IFIS food and health information

Best Practice Guide to Literature Searching for the Sciences of Food and Health

2021 EDITION

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INTRODUCTION TO LITERATURE SEARCHING AND LITERATURE REVIEWS

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PRACTICAL GUIDE TO LITERATURE SEARCHING

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ABOUT THIS GUIDE

An effective literature review is always built on the foundation of a high-quality literature search, one that is comprehensive and systematic. For any new project, a literature search is a crucial early step in the research process. Finding some literature on a question is usually easy; finding the right literature, and all of the most relevant literature for a solid literature review, is harder.

Through explanatory notes and practical, step-by-step guidance, we aim to help you understand how to effectively plan and carry out your literature searches.

> "Your guide is simply superb"
>
> *College Liaison Librarian, University College Dublin*

Carol Hollier, Author

This guide was written by Carol Hollier, IFIS' in-house Senior Information Literacy and Outreach Manager, with contributions by Dr. Helena Korjonen and Dr Mina Kalantar, Food Research & Regulatory Consultant.

It was reviewed by the **FSTA advisory board** comprising eminent researchers worldwide in the sciences of food and health.

WHO IS THE GUIDE FOR?

Anyone undertaking research or supporting others in their research activities:

- Students, those new to research, and those who need a refresher in literature searching.
- Researchers who wish to use a template when planning their literature searching.
- Librarians who support faculty and students in literature searching.
- Trainers who teach information literacy.

FEEDBACK FROM THE COMMUNITY

"Your Guide is simply superb. Many thanks for a great resource which I will be promoting with advanced stage degree students in food science agriculture and veterinary medicine here in UCD.

It is the best guide I have come across in some time so many thanks for this "Toolkit". This will be invaluable for UCD - Students, those new to research, and those who need a refresher in literature searching."

Carmel Norris, College Liaison Librarian, School of Agriculture & Food Science, University College Dublin

"It will be really useful for students who need to do literature research."

Professor Vural Gökmen, Food Engineering Department, Hacettepe University, Turkey

TELL US WHAT YOU THINK

We plan to update this guide regularly as resources and techniques evolve.

Please feel free to tell us what you think or to suggest additional material.

Get in touch with Carol Hollier, Senior Information Literacy and Outreach Manager, at **c.hollier@ifis.org**.

WHAT IS LITERATURE SEARCHING? 1

Literature searching is the task of finding relevant information on a topic from the available research literature. Literature searches range from short fact-finding missions to comprehensive and lengthy funded systematic reviews. Or, you may want to establish through a literature review that no one has already done the research you are conducting. If so, a comprehensive search is essential to be sure that this is true.

Whatever the scale, the aim of literature searches is to gain knowledge and aid decision-making. They are embedded in the scientific discovery process. Literature searching is a vital component of what is called "evidence-based practice," where decisions are based on the best available evidence.

WHAT IS "LITERATURE"?

Research literature writes up research that has been done in order to share it with others around the world. Far more people can read a research article than could ever visit a particular lab, so the article is the vehicle for disseminating the research. A research article describes in detail the research that's been done, and what the researchers think can be concluded from it.

It is important, in literature searching, that you search for **research literature**. Scientific information is published in different formats for different purposes: in **textbooks** to teach students; in **opinion** pieces, sometimes called **editorials** or **commentaries**, to persuade peers; in **review articles** to survey the state of knowledge. An abundance of other literature is available online, but not actually published (by an academic publisher)--this includes things like **conference proceedings**, **working papers, reports** and **preprints**. This type of material is called **grey (or gray) literature**.

Most of the time, what you are looking for for your literature review is research literature (and not opinion pieces, grey literature, or textbook material) that has been published in scholarly peer reviewed journals.

As expertise builds, using a greater diversity of literature becomes more appropriate. For instance, advanced students might use conference proceedings in a literature review to map the direction of new and forthcoming research. The most advanced literature reviews, systematic reviews, need to try to track down unpublished studies to be comprehensive, and a great challenge can be locating not only relevant grey literature, but studies that have been conducted but not published anywhere. If in doubt, always check with a teacher or supervisor about what type of literature you should be including in your search.

WHY UNDERTAKE LITERATURE SEARCHES?

By undertaking regular literature searches in your area of expertise, or undertaking complex literature reviews, you are:

- Able to provide context for and justify your research
- Exploring new research methods
- Highlighting gaps in existing research
- Checking if research has been done before
- Showing how your research fits with existing evidence
- Identifying flaws and bias in existing research
- Learning about terminology and different concepts related to your field
- Able to track larger trends
- Understanding what the majority of researchers have found on certain questions.

WHAT ARE LITERATURE REVIEWS? 2

A literature review is a critical assessment of the literature relating to a particular topic or subject. It aims to be systematic, comprehensive, and reproducible. The goal is to identify, evaluate and synthesise the existing body of evidence that has been produced by other researchers with as little bias as possible.

STANDALONE REVIEWS

Literature reviews take different forms. Some literature reviews are standalone projects. If you search the literature in food science and nutrition, you'll find examples of:

- **Mapping and scoping reviews**, which review existing literature in order to identify opportunities for further research.
- Reviews distilling the latest information to present the state-of-the-art understanding on a question or the latest updates on a methodology.
- **Systematic reviews**, which are a unique form of literature review: they are research studies of research studies, and their searches need to find all the research that's been done on their question whether it's been published or not. Conducted following a precise protocol, some systematic reviews include meta-analysis which extracts the data from all the quality research found and compiles it into a comprehensive data set in order to assess the current state of evidence on a question. Big projects, they generally take between 12 to 24 months to conduct.
- **Rapid reviews** are quicker versions of systematic reviews, with some of the steps simplified or omitted.

Review types include many variations and nuances, as well as overlap. For instance, a rapid review might conclude that more and better research is required on a question, and hence intersect with the purpose of a scoping review. This is just a small sampling of the variations of standalone review types out there—a recent study identified forty-eight distinct types of reviews within health disciplines alone![1]

INTEGRATED REVIEWS

Most literature reviews are not self-contained projects. A literature review is a key component of any advanced research project.

Primary research articles begin with a literature review in their introduction which surveys the existing research, and indicates the significance of the article's research, and places it in context. Researchers then may pull elements of the literature into the discussion section of the article, showing how their research compares to existing research, possibly expanding on it, or contradicting its conclusions, thus highlighting the significance of what their research has found.

PhD dissertations have extensive literature reviews, sometimes comprising a chapter or even two of the written project. In other theses or dissertations, a researcher might integrate their literature review into each section rather than writing it up into a distinct chapter. However it is incorporated, the literature search and review is a crucial component of the project.

1 Sutton, A. et al. (2019) 'Meeting the review family: exploring review types and associated information retrieval requirements', Health Information and Libraries Journal, 36(3), pp. 202–222. doi: 10.1111/hir.12276.

WHAT IS CRITICAL APPRAISAL? 3

We critically appraise information constantly, formally or informally, to determine if something is going to be valuable for our purpose and whether we trust the content it provides.

In the context of a literature search, critical appraisal is the process of systematically evaluating and assessing the research you have found in order to determine its quality and validity. It is essential to evidence-based practice.

More formally, critical appraisal is a systematic evaluation of research papers in order to answer the following questions:

- Does this study address a clearly focused question?
- Did the study use valid methods to address this question?
- Are there factors, based on the study type, that might have confounded its results?
- Are the valid results of this study important?
- What are the confines of what can be concluded from the study?
- Are these valid, important, though possibly limited, results applicable to my own research?

WHAT IS QUALITY AND HOW DO YOU ASSESS IT?

In research we commissioned in 2018, researchers told us that they define 'high quality evidence' by factors such as:

- Publication in a journal they consider reputable or with a high Impact Factor.
- The peer review process, coordinated by publishers and carried out by other researchers.
- Research institutions and authors who undertake quality research, and with whom they are familiar.

In other words, researchers use their own experience and expertise to assess quality. However, students and early career researchers are unlikely to have built up that level of experience, and no matter how experienced a researcher is, there are times when they will need to take a very close look at the validity of research articles.

There are checklists available to help with critical appraisal. The checklists outline key questions to ask for assessing specific types of studies. It can also be beneficial to discuss issues such as quality and reputation with:

- Your peers
- Teachers
- Your principal investigator (PI)
- Your supervisor or other senior colleagues
- Librarians
- Journal clubs. These are sometimes held by faculty or within organisations to encourage researchers to work together to discover and critically appraise information.
- Topic-specific working groups

The more you practice critical appraisal, the quicker and more confident you will become at assessing an article's quality.

EVIDENCE HIERARCHIES

Levels of hierarchies can be useful for assessing the quality of evidence. In health sciences, these are portrayed as a pyramid with levels for the different types of study design.

