Searches in Health Science Databases
Programme:

- Research questions and PICO or PEO
- Search protocol
- Search techniques and -strategies
- Boolean operators
- Which databases?
- Subject terms and subject codes
- Evaluation of search results
- Save the search and tips and tricks
- Example on a literature search in PubMed and Embase
The research question must be structured and focused in such a way, that it is possible to conduct a literature search. It must be **precise and accurate**. This is significant for the progress of the search process.

You can start with a ”Scoping search”: meaning scanning and exposing the subject, e.g. have other been working on this or has anybody written about it?

A structured research question makes it possible to divide the search into blocks and afterwards conduct a systematic literature search.

(Cochrane Handbook, 2019)
The research question

Ask only one question and focus on exactly which answer you are looking for.

E.g. What is the effect on treatment for pain with Naproxen among patients with rheumatoid arthritis?

Some models may help you on asking a focused research question,
• PICO is for intervention studies, and clinical research questions.
• PEO is for qualitative research questions.

More on these model:
https://www.sdu.dk/en/bibliotek/forskere/systematiske+reviews
The PICO model

**E.g.** What is the effect on treatment for pain with Naproxen among patients with rheumatoid arthritis?

- **Patient/Population/Problem**
  - *Patients with rheumatoid arthritis*

- **Intervention**
  - *Naproxen as treatment*

- **Comparison**
  - *Placebo or other pain treatments*

- **Outcome**
  - *The patients are without pain*

(Booth et al. 2000; Eriksen, 2018; Schardt et al, 2007, O’Sullivan, 2013)
The PEO model

E.g. How does patients with rheumatoid arthritis experience the pain treatment?

Patient/Population/Problem
(Patients with rheumatoid arthritis with pain)

Exposure
(how patients experience the pain treatment)

Outcome
(The nurses or physicians will know how to treat the patient, and deal with their mental condition as well)

(Khan, 2003)
The search protocol

As a part of the literature search it is advisable (a requirement for systematic reviews) to compile a search protocol.

The protocol is a structured outline on the collection of literature and information.

The search protocol must provide for the consistency in connection with a follow-up search or a replication of the search.

In connection with systematic reviews, there must be a search protocol and it can e.g. be registered in PROSPERO: [http://www.crd.york.ac.uk/PROSPERO/](http://www.crd.york.ac.uk/PROSPERO/).
The search protocol should contain:

• Background and issues or a case
• The focused research question
• Inclusion- and exclusion criteria's
• Information sources, (databases, webpages etc.)
• Search strategies and –results for each information source. What have you searched for and how? Limits on study types etc.
• Documentation on your search and in such a detail that it is reproducible.
• On literature studies: screening and selection, and in the end analysis of the literature. (e.g. by using Covidence or Prisma).

(Cochrane Handbook, 2019 – part 2 Chapter 1, part 1.5. + Chapter 3 og 4)
Quick searching / quick and dirty
Easy and quick method
Few words e.g. rheumatoid arthritis AND Naproxen
Rarely the best, complete strategy
(… but maybe an introduction to a more specific search)

Chain searching
Key documents and/or bibliographic data from this:
• in literature previously found (which references is used, method known as Pearl growing or Snowballing)
• or by citation index (who cited this key document)

Block searching
The search is divided in blocks with key elements.

(Harter, 1986)
Dividing the research question in blocks.

<table>
<thead>
<tr>
<th>Block 1</th>
<th>Block 2</th>
<th>Block 3</th>
<th>Block 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR</td>
<td>OR</td>
<td>OR</td>
<td>OR</td>
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<td></td>
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</tr>
<tr>
<td>AND</td>
<td>AND</td>
<td>AND</td>
<td></td>
</tr>
</tbody>
</table>

Combinations within and between the blocks with

Boolean operators **AND** **OR** **NOT**

(Harter, 1986)
What is the effect on treatment for pain with Naproxen among patients with rheumatoid arthritis?

