How to construct a literature search

Alice Tillema, Medical Library, Nijmegen

http://libguides.ru.nl/norecopa
How to construct a literature search

• Introduction

• Systematic Reviews

• Comprehensive Searching
  - Research Questions
  - Sources
  - Search options

• Practical
SYstematic Review Centre for Laboratory animal Experimentation
Preclinical Testing and Patient Care

Video on Systematic Reviews
Searching for literature
Searching for literature

SYSTEMATIC REVIEW
- Focuses on a specific question
- Aims to identify and appraise all available studies
- Can synthesize new, high-quality evidence

IN EBM

QUALITY OF EVIDENCE
Systematic Reviews

- Provide overview of available evidence
- Identify knowledge gaps
- Critical appraisal of study quality
- Identify factors influencing treatment efficacy
- Inform experimental design of animal clinical studies
Review Article

A step-by-step guide to systematically identify all relevant animal studies

Marlies Leenaars¹, Carlijn R Hooijmans¹, Nieky van Veggel¹2, Gerben ter Riet³, Mariska Leeflang⁴, Lotty Hooft⁵, Gert Jan van der Wilt⁶, Alice Tillema⁷ and Merel Ritskes-Hoitinga¹

Abstract
Before starting a new animal experiment, thorough analysis of previously performed experiments is essential from a scientific as well as from an ethical point of view. The method that is most suitable to carry out such a thorough analysis of the literature is a systematic review (SR). An essential first step in an SR is to search and find all potentially relevant

Keywords: Search guide, systematic review, education and training


http://lan.sagepub.com/content/46/1/24.full.pdf+html
Comprehensive searching:

Mouse AND Parkinson

(Mice OR Mouse) AND (Parkinson's OR Parkinsonian)

Relevant studies on Parkinson’s Disease mouse models
Comprehensive search: balance between sensitivity & specificity

A sensitive search retrieves:
more relevant studies &
more irrelevant studies
Steps in comprehensive searching

1. Research Question
2. Sources
3. Comprehensive search strategy
4. Search results
5. Select relevant papers
6. ……

From: A step-by-step guide to systematically identify all relevant animal studies, Leenaars 2012
1. Research question

• Specific and structured
  - Animals (species)
  - Disease model/biological phenomenon/mechanism
  - Intervention/exposure
  - Outcome
1. Research question (example)

In animal models for acute pancreatitis what is the effect of probiotic supplementation on harmful effects?

Search Components (SC)?

http://libguides.ru.nl/norecopa
In animal models for acute pancreatitis what is the effect of probiotic supplementation on harmful effects?

Search Components (SC)?

1. pancreatitis
2. probiotics
3. animal

To enhance comprehensiveness of search results we are not including: models, acute, effect, supplementation, harmful effects
In animal models for acute pancreatitis what is the effect of probiotic supplementation on harmful effects?

We will create separate search strategies: one for each search component. The overlap will provide the possibly relevant studies.
1. Research question

Deriving search components from your question think about

– How many?
– More specific or more general concepts?
– Phrasing?
2. Sources – bibliographic databases

• Coverage
  - Disciplines
  - Journals
  - Time period

• Types of publications
  - Journal articles
  - Conference Abstracts
  - Book reviews
  - Grey literature

• Search options
  - Controlled vocabulary

• Availability
2. Sources – bibliographic databases

# THE EURL ECVAM SEARCH GUIDE

## TABLE OF JOURNALS relevant to the 3Rs indexed by Databases and Meta-Databases

<table>
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<th>Journal</th>
<th>AGRICOLA</th>
<th>BIOSIS Previews</th>
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<th>Web of Science</th>
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<td>Toxicology in vitro</td>
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## Databases

### AGRICultural OnLine Access, AGRICOLA

<table>
<thead>
<tr>
<th>Subject Coverage</th>
<th>Agriculture, biotechnology, food and nutrition, microbiology, veterinary medicine, environmental sciences</th>
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<tbody>
<tr>
<td>Content</td>
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<tr>
<td>Sources</td>
<td>Journal articles, conference proceedings, books, book chapters, monographs, theses, patents, computer files, maps, audiovisual materials, technical reports</td>
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</table>

**Features for the 3Rs**

AGRICOLA indexes publications that address alternatives to animal experiments and other areas of animal welfare, e.g. farm animals. The database covers several 3Rs relevant journals, e.g. ILAR Journal, Journal of Animal Science, and Lab Animal. The NAL Agricultural Thesaurus (NALT) includes 3Rs relevant terms: animal welfare, animal use alternatives, animal use reduction, animal use refinement, and animal use replacement, see section Search Terms and their Use. The NALT (http://agclass.nal.usda.gov/agt/agt.shtml) is used as a supplement to the CAB Thesaurus, which is the original AGRICOLA indexing system.