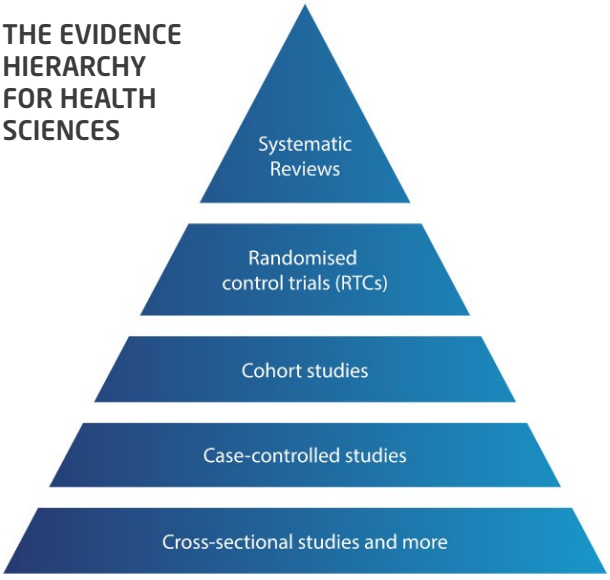
Understanding study designs will help you judge the limitations of what can be concluded from a particular study.

While in health-related research this hierarchy of study types can be used as a guideline, you cannot rely on the hierarchy to substitute for critical appraisal. A strong cohort study would be more useful than a flawed systematic review. There are times when evidence is better sorted by its usefulness for your own research question than by type of study design.

In food research, there is no consensus around the hierarchy of evidence.[2] Best practice is to decide, when you plan your search, on the type of research you are looking for and what study designs would be appropriate for it.

For example, if you are interested in qualitative studies of people's behaviour towards nutrition, or in animal studies, you are unlikely to find large RCTs as it **isn't** ethical or possible to run randomised studies in certain areas, so they may not exist. You are more likely to find qualitative studies that may include survey and interview data, write-ups from focus groups, or other types of studies that exist involving crops or animals (often observational or non-randomised studies). Similarly, you might decide that challenge studies are the most appropriate way to research packaging and shelf life.

THE EVIDENCE HIERARCHY FOR HEALTH SCIENCES



A **systematic review** is a study of studies, where researchers follow a predetermined and published protocol to find all the primary research studies done on a question, weigh the reliability of each one, and, if possible, extract the data from the studies in order to draw a conclusion from the combined evidence.

Randomised control trials (RCTs) randomly allocate participants to either an intervention or a control group, so that conclusions can be drawn about the efficacy of an intervention.

Cohort studies are observational, longitudinal studies that look at a group of people with a shared experience or characteristic to see how they fare over time in regards to a particular factor.

Case-controlled studies are observational studies in which a group of cases (i.e. people with a condition or disease) is compared to an analogous group (similar to the case group except that they don't have the condition) to see if a causal attribute can be found for the case group.

Cross-sectional studies are observational studies that describe a population at a certain point in time. These studies can locate correlations but not causal relationships.

2 Reported in Research Synthesis Methods and EFSA Journal.

PART 2
PRACTICAL GUIDE TO LITERATURE SEARCHING

SEARCH PROCESS OVERVIEW 1

Good searching takes place in three broad stages: planning, searching, and follow up.

In the planning stage, you line up tools to optimize organization and think about where you can and should search. You also begin to define your search question and translate it into a search strategy.

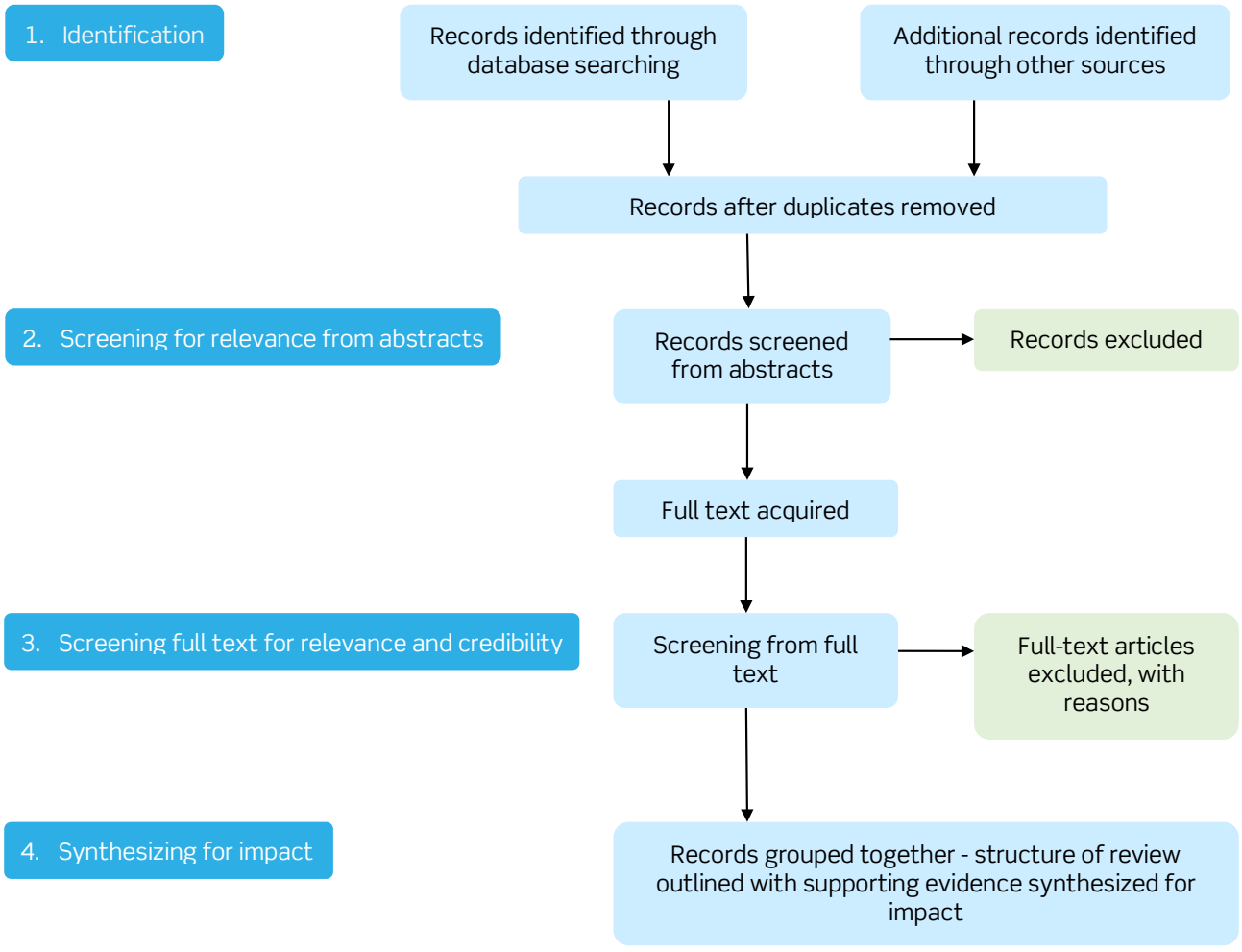
This merges into the search stage, where you will try out your search strategy in different databases and refine, refine, refine! You will collect records along the way, but you don't need to get the full text of these articles until you start the follow-up stage where you screen the records, first cursorily, then carefully.

Following this procedure for your searching helps ensure that you are capturing the research most relevant to your question.

STEPS FOR A LITERATURE REVIEW

In the diagram below you can see the four concrete steps you'll go through for a literature review.

- First you find, or identify, records, using a good search strategy in one or more databases, library discovery services, and search engines. At the identification stage you capture everything that looks like it has any potential to be useful.
- Next you screen those records, and weed out the ones that, on closer look, are not actually relevant. You only need to get the full text only for those that still look relevant.
- The next stage is a close screening of the full text, using critical appraisal techniques to ascertain to what extent the research is useful for your review.
- Finally, you will use the critical appraisal work you've done to group and synthesize the literature.



MANAGING REFERENCES 2

It may seem counterintuitive to start thinking about reference management at the very start of your search process but having good tools in place before you start searching will streamline the process from start to finish.

BENEFITS OF CITATION MANAGERS

Using a citation manager will help you run comprehensive and systematic searches. You will almost always run searches in more than one database and/or search engine, and when you do so you will pick up duplicate copies of references. This could seem burdensome and time-wasting if you had to sort your references manually, and you might be tempted to be less comprehensive in your searching. Fortunately, a citation manager makes identifying and removing duplicate records easy.

Some citation managers also can quickly link to the full text of an article if your library subscribes to it. Furthermore, almost of all of them are able to read the metadata, or descriptive information, embedded in a PDF to automatically create a reference from an article that you have imported into the software.