The example divided in blocks:

<table>
<thead>
<tr>
<th>Block 1</th>
<th>Block 2</th>
<th>Block 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients med RA</td>
<td>Naproxen</td>
<td>Pain(s)</td>
</tr>
<tr>
<td>Rheumatoid arthritis</td>
<td>Naproxen</td>
<td>Pain(s)</td>
</tr>
<tr>
<td>Rheumatoid nodule</td>
<td>Naprosyn</td>
<td>Ache(s)</td>
</tr>
<tr>
<td>Anaprox</td>
<td>Suffering</td>
<td></td>
</tr>
</tbody>
</table>
Example:
(rheumatoid arthritis OR rheumatoid nodule) AND (naproxen OR naprosyn OR anaprox) AND (pain OR ache OR suffering)

The parenthesis enables you to control the sequence of the commands, on contemporary use of AND and OR

In PubMed AND and OR is written in capital letters.
When the **focused research question** has been expressed (e.g. with PICO or other models), you may transfer the key elements to a **block search**.

Usually you only search for “P” (patients/population) and ”I” (interventions), if PICO has been used.

For each block you must choose all relevant words, synonyms, antonyms (e.g. fertility/infertility), or other relevant medical terms.

Check relevant articles, look at ”**entry terms**” in PubMed and ”**Used for**” in Embase.
The selection of databases depends on the subject and intended extent of the literature search.

<table>
<thead>
<tr>
<th>Databases</th>
<th>Content</th>
<th>Subject index</th>
</tr>
</thead>
<tbody>
<tr>
<td>PubMed (NLM)</td>
<td>Journals on all health scientific subjects (PubMed includes Medline)</td>
<td>MeSH</td>
</tr>
<tr>
<td>Medline (Ovid)</td>
<td>Medline (approx. 5600 journals in PubMed indexed with MeSH-terms) could be used separately</td>
<td>MeSH</td>
</tr>
<tr>
<td>Embase (Ovid)</td>
<td>More European journals than PubMed. Health scientific subjects, especially pharmacology. Embase includes Medline.</td>
<td>EmTree</td>
</tr>
<tr>
<td>Cinahl (EBSCO)</td>
<td>Nurse scientific journals, and physiotherapy, occupational therapy and radiography.</td>
<td>Cinahl-Headings</td>
</tr>
<tr>
<td>Cochrane Library (Wiley)</td>
<td>A collection on databases, including CENTRAL containing randomized clinical trials (RCT)</td>
<td>MeSH</td>
</tr>
<tr>
<td>PsycInfo (Ovid)</td>
<td>Psychological database developed by APA (American Psychological Association)</td>
<td>Psyc. Index terms</td>
</tr>
<tr>
<td>Scopus (Elsevier)</td>
<td>Abstract and citation database with peer-reviewed literature within medical science and social science. Contains journals, books and conference proceedings. Especially suitable for qualitative studies</td>
<td>None</td>
</tr>
<tr>
<td>Web of Science</td>
<td>Scientific core journals within medicine. The most reliable in citation searching.</td>
<td>None</td>
</tr>
</tbody>
</table>

Other, see: [https://sdu-dk-en.libguides.com/databases](https://sdu-dk-en.libguides.com/databases)
Subject terms and subject coding

**Subject codes** e.g. MeSH (Medical Subject Headings) in PubMed (Medline) and Cochrane Library. EmTree in Embase and Cinahl subject headings in Cinahl.

A subject code is connected to the articles to describe containment, which might not be in title-abstract-keywords.

The number of subject codes for each article varies between the databases:

PubMed (Medline): 10 – 30; Embase: often more than PubMed. Medline 26,000 MeSH terms and Embase 75,000 EmTree terms.

When looking up subject codes, you might find more search terms or synonyms you can include in your search.
In the MeSH database (e.g. in PubMed) it is relevant to look at the "Entry terms", you might find some synonyms. This is a look-up on Naproxen.