### BIOSIS Previews®

<table>
<thead>
<tr>
<th>Subject Coverage</th>
<th>Biology, biochemistry, biotechnology, botany, medicine, pharmacology, toxicology, environmental sciences, zoology, agriculture, veterinary science</th>
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<tr>
<td>Content</td>
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</tr>
<tr>
<td>Sources</td>
<td>Journal articles, serials, proceedings of meetings, conferences, and symposia; reports, books, book chapters, U.S. patents, reviews</td>
</tr>
</tbody>
</table>

**Features for the 3Rs**

BIOSIS Previews® offers information from many different life science disciplines. The database provides comprehensive access to literature in pre-clinical and experimental research, methods, and animal studies. It allows scientists expansive retrospective literature. BIOSIS Previews® covers several 3Rs relevant journals, e.g. Animal Welfare, Alternativen zu Tierexperimenten (ALTEX), Alternatives to Laboratory Animals (ATLA), ILAR Journal, Laboratory Animals, Journal of Animal Science, Journal of Applied Animal Welfare Science, and Toxicology in vitro.
### Subject Coverage
Biomedicine, psychology, environmental and public health, molecular biology, and complementary medicine, bioethics, pharmacology, veterinary medicine

### Content
**File Size**
1946 to the present more than 21 Million records

**Sources**
Journal articles

### Features for the 3Rs
MEDLINE records are indexed with Medical Subject Headings (MeSH®), the U.S. National Library of Medicine's controlled vocabulary. From 1985 till 2000 the 3Rs relevant term “animal testing alternatives” was used to index publication according to the 3Rs. Since 2000 the term “animal use alternatives” is used by the NLM, see section Search Terms and their Use. In addition, the MeSH includes the term “animal welfare.”

**Selection of journals indexed by MEDLINE is based on the evaluation** and recommendation of an NIH-chartered advisory committee of external experts. MEDLINE covers 3Rs relevant journals, e.g., Alternativen zu Tierexperimenten (ALTEX), Alternatives to Laboratory Animals (ATLA), ILAR Journal, Journal of Animal Science, Journal of Applied Animal Welfare Science, Lab Animal, Laboratory Animals, and Toxicology in vitro.
2. Sources – search options & search fields

- Controlled vocabulary: e.g. thesaurus
- Title, abstract, keyword searching
2. Sources – search options & search fields

Reference from PubMed

A Protein Extract from Chicken Reduces Plasma Homocysteine in Rats.
Lysne V, Bjørndal B, Vik R, Nordrehaug JE, Skorve J, Nygård O, Berge RK.

PubMed article description contains fields like title, abstract, MeSH terms etc.

In general PubMed does not search the full text of articles.
Controlled vocabulary
MeSH Database

**Mice** = MeSH term

The common name for the genus Mus.

Year introduced: 2006

Entry Terms:
- Mus
- Mouse
- Mus musculus
- Mice, House
- House Mice
- Mouse, House
- House Mouse
- Mus domesticus
domesticus, Mus
- Mus musculus domesticus
domesticus, Mus musculus
musculus domesticus, Mus
- Mice, Laboratory
- Laboratory Mice
- Mouse, Laboratory
- Laboratory Mouse
- Mouse, Swiss
- Swiss Mouse
- Swiss Mice
- Mice, Swiss

= synonyms

http://libguides.ru.nl/norecopa
PubMed search for all publications on ‘mice’

MEDLINE
> 22 million citations

PubMed (total) > 26 million citations
= MEDLINE + nonindexed citations

mice[MeSH]

mice [?] mouse [?] murine [?]

mice[tiab] mouse[tiab] murine[tiab]
Combining search terms

Which search in PubMed will retrieve this record?

1. mice[ti]  ×
2. mouse[tiab]  ✓
3. mice[mesh]  ?
Sensory network dysfunction, behavioral impairments, and their relationship to Alzheimer's β-amyloidosis mouse model.


Abstract
The unique vulnerability of the olfactory system to Alzheimer's disease (AD) provides a quintessential model for understanding mechanisms of synaptic dysfunction and pathological progression in the disease. Using a mouse model of β-amyloidosis, we show that aberrant, hyperactive olfactory network activity begins early in disease progression, prior to behavioral impairments or comparable hippocampal dysfunction and at a time when amyloid-β (Aβ) deposits within the olfactory bulb (OB). Hyperactive odor-evoked activity in the piriform cortex (PCX) and increased odor-evoked connectivity emerged at a time coinciding with olfactory behavior impairments. This hyperactive activity was Aβ-dependent, because agonist treatment to promote Aβ degradation rescued the hyposensitive state and olfactory behavior. These findings provide evidence to a novel working model of olfactory dysfunction in AD and, complimentary to other recent studies, suggest that the development of Aβ in the OB might aid in early detection of AD.

PMID: 22049439 [PubMed - indexed for MEDLINE]
In animal models for acute pancreatitis what is the effect of probiotic supplementation on harmful effects?

Search components:
1. pancreatitis
2. probiotics
3. animal
Search components: finding search terms

• What is/are the MeSH term(s)?
  - Try to find a relevant MeSH term via the MeSH database

• Are there any synonyms?
  - Copy the ‘Entry terms’ and the selected MeSH term

• Are there any other synonyms?
  - Wikipedia?
  - Experts?
  - Relevant publications?
Search component: Pancreatitis

- What is/are the MeSH term(s)?
  Pancreatitidis[MeSH]

- Are there any synonyms?
  Pancreatitidis
  Pancreatitides

- Are there any other synonyms?
  - Wikipedia?
  - Experts?
  - Relevant publications?
  Pancreas inflammation
  Pancreatic inflammation
Search Component: Probiotics

• What is the MeSH term?  
  Probiotics[MeSH], Synbiotics[MeSH], ........