CITATION MANAGERS AND WRITING

Citation managers also ease the writing process, as they will connect with Microsoft Word, and sometimes other word processing options like Google Docs or LibreOffice, to let you automatically pull a citation, formatted in whatever referencing style you choose, into the proper place in the text, and add it, correctly formatted, into the reference list.

SHARING PDFS

Most programmes also allow you to share some or all of your references and PDFs with someone else, or a group, working with the same citation manager. This can facilitate group research. It can also make it easy to share references with a supervisor or colleague.

Remember that it is easy to move all your references from one reference management software programme to another if you decide you would like to switch.

COMPARING SOFTWARE

Many programmes are available, but arguably the four used most by researchers are EndNote, Mendeley, Sciwheel (formally F1000workspace), and Zotero. Each programme has different advantages. Your choice about which is best for you might be influenced by the need to work offline, by what colleagues you need to collaborate with are using, or what you have available at a discount or for free from your institution.

	EndNote Desktop	Mendeley	Sciwheel	Zotero[3]
Cost	Subscription (possibly free through your institution)	Basic account free	Subscription but free trial (possibly free through your institution)	Free with option to purchase additional storage
Offline use	online or offline	online or offline	online	online or offline
Annotation of PDFs?	yes	yes	yes	no
Word processor	Microsoft Word	Microsoft Word, LibreOffice	Microsoft Word, LibreOffice	Microsoft Word, LibreOffice
Deduplication	yes	yes	yes	yes

Each of these programmes have browser plugins that make it easy to collect references, and as you do searches within databases you can export selected references into them[3].

BEST PRACTICE RECOMMENDATION

Be sure to choose a citation manager to use at the beginning of your literature searching, and always save all relevant references you find in your searches. Learn how the programme works right away, so you can take full advantage of its functionality.

3 This chart has been adapted from the Compare EndNote, Sciwheel, Mendeley, Zotero: At a Glance guide from the University of North Carolina Health Sciences Library: https://guides.lib.unc.edu/compare-citation

DEFINING YOUR RESEARCH QUESTION 3

To run a successful literature search, you need to frame your question in a way that brings back relevant results. You need to identify the main components of your research question and think about how they intersect.

You might break your research question into separate parts to see what relevant research has been done on each for your literature review, so you might need to run multiple searches. **Or,** you might be looking for all the research on a specific question, so you might run a single search (in more than one place) for your review.

Thinking about how specific to make your question(s) is important—if you frame your question as a very broad query, you can be overwhelmed by results. On the other hand, if you frame your question too narrowly, you risk missing important information.

HOW TO FRAME A QUESTION

Using a **conceptual structure** to frame your question helps you focus your search. In health fields, searchers often use the PICO framework. PICO stands for **Patient, Intervention, Comparator and Outcome**. Food science researchers can use a modified version of PICO to frame their search question. Variations like PECO, PO, PIT, or PES (see chart below) can also be appropriate. These structures help you identify what elements are key for your question.

POSSIBLE ELEMENTS IN YOUR RESEARCH QUESTION	
P - subject	product, population, animal, cells, food group, plant, chemical, environmental factor
I - intervention	what is being tested - a process, a method, something else?
S - setting	place, country, building, i.e. meat processing plant
O - outcome/result	what is the result? i.e. safety, quality, sustainability, etc.
C - comparator	are you comparing with something else?
C - characteristic/property	rheological, functional, chemical, sensory
T - Timing	for tests this may be useful
E - Exposure	for example, to a disease or pathogen

A good search question often contains three elements, but sometimes two is better, and sometimes four. Identify the elements of your search question, and then, when you are structuring your search, experiment with how many terms to actually use in your search string. For instance, research is often interested in an outcome, but you might leave that element out of the actual search.

DO NOT include all the possible elements in your research question—doing that would make your question too specific and make it extremely unlikely you will find relevant literature.

EXAMPLE QUESTIONS

AGRICULTURE QUESTION

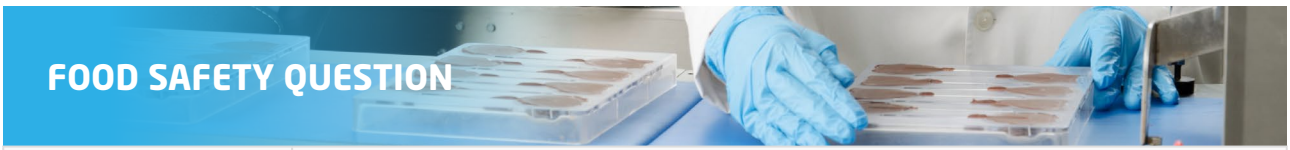
Research question	**What impact does ethylene production during ripening have on apple quality changes during storage?**	
P - subject	product, population, animal, cells, food group, plant, chemical, environmental factor	apples
I - intervention	what is being tested - a process, a method, something else?	ethelyne/ripening
S - setting	place, country, building, i.e. meat processing plant	storage
O - outcome/result	what is the result? i.e. safety, quality, sustainability, etc.	quality

MICROBIOLOGY QUESTION

Research question	**Can bacteriophages be used to prevent formation of Vibrio parahaemolyticus biofilms?**	
P - subject	product, population, animal, cells, food group, plant, chemical, environmental factor	Vibrio parahaemolyticus biofilms
I - intervention	what is being tested - a process, a method, something else?	bacteriophages
S - setting	place, country, building, i.e. meat processing plant	
O - outcome/result	what is the result? i.e. safety, quality, sustainability, etc.	prevention

NUTRITION QUESTION

Research question	**Does maternal diet impact risk of preterm birth?**	
P - subject	product, population, animal, cells, food group, plant, chemical, environmental factor	pregnant women
I - intervention	what is being tested - a process, a method, something else?	diet
S - setting	place, country, building, i.e. meat processing plant	
O - outcome/result	what is the result? i.e. safety, quality, sustainability, etc.	preterm birth



FOOD SAFETY QUESTION

Research question	What are appropriate methods for determining the allergenicity of novel foods?	
P – subject	product, population, animal, cells, food group, plant, chemical, environmental factor	novel foods
I – intervention	what is being tested - a process, a method, something else?	testing methods
S – setting	place, country, building, i.e. meat processing plant	
O - outcome/result	what is the result? i.e. safety, quality, sustainability, etc.	
C – comparator	are you comparing with something else?	
C - characteristic/ property	rheological, functional, chemical, sensory	allergenicity

DOWNLOAD THE FRAMING QUESTION TEMPLATE

EXCLUSIONS AND INCLUSIONS

When framing your research question, it is also good to think about your inclusion and exclusion criteria. Remember, however, that limits may introduce bias.

Examples you may want to cover include:

- Geographic area
- Population group(s)
- Types of studies
- Language - If you only read English, remember that many databases translate titles and abstracts into English. This should give you enough information to judge if a study is relevant enough to have it translated in full into English.

Notice that limiting by date is not included on this list. As a rule, your literature review should not just cover the latest developments. Sometimes critical research has been done decades ago and not repeated because researchers were aware of it. If you are new to a subject area, don't make the mistake of overlooking seminal research.

BEST PRACTICE RECOMMENDATION

If you are looking at a recent development in research, you should also look back at the foundational, historical research that is key to understanding current research.

WHERE TO SEARCH 4

To conduct a successful literature review, you need to conduct a comprehensive search so that you feel confident that you've found all the relevant literature on the topic you are investigating. You can put together an excellent search, but if you are not looking in the right places, you will not find the literature you need.

It is helpful to think about the tools you use in terms of whether they are better for **accessing SOME** research or if they are better for **discovering ALL** the research you need. Using search tools correctly will make all the difference in whether your search is actually comprehensive and systematic or not.

Access means getting the full text of research. **Discovery** means finding out about the existence of research. It is a very common mistake to use tools that are better for access for the task of discovery. Doing this means that you are doing your searching backwards!

The first step of your search must be discovery, and only after you know what is out there do you need to start acquiring the full text of the articles you need. Making this common mistake of reversing the order wastes time and negatively affects the quality of your literature review because you will be much less likely to find all the research you should be finding about your question.

Below you will see advantages and disadvantages of various discovery and access tools available to researchers.

DATABASES

The best tools for conducting your literature searches comprehensively and systematically are databases. Databases abstract and index the content of academic journals from multiple publishers, and often other publication types such as trade journals, reports, conference papers and patents. They are designed to make all the material they include easily searchable. Sometimes records in databases link directly to the full text of an article and sometimes not, but they are designed for discovery—i.e. finding out that a piece of research exists and giving you the bibliographic details you need to find that piece of research. They are key tools for conducting comprehensive searches on any research topic.

THE DIFFERENCE BETWEEN SUBJECT-SPECIFIC DATABASES AND GENERAL DATABASES

Databases are organised around subject content which can be as broadly defined as science, or more focused (e.g. chemistry), or even more focussed (e.g. sports and sports medicine or the sciences of food and health). The scope of each database tells you what content you can expect to find with it. Scope information can usually be found on library subject pages and on the database's website.