**TIP! Quick searching (find more words)**
1. Click on ‘Add to search builder’ and ‘Search PubMed’
2. Look at the first 20-30 articles for synonyms
In EmTree (Embase) it is relevant to look at "Used for", you might find some synonyms. This a look-up on **Naproxen**

<table>
<thead>
<tr>
<th>Naproxen</th>
<th>23118</th>
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<tbody>
<tr>
<td>[Used For]</td>
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<tr>
<td>2-(6-methoxy-2-naphthyl)acetic acid</td>
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<tr>
<td>2-naphthaleneacetic acid &amp; 6-methoxy alpha methyl</td>
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<td>5-methoxy alpha methyl 2-naphthaleneacetic acid</td>
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<td>aceproxan</td>
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<td>aliproxen</td>
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<td>alpran</td>
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<td>alneprox</td>
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<td>enaprox ds</td>
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<td>enailexpan</td>
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<tr>
<td>iso-naproxen</td>
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<td>atiron</td>
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<td>batal</td>
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<td>biritrol/</td>
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<td>bonyl</td>
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<td>conplex</td>
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<td>crysital/</td>
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<td>caffeax</td>
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<td>dejiprox</td>
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<td>deporal esfero</td>
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<td>delfanalax</td>
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Remember: **subject terms** guarantees a specific search, but does not necessarily give you all the relevant literature.

A systematic search should contain both **subject terms AND free text terms** (free text refers to title, abstract, author keywords etc.)

PubMed ”translates” (if possible) automatically all search terms you type, into **subject codes/terms** from **MeSH**. Neither of the other relevant databases does that (e.g. Embase, Cinahl, PsycInfo).

In the other databases, you must look up every search terms in the **subject coding register**. Afterwards you can combine with the **free text terms**.
Evaluating search results

Remember, the goal is not a specific number, but an excellent literature search!

* High recall = finding “everything”
* High precision = the core literature

Is the search result very large: use more blocks, search more specific, use limits/inclusion or exclusion criteria.

Is the search result modest: include more search terms, search for special/professional terms, use fewer blocks, remove limits.

Go a step back in your search process and use more or better search terms. Read abstracts and keywords in relevant reviews.

And remember, you are searching for studies – one study might be published in more reviews.

Save your searches

**Search history**
Save your search history in e.g. Word
Save your search string:
• In My NCBI in PubMed
• Login and save functionalities in all databases
• Alerts - updates you on new reviews on your subject.

**References**
Save references in a reference management tool:
EndNote, Zotero or other – Build up a library on your subject.
Tips and tricks for literature searches

PubMed and other databases:
https://sdu-dk-en.libguides.com/databases

Reviews may be collected by the SDU Link or you can order these (if you do not have access).

Guidelines for some health science databases (PubMed, Embase, Cinahl, PsycInfo, Cochrane Library), and guidelines on advanced search techniques:
https://sdu-dk-en.libguides.com/HealthSciences/guides

The reference management tool EndNote can be installed from Blackboard/E-learn (SDU students) or Software Centre (SDU employees). OUH employees may use Kiwi.
Tips on PubMed

Example: What is the effect on treatment for pain with Naproxen among patients with rheumatoid arthritis?

PubMed

• Check the search details to see if PubMed has “translated” search terms into MeSH terms.

• Choice of filters (left side of the screen)
  • Use only “publication date” and / or “languages” (you will find this in “show additional filters”)
  • Using other filters, search will only be performed in Medline (a part of PubMed) and latest articles will be lost!

More Search filters:
https://sdu-dk-en.libguides.com/HealthSciences/literaturesearching
Example in PubMed

New version of PubMed
In **advanced** you can combine your search strings ("Actions") and the search history is visible here (it is automatically saved for 8 hours).
Limiting a search

Limit on publication type e.g. randomized controlled trials:

3 possibilities:
1. Filters in PubMed
2. Include a block in the search string
3. Include a complex and methodological search filter (recommended)
Filters in PubMed.

All filters (besides Publication date and Language) demands that articles are coded with MeSH terms (and it may take some time, if it ever happens). You will not find all this way.
Search for **randomized controlled trial** as an extra "block" in your search.