• Are there any synonyms?  
  probiotics  
  probiotic  
  synbiotics  
  synbiotic

• Are there any other synonyms?  
  Lactobacillus  
  Bifidobacterium  
  Lactococcus  
  Bacillus
Creating a search string in Word

1. List the MeSH term

2. Make a list of synonyms, e.g. Entry terms, etc.
   If you have a bulleted list → remove the bullets

3. Select all synonyms (not the MeSH term)
   - Choose Replace
   - Replace: ^p Replace with: [tiab] OR
     (a space before and after OR)
   - Replace all

4. Add MeSH term with OR

OR Pancreatic neoplasms[tiab] OR Pancreatic neoplasms[tiab] OR Pancreas cancer[tiab]
OR Pancreatic cancer[tiab] OR Cancer of the pancreas[tiab]
Search component: Animals

Enhancing search efficiency by means of a search filter for finding all studies on animal experimentation in PubMed.
Hooijmans CR, Tillema A, Leenaars M, Ritskes-Hoitinga M.
Creating a search for separate Search Components

Table 2
Step A
Search Components

Step B
Search strategy

• Identify standardized subject terms e.g. MeSH
• Identify free-text terms
• Combine standardized and free-text terms

A step-by-step guide to systematically identify all relevant animal studies, Leenaars 2012
In animal models for acute pancreatitis, what is the effect of probiotic supplementation on harmful effects?

**Simple Searches**

1. pancreatitis AND probiotics AND animal models 11
2. pancreatitis AND probiotic AND animal models 12
3. pancreatitis AND probiotics AND animals 34
Comprehensive search  

**PANCREATITIS**


**PROBIOTICS**


#3  #1 AND #2

#4  With PubMed Animal Search Filter (see Hooijmans 2010)
Practical
Research question 2

In animal models for Alzheimer’s Disease what is the effect of supplementation of omega-3 fatty acids on cognition and neurodegeneration?

Search Components (SC)?

http://libguides.ru.nl/norecopa
Research question 2: Search Components

- Animals
- Alzheimer(s)
- Omega-3 Fatty Acid(s)
Practical: Start

- Go to [http://libguides.ru.nl/norecopa](http://libguides.ru.nl/norecopa) → Tab Search tips
- Click the tab Search tips
- Start PubMed with incorporated Animal filter
- Go to SYRCLE training website and copy search string for component *Alzheimer*
- Paste search string for *Alzheimer* in search box PubMed
Practical exercise

Create comprehensive search strategy for:

Omega 3 fatty acids

Tips:
• Use the MeSH Database for selecting MeSH terms
• Use Word for collecting MeSH terms and synonyms
• Combine MeSH terms OR ‘free text’ in your search
Where to find the MeSH Database

Start:
• Open the MeSH Database in PubMed
• Explore & collect search terms in a Word document
Where to find the Search History

PubMed
PubMed comprises more than 25 million citations for biomedical literature from MEDLINE, life science journals, and online books. Citations may include links to full-text content from PubMed Central and publisher web sites.

Using PubMed
PubMed Quick Start Guide
Full Text Articles

PubMed Tools
PubMed Mobile
Single Citation Matcher

More Resources
MeSH Database
Journals in NCBI Databases
Comprehensive search for Omega-3 fatty acids

First find the MeSH term(s):

Fish Oils

**Fatty Acids, Omega-3**
- Docosahexaenoic Acids
- Eicosapentaenoic Acid

Then find synonyms per MeSH term e.g.:
- n-3 PUFA, n-3 Fatty Acids, Fatty Acids, n-3, n 3 Fatty Acids
- n-3 Polyunsaturated Fatty Acid, n 3 Polyunsaturated Fatty Acid, etc.

Combine MeSH terms with synonyms (in title or abstract [tiab])


more than 100,000 records
Combination of search strategies

<table>
<thead>
<tr>
<th>Disease of interest</th>
<th>Intervention</th>
<th>Animal</th>
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<td>183083</td>
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</tr>
<tr>
<td>520 relevant studies</td>
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</table>

Search Date: 29 October 2015
Useful links

• ECVAM Search Guide

• A step by step guide to systematically find all animal studies
  http://lan.sagepub.com/content/46/1/24.full.pdf+html

• PubMed url with incorporated animal filter

• SYRCLE website
  www.syrcle.nl
  https://www.radboudumc.nl/srtraining

Images mouse/mice
  https://commons.wikimedia.org/wiki/File:Mice_(1).jpg
  https://www.flickr.com/photos/davedugdale/5102302821
  https://en.wikipedia.org/wiki/Mouse#/media/File:%D0%9C%D1%8B%D1%88%D1%8C_2.jpg