A database's scope also shapes how you find information within it. Because of their breadth of coverage, general science databases are more likely to bring back what are called false hits, where the term you search is not used in the sense you need. For instance, if you search the word spirits in the medical database PubMed or the broad science databases Web of Science or Scopus, you will get results about alcoholic beverages mixed in with results about the supernatural and moods.

False hits: examples of results returned searching spirits in PubMed:

Hearing **spirits**? Religiosity in individuals at risk for psychosis-Results from the Brazilian SSAPP cohort.

Playing Music for Hospitalized Patients Enhances Mood and Reduces Perceptions of Pain.

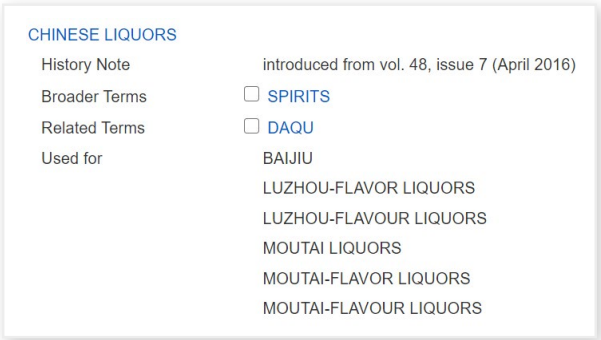
A database focused on food science not only doesn't bring back supernatural false hits, it returns many more relevant ones about distilled alcoholic beverages because of how each record has been tagged with the subject specific term spirits, even when that **exact** term does not appear in an article's title or abstract.

WHAT IS INDEXING AND WHY IS IT HELPFUL IN SEARCHING?

Databases also use a thesaurus, or controlled vocabulary, for indexing content, where all the different terms referring to a topic are pulled together under a single heading. This helps users to navigate the variations in language and terms used by researchers.

For example, in FSTA, if you search the thesaurus term **aroma** it pulls together all the results where authors used the word aroma to describe an important element of the research, but also will include articles where authors used the words **odor**, **odour** or **smell**.

Similarly, research about **Baijiu, Luzhou-flavor liquors, Luzhou-flavour liquors, Moutai liquors**, and **Moutai-flavor liquors** are all gathered under the thesaurus subject heading **Chinese liquors**.



In PubMed, searching the MeSH heading **Diet**, **Reducing** would also find results about **Weight Loss Diet** and **Weight Reduction Diet**.

Some databases rely on machine learning to do the indexing, while others like FSTA have editorial teams of experts who do the work more accurately. Studies have shown that databases that rely on machine indexing, like PubMed and Scopus, include a certain amount of predatory content.[4]

Assessing the quality of publications, including identifying and excluding predatory journals, is part of the role of an editorial team. Using a database which is managed by experts will give you assurance that all the results your find within it have been published in legitimate journals.

4 Severin, A., Low, N. Readers beware! Predatory journals are infiltrating citation databases. Int J Public Health 64, 1123-1124 (2019). https://doi.org/10.1007/s00038-019-01284-3.

SEARCH ENGINES

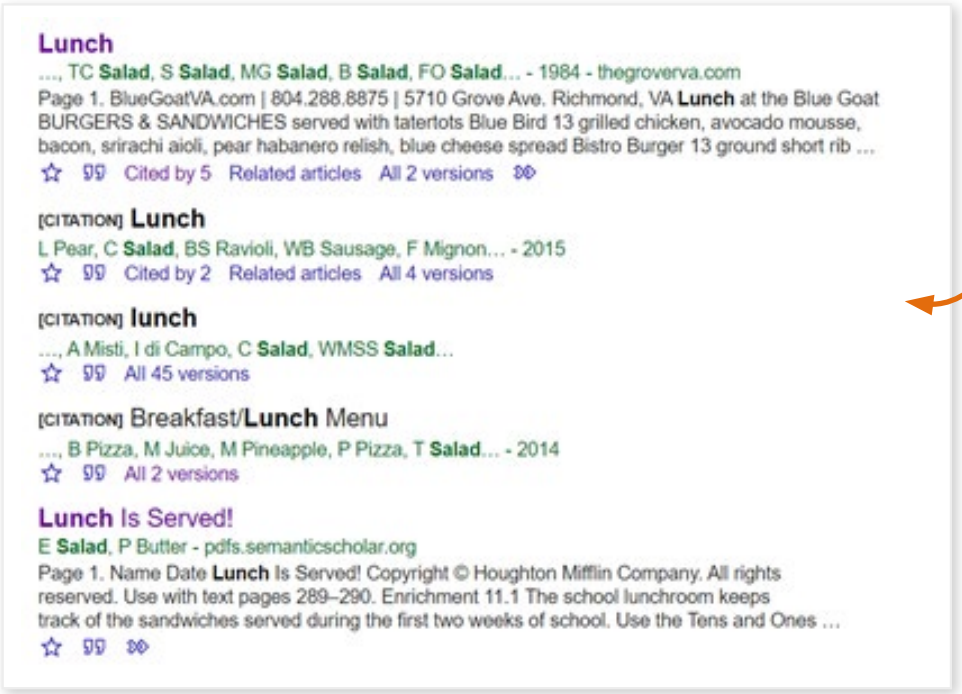
Search engines like **Google** allow you to find all sorts of information on the internet, but they are not designed specifically for finding scholarly information, so are terrible for literature searches.

However, they are good for finding **governmental information** like U.S. Department of Agriculture research funding instructions, scientific reports from the UK Food Standards Agency or the European Food Safety Authority, or guidelines from organizations like the World Health Organization. Academic search engines and most databases do not include this type of document. The database FSTA is an exception, since it indexes standards and some reports and legislation (but not funding instructions).

ACADEMIC SEARCH ENGINES

Unlike general search engines, academic search engines like **Google Scholar** and **Microsoft Academic** do focus on scholarly information, but they:

- DO NOT exercise editorial standards about the content's quality, which results in the inclusion of predatory journal articles**,** and also distracting, sometimes silly, completely irrelevant citations.



Google Scholar parsed a cafeteria lunch menu as an author list in 2020

- DO NOT allow precise control over searches, even with advanced search options.
- DO NOT use indexing, which means you only find results written in the language in which you are searching.
- DO cover all disciplines, which means that your searches are likely to bring back lots of false hits.

As a result, you can be certain that along with some quality results, you are getting lots that are untrustworthy or substandard, which can negatively impact the quality of your literature review. Wading through them to weed out the bad and identify the high-quality research is time consuming!

Search engines can be useful for accessing the full text of articles and patents but using them for discovery is an inefficient - and potentially hazardous - way to research.

RESEARCHER PLATFORMS

Platforms like Academia.edu and ResearchGate allow researchers to create profiles to showcase their work and share their articles. Both can be useful for acquiring full-text articles; however, because researchers create and maintain their own profiles, searching these platforms will not give you a comprehensive overview of a field—you'll only find the work of researchers who have chosen to participate.

Don't confuse these platforms with discovery services, such as databases, which are specifically designed to be comprehensive in the subject area they cover in order to help researchers find relevant information.

PUBLISHER PLATFORMS

Some tools might seem to be full text databases but are actually publisher-specific platforms. ScienceDirect, the subscription platform hosting Elsevier's journal articles, is a notable example. ScienceDirect makes it very easy to access Elsevier content, but only about 20% of food science research is published in Elsevier journals. Using that platform or any other single publisher platform to search for content will severely limit your search.

LIBRARY DISCOVERY SERVICES

Library discovery services are designed for discovery *and* access. They are intended to make it easy for a user to search in one place to find everything in the library's collections—print and e-books, articles, and more. They make it easy to access the full text of everything a library owns or subscribe to, or link to inter-library loan forms to borrow material from other libraries. The disadvantages of using them for the discovery process are:

- They often give the impression that their search includes everything the library has in its collections, when for a variety of behind-the-scenes reasons, this is almost always not true.
- They are interdisciplinary by nature because the library's collections will span many subjects, which means that they lack subject specific features to help build targeted search.

See the table on the following page for a comparison of popular search tool features.

Additionally, this video shows how indexing works by comparing FSTA, the food and nutrition database, to the Google Scholar search engine.

BEST PRACTICE RECOMMENDATIONS:

Look at the library discovery page for a link to the subject specific databases. You can often see a list ordered by subjects or alphabetically or both.

Familiarise yourself with the databases you have access to, including subscription databases -get to know their scope (what content they index) and how to search them, including using thesaurus functions if available, so that you can use each to their full capacity.

Remember that research for a literature review is a two-step process—first is discovery of research, and the second is accessing the research you've determined you need.