This will give you more hits. PubMed searches on both randomized controlled trials as a **MeSH** term and as **free text words**!
Use a methodological search filter as an extra "block".
Search filters can be found in:
https://sdu-dk-en.libguides.com/HealthSciences/literaturesearching

These filters are search strings mainly capturing study types. Copy/paste the filter and add it to your search in PubMed with AND. This gives you the most accurate result.
Pharmacological Characterisation of CR6086, a Potent Prostaglandin E_2 Receptor 4 Antagonist, as a New Potential Disease-Modifying Anti-Rheumatic Drug

Gianfranco Caselli, Albino Bonazzi, Lucio Claudio Rovati

Abstract

Background: Prostaglandin E_2 (PGE_2) acts via its EP4 receptor as a cytokine amplifier (e.g., interleukin [IL]-6) and induces the differentiation and expansion of inflammatory T-helper (Th) lymphocytes. These mechanisms play a key role in the onset and progression of rheumatoid arthritis (RA). We present the pharmacological characterisation of CR6086, a novel EP4 receptor antagonist, and provide evidence for its potential as a disease-modifying anti-rheumatic drug (DMARD).

Methods: CR6086 affinity and pharmacodynamics were studied in EP4-expressing HEK293 cells by radioligand binding and cyclic adenosine monophosphate (cAMP) production, respectively. In immune cells, IL-6 and vascular endothelial growth factor (VEGF) expression were analysed by RT-PCR, and IL-23 and IL-17 release were measured by enzyme-linked immunosorbent assay (ELISA). In collagen-induced arthritis (CIA) models, rats or mice were immunised with bovine collagen type II. Drugs were administered orally (etanercept and methotrexate intraperitoneally) starting at disease onset. Arthritis progression was evaluated by oedema, clinical score and histopathology. Anti-collagen II immunoglobulin G antibodies were measured by ELISA.

Results: CR6086 showed selectivity and high affinity for the human EP4 receptor (K_i = 16.6 nM) and functioned as a pure antagonist (half-maximal inhibitory concentration, 22 nM) on PGE_2-stimulated interleukins in HEK293 cells. In CIA, CR6086 reduced clinical score and histopathology, and suppressed collagen II-specific antibodies.

You may collect material on ULSD (SDUB) locations or OUH-Library
Reporting a search string

Make a report on your search string, with so many details, that other can reproduce it in the database. Remember: Date for the search!

When reporting from PubMed: use the search string, from Advanced and Details. In this way you can see how PubMed processed/translated your search:

Add this as an appendix or The method section.
Tips on Embase

What is the effect on treatment for pain with Naproxen among patients with rheumatoid arthritis?

Embase-searching:
Embase differs from PubMed, in that way that you must search on one search term at a time in EMTree (e.g. on rheumatoid arthritis), and you must make some choices:

- Do you want to include all “subheadings” e.g.“diagnosis”, “Drug Therapy”, “Surgery” etc.
- If the search term is an EM Tree term, do you want to include the keyword as well (this is recommended).
What is the effect on treatment for pain with Naproxen among patients with rheumatoid arthritis?

**EMTree-search:**
An exhaustive **literature search** in Embase should include both **subject terms (EmTree)** and **free text words**.

<table>
<thead>
<tr>
<th>Search History (11)</th>
</tr>
</thead>
<tbody>
<tr>
<td># Searches</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3 1 or 2</td>
</tr>
<tr>
<td>4 exp naproen or Naproxen mp</td>
</tr>
<tr>
<td>5 Naprosyn.mp.</td>
</tr>
<tr>
<td>6 Anaprox.mp.</td>
</tr>
<tr>
<td>7 4 or 5 or 6</td>
</tr>
<tr>
<td>8 exp pain or pain.mp</td>
</tr>
<tr>
<td>9 ache.mp.</td>
</tr>
<tr>
<td>10 8 or 9</td>
</tr>
<tr>
<td>11 3 and 7 and 10</td>
</tr>
</tbody>
</table>


