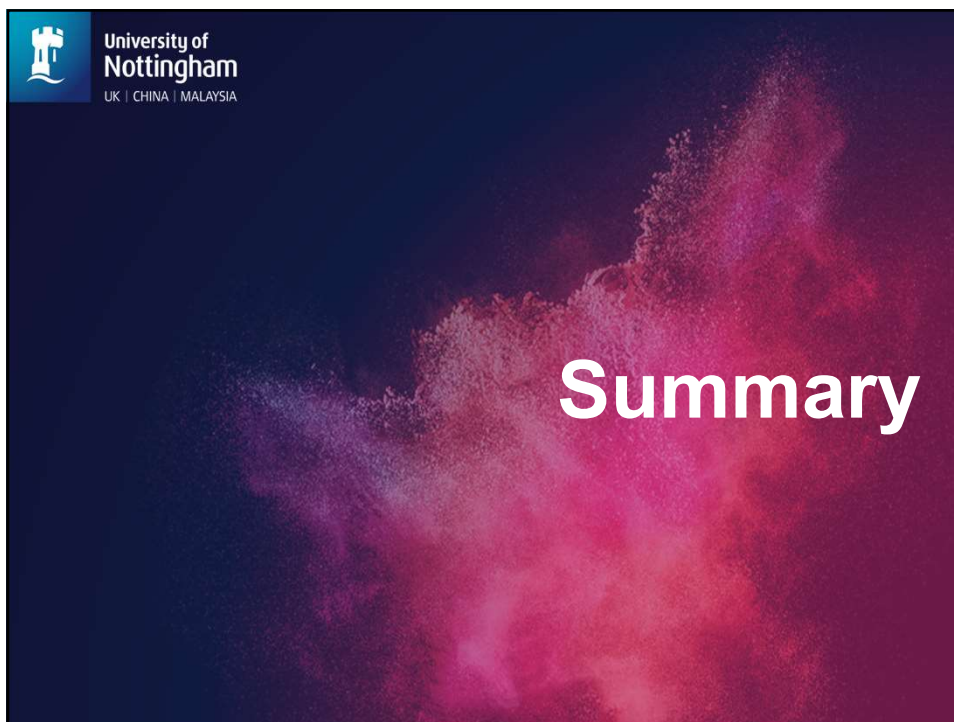


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## USEFUL WEBSITES







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## TO FIND RESOURCES FOR NON-ANIMAL METHODS

- Define the search as well as possible
- Identify synonyms and 3Rs terms
- Remember the differences between British & American English
- Use several databases (little overlapping)
- Learn the differences between the search engines (read the instructions!)
- Get used to using Boolean logic and check which terms are supported by the search engine
- Learn how to expand/narrow your search
- Look for core articles and key authors
- Use the possibilities on the Internet to get in touch with the best research labs and organisations

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# References



- **EURL ECVAM Search Guide, 2013**
  - <https://publications.europa.eu/en/publication-detail/-/publication/8835aa05-f780-454a-ac43-7752b38b394e/language-en>
- **Animal Welfare Act and Regulations, 2013**
  - [https://www.aphis.usda.gov/animal\\_welfare/downloads/AC\\_BlueBook\\_AWA\\_FINAL\\_2017\\_508comp.pdf](https://www.aphis.usda.gov/animal_welfare/downloads/AC_BlueBook_AWA_FINAL_2017_508comp.pdf)
- **Norecopa**
  - <https://norecopa.no>





- **CCAC Guide to the Care and Use of Experimental Animals, 1993**
  - [https://www.ccac.ca/Documents/Standards/Guidelines/Experimental\\_Animals\\_Vol1.pdf](https://www.ccac.ca/Documents/Standards/Guidelines/Experimental_Animals_Vol1.pdf)
- **European Directive 2010/63/EU**
  - <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32010L0063>
- **Leenaars et al (2012)**
  - <http://lan.sagepub.com/content/46/1/24.long>
- **SYRCLE**
  - <https://www.radboudumc.nl/en/research/departments/health-evidence/systematic-review-center-for-laboratory-animal-experimentation>



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An earlier version of this presentation including  
audio commentary is available at:  
<https://www.youtube.com/watch?v=jn0fPOHycK0>