Don't switch the order of the steps! If you limit your search to the research outputs that you think that you have easy access to, you will almost certainly end up with a biased review that is neither systematic nor comprehensive.

WHICH IS THE BEST SEARCH TOOL FOR FOOD AND NUTRITION RESEARCH?

www.ifis.org IFIS

Type	Subject specific databases				General databases		Additional tools		
Search tool	**FSTA**	**CAB Abstracts**	**PubMed**	**Medline**	**Web of Science Core Collection**	**Scopus**	**ScienceDirect**	**Library discovery services**	**Google Scholar**
Curated by experts in food-related sciences	✔	✘	✘	✘	✘	✘	n/a	✘	✘
Quality-checked by experts in food-related sciences	✔	✘	✘	✘	✘	✘	n/a	✘	✘
Subject-specific thesaurus used to index content for search accuracy	✔ Food-related (commodities and sciences)	✔ Life sciences	✔ Medical	✔ Medical	✘	✘	✘	✘	✘
Content coverage	Food-focused, interdisciplinary	Agriculture-focused, interdisciplinary	Medical-focused, interdisciplinary	Medical-focused, interdisciplinary	Multidisciplinary	Multidisciplinary	Multidisciplinary	Multidisciplinary	Multidisciplinary
Content type	Journals, books, conference proceedings, trade publications, patents, theses, reports, standards	Journals, books, conference proceedings, trade publications, reports	Journals, books	Journals	Journals, conference proceedings, books	Journals, books, conference proceedings, trade publications, patents	Journals, books	Library collections: excludes content accessible only by direct database search	Any content meeting the structural criteria for Google Scholar's automated "crawlers"
Type of service	Subject-specific database	Subject-specific database	Subject-specific database	Subject-specific database	General academic database	General academic database	Publisher-specific platform	Institution-specific discovery layer	Academic search engine
% of FSTA content **not** available in this resource*	n/a	 33%	 38%	 65%	 35%	 30%	 85%	*Institution dependent*	*Unknown*

Learn more about using the right tools to successfully conduct your literature search: **bit.ly/literature-search-tools**

**Analysis conducted by EBSCO (2020)*

SEARCH STRATEGY 5

Once you have determined what your research question is and where you think you should search, you need to translate your question into a useable search. Doing so will:

- Make it much more likely that you will find the relevant research and minimise false hits (irrelevant results).
- Save you time in the long run.
- Help you to stay objective throughout your searching and stick to your plan.
- Help you replicate and update your results (where needed).
- Help future researchers build on your research.

If you need to explore a topic first, your search strategy can initially be quite loose. You can then revisit search terms and update your search strategy accordingly. Record your search strategy as you develop it and capture the final version for each place that you search.

Remember that information retrieval in the area of food is complex because of the broadness of the field and the way in which content is indexed. For example:

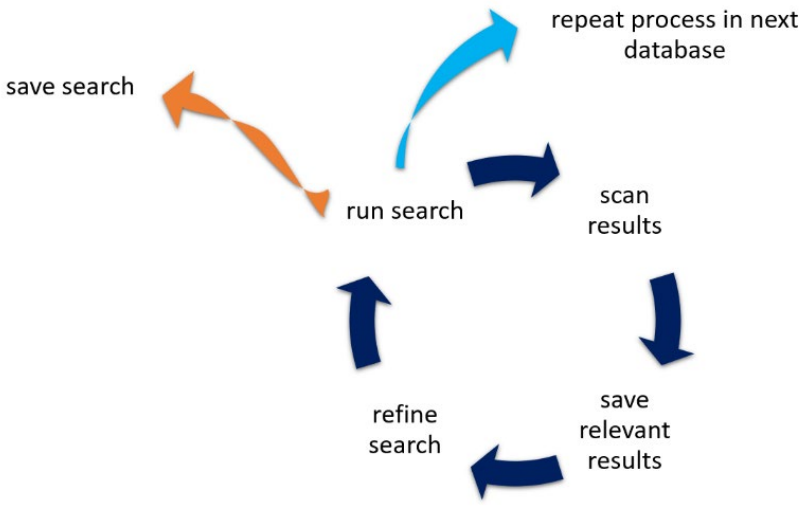
- Searching for **"**pig" in a general database will bring back content where an animal has been used in preclinical trials, from livestock research, the use of pork in food, etc.
- In a health-focused database, the search options and filters will have been developed for the human health field, which may not be helpful for searching food science topics not related to human health.

As a result, there is often a high level of "noise" when searching food topics in a database not designed for food content. **Creating successful search strategies involves knowledge of a database, its scope, indexing and structure.**

SHAPING A SEARCH STRING

A good search strategy will include:

- Key concepts and meaningful terms
- Keywords or subject headings
- Alternative keywords
- Care in linking concepts correctly
- Regular evaluation of search results, to ensure that your search is focused
- A detailed record of your final strategy. You will need to re-run your search at the end of the review process to catch any new literature published since you began.



SEARCH MATRIX

Using a search matrix helps you brainstorm and collect words to include in your search. To populate a search matrix:

- Identify the main concepts in your search
- Use two parallel strategies to populate the other boxes:

  Run initial searches with your terms, scanning abstract and subject terms (sometimes called descriptors, keywords, MeSH headings, or thesaurus terms, depending on which database you are using) of relevant results for words to add to the matrix.

  Explore a database thesaurus hierarchy for suitable broader and narrower terms.

Example question: How do safe thawing processes impact the sensory quality attributes of beef?

Concept	safe	thawing	sensory quality attributes	beef
Synonyms and related terms	food safety disinfection	thawing medium	sensory perception mechanical properties rheological properties sensory analysis	
Broader (more general) terms	decontamination contamination	thermal processing	quality	meat
Narrower (more specific) terms		defrosting	aroma appearance eating quality juiciness mouthfeel texture	beef extracts beef products cattle carcasses
Alternative spellings, phrases, truncation	"food safety"	thaw* defrost*	"sensory perception" "mechanical properties" "rheological properties" "sensory analysis"	

NOTE: You do not need to fill all the boxes in a search matrix.

DOWNLOAD THE SEARCH MATRIX TEMPLATE

You will find that you need to do some searches as you experiment in running it and this will help you refine your search strategy. For the search on this example question:

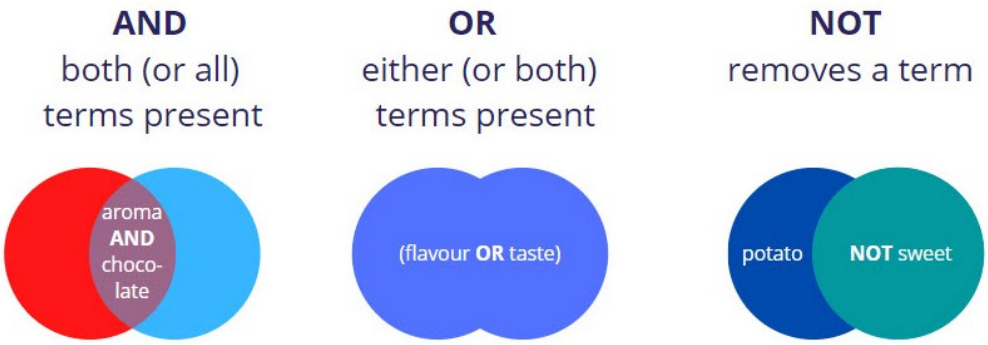
- Some of the broader terms turned out to be too broad, introducing a host of irrelevant results about pork and chicken.
- Some of the narrower terms were unnecessary, as any result containing "beef extract" is captured by just using the term beef.

This revised matrix shows both adjustments made to terms, and how the terms are connected with Boolean operators. Different forms of the same concept (the columns) are connected with OR, and each of the different concepts are connected with AND.

		AND	AND	AND
OR	**safe**	**thawing**	**sensory quality attributes**	**beef**
OR	food safety disinfection	thawing medium	sensory perception mechanical properties rheological properties sensory analysis	
OR	decontamination Contamination	~~Thermal processing~~	quality	~~meat~~
OR		defrosting	aroma appearance eating quality juiciness mouthfeel texture	beef ~~extracts~~ beef ~~products~~ cattle carcasses
OR	"food safety"	thaw* defrost*	"sensory perception" "mechanical properties" "rheological properties" "sensory analysis"	"cattle carcasses"

BOOLEAN OPERATORS

Boolean operators tell a database or search engine how the terms you type are related to each other.



Use OR to connect variations representing the same concept. In many search interfaces you will want to put your OR components inside parentheses like this: (safe OR "food safety" OR decontamination OR contamination OR disinfect*). These are now lumped together into a single food safety concept for your search.

Use AND to link different concepts. By typing (safe OR "food safety" OR decontamination OR contamination OR disinfect*) **AND** (beef OR "cattle carcasses")—you are directing the database to display results containing both concepts.

NOT eliminates all results containing a specific word. Use NOT with caution. The term excluded might be used in a way you have not anticipated, and you will not know because you will not see the missing results.

The search in the matrix above would look like this in a database:

("food safety" OR safety OR decontamination OR contamination OR disinfection) AND (thaw* OR defrost* OR "thawing medium") AND ("sensory quality attributes" OR "sensory perception" OR quality OR aroma OR appearance OR "eating quality" OR juiciness OR mouthfeel OR texture OR "mechanical properties" OR "sensory analysis" OR "rheological properties") AND (beef OR "cattle carcasses")

> Learn more about using Boolean operators:
> **Research Basics: Using Boolean Operators to Build a Search (ifis.org)**

PHRASES AND PROXIMITY SEARCHING

Thesaurus terms will help you capture variations in words and spellings that researchers might use to refer to the same concept, but you can and should also use other mechanisms utilised by databases to do the same. This is especially important for searches in databases where the thesaurus is not specialised for food science.

PHRASE SEARCHING

Phrase searching, putting two or more words inside quotation marks like "food safety" or "shelf life" will ensure that those words appear in a single field (i.e. title or abstract or subject heading) together as the phrase. Phrase searching can eliminate false hits where the words used separately do not represent the needed concept.

PROXIMITY SEARCHING

Some databases allow you to use **proximity searching** to specify that words need to be near each other. For instance, if you type **ripening N5 cheese** you will get results with a maximum of five words between **ripening** and **cheese**. You would get results containing **cheese ripening** as well as results containing **ripening of semi-hard goat cheese**.

> Learn how to test if a phrase search or a proximity search is the better choice for your search:
> **Proximity searching, phrase searching and Boolean AND: Focus your literature search (ifis.org)**

TRUNCATION AND WILDCARDS

Thesaurus terms will help you capture variations in words and spellings that researchers might use to refer to the same concept, but you can and should also use other mechanisms utilised by databases to do the same. This is especially important for searches in databases where the thesaurus is not specialised for food science.

TRUNCATION

Truncating a word mean typing the start of a word, followed by a symbol, usually an asterisk (*). This symbol tells the database to return the letters you have typed followed either by no letters (if appropriate) or letters. It is an easy way to capture a concept that might be expressed with a variety of endings.

Sometimes you need to adjust where you truncate to avoid irrelevant results.

See the difference between results for nutri* or nutrit*

nutri*	nutrit*
nutria	nutrition
nutritious	nutritious
nutrition	nutritional
nutritional	nutritionally
nutritionally	nutritionists
nutricereals	nutritive
nutrikinetics	
nutritionists	
nutrative	
nutrient	
nutrients	
nutrigenetics	
nutrigenomic	
nutrigenomics	
and more.	

WILDCARDS

Inserting **wildcard symbols** into words covers spelling variations. In some databases, typing **organi?ation** would return results with **organisation** or **organization**, and **flavo#r** would bring back results with **flavor** or **flavour**.

You can combine these tools, too. **"Brewer* yeast"** will bring back results for **"brewer yeast"**, **"brewer's yeast"** and **"brewers yeast"**, three variations which are all used in the literature.

BEST PRACTICE RECOMMENDATION

Always check the database help section to be sure that you are using the correct truncation and wildcard symbols for that database.

HANDSEARCHING

It is good practice to supplement your database searches with **handsearching**. This is the process of manually looking through the table of contents of journals and conferences to find studies that your database searches missed. A related activity is looking through the **reference lists** of relevant articles found through database searches. There are three reasons why doing both these things is a good idea:

1. If, through handsearching, you identify additional articles which are in the database you used but weren't included in the results from your searches, you can look at the article records to consider if you need to adjust your search strategy. You may have omitted a useful variation of a concept from your search string.

2. Even when your search string is excellent, some abstracts and records don't contain terms that allow them to be easily identified in a search, but are relevant to your research.

3. References might point to research published before the indexing began for the databases you are using.

For handsearching, target journals or conference proceedings that are clearly in the area of your topic and look through tables of contents. Sometimes valuable information within supplements or letters is not indexed within databases.

Academic libraries might subscribe to tools which can speed the process such as Zetoc (which includes conference and journal contents) or Browzine (which only covers journals). You can also see past and current issues' tables of contents on a journal's webpage.

Handsearching is a valuable but labour-intensive activity, so think carefully about where to invest your time.

BEST PRACTICE RECOMMENDATIONS:

Ask a colleague, lecturer, or librarian to review your search strategy. This can be very helpful, especially if you are new to a topic. It adds credibility to your literature search and will help ensure that you are running the best search possible.

Save a detailed record of your searches so that you can run them shortly before you are ready to submit your project to see if any new relevant research has been published since you embarked on your project. A good way to do this is to document:

- **where the search was run**
- **the exact search**
- **the date it was run**
- **the number of results**

Keeping all this information will make it easy to see if your search picks up new results when you run it again.

Remember that research for a literature review is a two-step process—first is discovery of research, and the second is accessing the research you've determined you need. Don't switch the order of the steps! If you limit your search to the research outputs that you think that you have easy access to, you will almost certainly end up with a biased review that is neither systematic nor comprehensive.

SCREENING RESULTS

6

After running your searches, you need to decide which results are best for your research. The process is like a funnel that only the best results can fit through. When you ran your searches, you needed to be comprehensive so as not to miss any important literature on your topic, but you'll have far more results than will end up in your literature review. You eliminate inadequate results through three steps:

- Deduplication
- Screening for relevance with abstracts
- Screening full text with critical appraisal techniques

This leaves you with a much smaller pool of relevant and credible literature to include in your review. By processing your search results this way, you will also begin to shape your review because you'll start to identify important features within each article, and you'll start the process of synthesising the literature for impact.

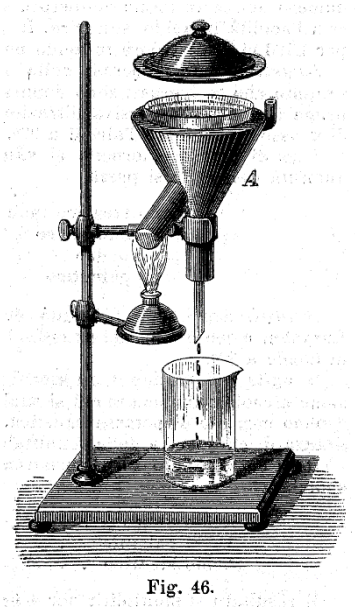


Fig. 46.

The first step of winnowing your results, after you have satisfied yourself that you have captured all relevant results through your search process, is to weed out duplicate records. Remember that reference management software can speed this up – some programmes have deduplication functions, and others let you order references alphabetically and deduplicate results manually.

Once you've removed any duplicates, you screen all your results for relevance. Screening is done by reading the title and abstract of each record and discarding any which obviously don't fit your research question. You can also, at this point, consider if the research was published in a trustworthy source. For example, if you know that the research is published in a predatory journal, it will be risky to include it in your review, as it won't have been properly peer reviewed to give you the confidence that the research is sound. Learn more about predatory journals and how to identify them.

Having excluded clear mismatches and results from obviously poor sources, you now will now have a much shorter list of results that look potentially useful for your review. Now you need to get the full text of the articles so that you can critically appraise them. You will see if the claims you read in the abstract stand up to scrutiny and make a final judgement on whether each article is relevant enough and credible enough to include in your literature review.

BEST PRACTICE RECOMMENDATION

Never cite an article you have not read in full.

While abstracts are a guide to the content of studies, they can be misleading and if you cite inappropriate publications in your work it will be obvious to teachers or reviewers who are familiar with the work that you have not read the full study.

PAPER ACQUISITION 7

Every researcher will need to think about how to acquire the full text articles identified through literature searches. You can often get copies of the articles you need for free through one of the options below.

LIBRARIES

If you are affiliated with a university, the library is the best place to start looking for full text. The library will have subscriptions to many articles. It will probably be able to get you copies of others through inter-library loan. If you are searching a database like FSTA, each record will link straight to the library's copy of the full text article if they have one.

OPEN ACCESS

Anyone, affiliated with a university or not, can get the full text of open access articles. Using a browser extension like Unpaywall can help you source free legal open access copies of articles. Databases and libraries also often link directly to open access articles.

Check with your library if you need help getting the full text of a published article.

GOOGLE SCHOLAR

Google Scholar can be a good place to look for a specific article, conference paper, report or patent, as it will sometimes link you to legal versions of the full text.

Searching the full title of the item you want will quickly reveal if this option works or not. You may find it takes you to a link on a researcher platform.

Be aware that Google Scholar has poor version control and can present different items as though they are different versions of the same item. A link that you think will take you to a six-page journal article can take you to a 210-page thesis, or might take you to a 6-page conference proceeding. Even if these have the same title, they are clearly not the same item[5]. Always be sure to check that the link is taking you to what you need.

RESEARCHER PLATFORMS

On platforms like ResearchGate and Academia.edu an author might make a copy available to download, or you can request a copy. Sometimes the versions available to download are drafts or pre-prints, which would not be suitable to use in your own research, though they can be useful for determining if it is worth pursuing the published version, also called "the version of record."

Learn more about manuscript versions here:
https://libguides.cam.ac.uk/openaccess/manuscriptversions

5 See Dotson, D.S. (2019) Citation Rates for Ohio State Graduate Theses & Dissertations: Trends, Surprises, and Inaccuracies. Library Philosophy and Practice: https://digitalcommons.unl.edu/libphilprac/3580/

CORRESPONDING AUTHORS

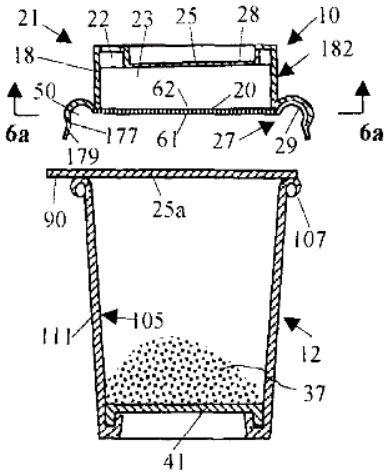
If you cannot get an article through your library by locating an open access copy, you can write to the corresponding author to ask them to send you a copy of their article. The information needed to contact them is part of the article record. Sometimes the corresponding author is denoted with a small envelope next to their name.

PATENTS

When you know a patent's title or publication number (which you will find in a database that includes patents, like FSTA) the free patent sites Espacenet or Google Patents will usually lead you to the full text document.

Espacenet often leads to full original downloadable patent documents, and also collates patent families, linking together patent applications for the same content filed with patent offices around the world. To find a patent:

- Search the patent's title inside quotation marks
- Or, search the patent number with any spaces closed up
- Toggle to the Patent Family tab to see patents for the same invention filed in different countries. Select the "original document" for your preferred version. Next, click on the three dots in the upper right-hand corner of the screen to download the full document



To get full text with Google Patents:

- Check if Google Patents has the full text by searching the patent title, inside quotation marks, in the simple search box
- Or, search by publication number, with any spaces closed

Sometimes Google Patents results will include a downloadable PDF version of a patent and sometimes only an HTML version.

In the rare cases that Espacenet or Google Patents fail to retrieve a patent's text, try googling the issuing patent office to go directly to a country's patent office search. Translate the page, if necessary, to find how to proceed.

Learn more on the IFIS Research Skills blog:
Finding and Retrieving Food Science and Nutrition Patents (ifis.org)

THINKING ABOUT BUDGETING

If you do not have access to library collections, you might need a budget for acquiring papers. Remember that you will not need to get the full text of every article you find with your searches. The information available in the abstracting and indexing record is often enough to determine if an article is relevant enough to your research question to need to read the full text.
If you will need to purchase some articles, be sure to establish your budget before you begin. Wait to make your purchasing decisions until you have run your searches and gone through your initial screening process.

COPYRIGHT CONSIDERATIONS

There are various forms of intellectual property (IP) rights which protect assets such as discoveries, inventions, and literary and artistic works, including research. In many cases, IP rights begin automatically when the work is created. The owner of these rights may sell them or issue licences to allow others to make use of an asset. If copyright is infringed, the owner can seek damages or an injunction to prevent further infringements.

It is important to comply with the law in acquiring and using research articles and other material. Copyright laws around the world tend to grant exceptions (sometimes called Fair Use or Fair Dealing) to allow people to use materials for research done for **non-commercial purposes**. Even in these circumstances restrictions apply on what you can do you with the research—for instance, you can only download a certain proportion of the articles in a single issue of a journal, you cannot share the full text of an article you have not written unless the article has been published as open access, and you must always properly cite any work you use. Your librarian will be able to advise you further on intellectual property and copyright protection of any materials you wish to use in research. If you are conducting research for commercial purposes, you will need to familiarise yourself and comply with the law.

BEST PRACTICE RECOMMENDATION

If you are affiliated with a university, be sure to learn how to take full advantage of their subscriptions and inter-library loan services to get the full text articles you need. Don't overlook what is available to you for free because you haven't learned to use your library!

CRITICAL APPRAISAL 8

Once you have narrowed down your pool of results, it is time to begin critically appraising your articles. Using a checklist helps you scrutinise articles in a consistent, structured way.

Questions to consider include:

- [ ] **Are the aims of the study clearly stated?**
- [ ] **Is the study design suitable for the aims?**
- [ ] **Are the measurements and methods used clearly described?**
- [ ] **Are the correct measurement tools used?**
- [ ] **Are the statistical methods described?**
- [ ] **Was the sample size adequate?**
- [ ] **Are the methods overall described in enough detail that you could replicate the study?**
- [ ] **Does the discussion overall reflect the results?**
- [ ] **Who funded this study?**
- [ ] **What are the specific limitations of what can be concluded from the study?**

Working through the questions will help you identify the strengths and weakness of each article, and also identify points to draw on when you write about the literature.

DOWNLOAD THE CRITICAL APPRAISAL CHECKLIST

ADDITIONAL CRITICAL APPRAISAL CHECKLISTS

A number of organizations have created study-specific checklists to help researchers judge quality.

REFLECT provides a checklist for evaluating randomized control trials in livestock and food safety.

CASP provides checklists for critical appraisal of studies related to health.

JBI also provides checklists for critical appraisal of studies related to health.

DOCUMENTING CRITICAL APPRAISAL DECISIONS

As you closely examine full articles, you will be making judgements about why to **include** or **exclude** each study from your review. Documenting your reasoning will help you reassure yourself and demonstrate to others that you have been systematic and unbiased in your appraisal decisions.

Full text article screening

Articles excluded (expand as needed)

Citation	Reason for exclusion
Hajivand, P. *et al.* (2020) 'Fabrication and characterization of a promising oregano-extract/psyllium-seed mucilage edible film for food packaging.', *Journal of Food Science*, 85(8), pp. 2481–2490.	Not relevant for *xxx* reason.

Keeping track of what you have excluded, and why, will be very helpful if you must defend your work—for instance, if your literature review is part of a dissertation or thesis.

Articles included (expand as needed)

Citation	Key points for synthesis
Chan, H. M. *et al.* (2020) 'Investigation of properties of polysaccharide-based edible film incorporated with functional Melastoma malabathricum extract.', *Carpathian Journal of Food Science and Technology*, 12(1).	"The addition of Melastoma malabathricum extract does not affect the solubility of sodium alginate edible film as there was no significant difference (p>0.05) between the solubility of sodium alginate edible films and pure sodium alginate film." p. 128 --replacing non-biodegradable films with edible films

Pulling all the literature you will include in your review into a single chart is a good way to begin to **synthesise the literature.**

DOWNLOAD THE FULL TEXT SCREENING CHART

BEST PRACTICE RECOMMENDATIONS:

If you include any direct quotes in your chart or in any notes be sure to use quotation marks so that you do not later mistake the words for you own.

The more carefully you record each of the steps of your process, the more easily reproducible it will be.

SUMMARY OF BEST PRACTICE RECOMMENDATIONS AND TEMPLATES

9

RECOMMENDATIONS

1. Be sure to choose a citation manager to use at the beginning of your literature searching, and learn how it works right away, so you can take full advantage of its functionality.

2. Always save all relevant references you find in your searches.

3. If you are looking at a recent development in research, you should also look back at the foundational, historical research that is key to understanding current research.

4. Look at your library webpages page for a list of subject specific databases.

5. Familiarise yourself with the databases you have access to, including subscription databases -get to know their scope (what content they index) and also how to search them, including using thesaurus functions if available, so that you can use each to their full capacity.

6. Always check the database help section to be sure that you are using the right truncation and wildcard symbols for that database.

7. Remember that research for a literature review is a two-step process—first is discovery of research, and the second is accessing the research you've determined you need. Don't switch the order of the steps! If you limit your search to the research outputs that you think that you have easy access to, you will almost certainly end up with a biased review that is neither systematic nor comprehensive.

8. Ask a colleague, lecturer, or librarian to review your search strategy. This can be very helpful, especially if you are new to a topic. It adds credibility to your literature search and will help ensure that you are running the best search possible.

9. Save a detailed record of your searches so that you can run them shortly before you are ready to submit your project to see if any new relevant research has been published since you embarked on your project. Document:
    a. where the search was run
    b. the exact search
    c. the date it was run
    d. the number of results.

10. Keeping all this information will make it easy to see if your search picks up new results when you run it again.

11. If you are publishing your research, take note of journals appearing frequently in your search results for an indication of where to publish a research topic for good impact.

12. Never cite an article you have not read in full. While abstracts are a guide to the content of studies, they can be misleading and if you cite inappropriate publications in your work it will be obvious to teachers or reviewers who are familiar with the work that you have not read the full study.

13. If you are affiliated with a university, be sure to learn how to take full advantage of their subscriptions and inter-library loan services to get the full text articles you need. Don't overlook what is available to you for free because you haven't learned to use your library!

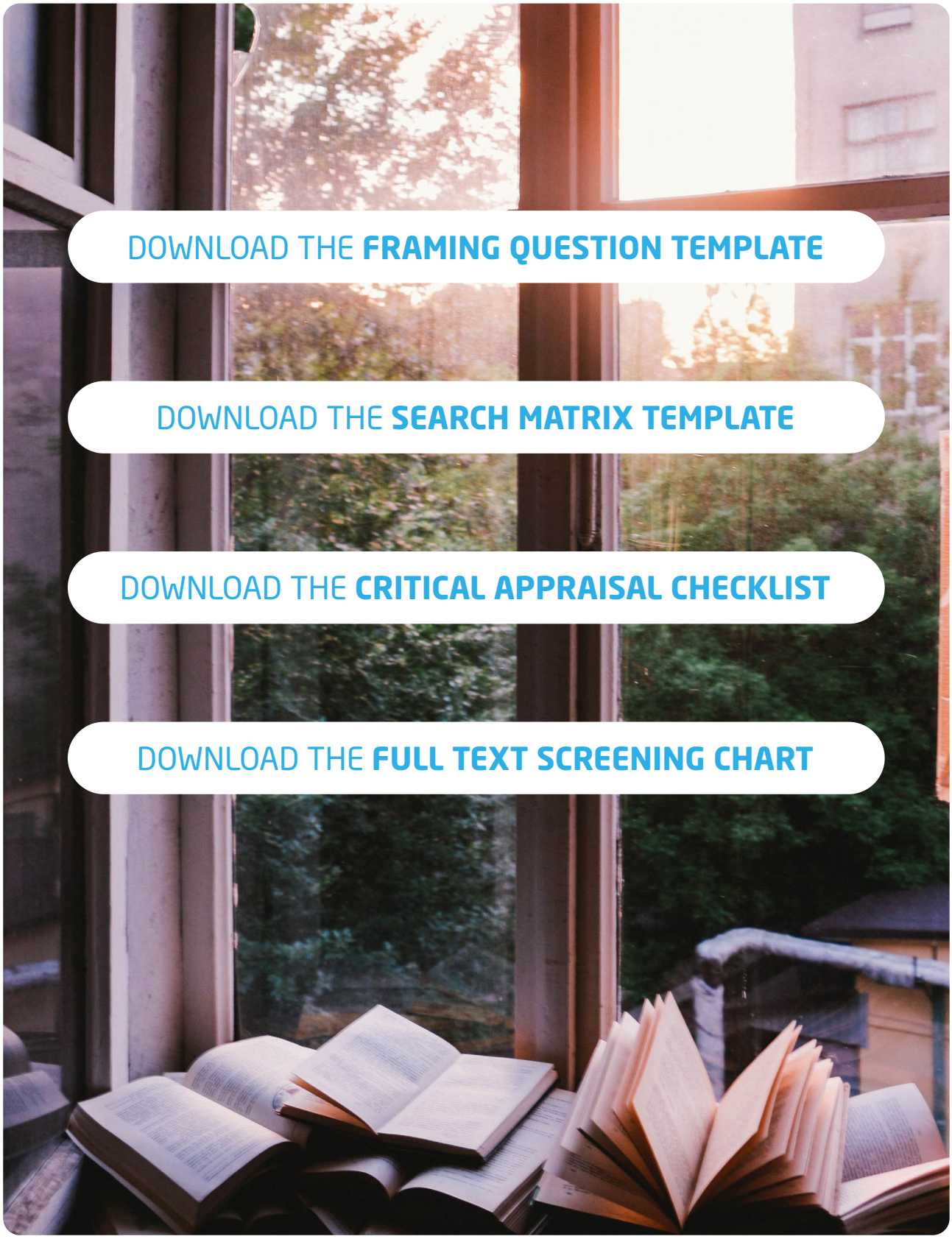
14. If you include any direct quotes in your full text screening or chart or when you are taking any notes on an article, be sure to use quotation marks so that you don't later mistake the words for you own.

15. The more carefully you record each of the steps of your process, the more easily reproducible it will be.

SUMMARY OF BEST PRACTICE RECOMMENDATIONS AND TEMPLATES

9

TEMPLATES

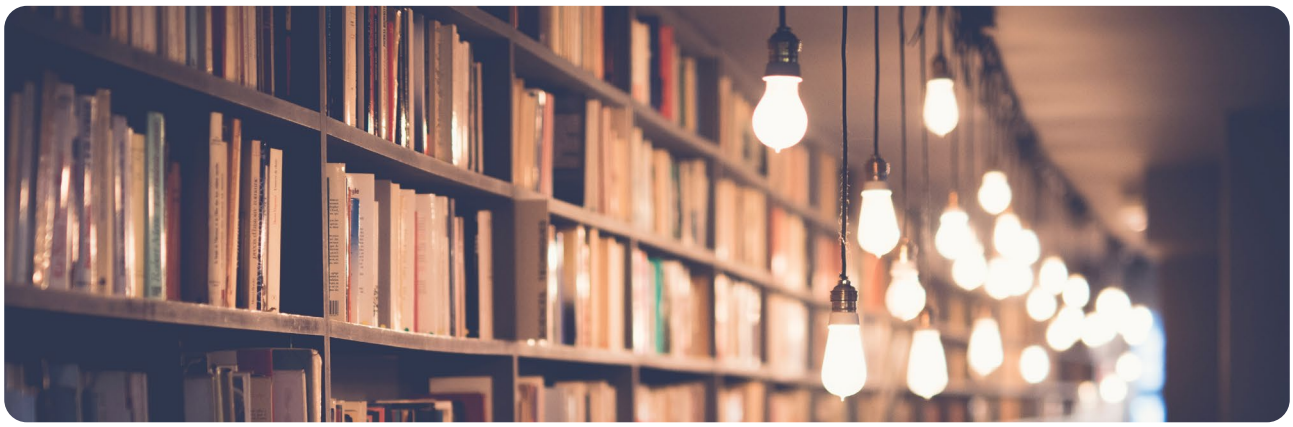


FURTHER RESOURCES 10

Useful resources

There are few tools for food science topics, and much is borrowed from health/medical research, but some of these tools may be useful to you in improving your search skills, assessing quality of evidence, and reporting your research methodology and results. If you wish to explore some other resources, the following list is aimed as a guide only. Please let us know if you wish to add to it, by emailing Carol Hollier (author) at c.hollier@ifis.org.

- Authority, Accuracy, Coverage, Objectivity, Date, Significance grey literature checklist – Flinders University.
- Cochrane Handbook for Systematic Reviews
- CONSORT Statement is an evidence-based, minimum set of recommendations for reporting randomized trials
- Critical appraisal of qualitative research – Teesside University
- Critical Appraisal Skills Programme (CASP) – eight critical appraisal tools designed to be used when reading research.
- Effective Public Health Practice Project (EPHPP) – quality assessment tool for quantitative studies
- Equator Network – for health research.
- European Food Safety Authority (EFSA) Tools – for critically appraising different study designs
- GRADE – an approach to assess evidence.
- Grey literature in the health sciences – University of Pennsylvania Libraries.
- Joanna Briggs Institute Critical Appraisal Tools — checklists for healthcare studies.
- Meridian – reporting standards that can help improve search quality in animal research are collated.
- National Collaborating Centre for Methods and Tools – Canadian resources for evidence-informed public health.
- PRISMA – focuses on the reporting of reviews evaluating randomized trials, but can also be used as a basis for reporting systematic reviews of other types of research, particularly evaluations of interventions.
- REFLECT – a checklist for livestock trials including randomised, challenge and field trials looking at production, health, and food-safety outcomes.
- SIGN – critical appraisal notes and checklists.
- STROBE-Vet statement is a modification of the STROBE statement for use in reporting studies undertaken in animal populations.
- SYREAF – a rich resource about Systematic Reviews for Animals and Food with tutorials and guidance on each step of conducting a systematic review in this area.



ORGANISATIONS AND RESOURCES CONSULTED FOR THIS GUIDE

The following organisations and resources were consulted when preparing these guidelines:

- Health Knowledge: Finding and Appraising the Evidence
- National Collaborating Centre for Method and Tools
- University of Reading Library
- Teesside University
- The University of Queensland
- Campbell Collaboration
- Cochrane Collaboration
- Collaboration for Environmental Evidence
- The EPPI-Centre
- University of York

ADDITIONAL PUBLICATIONS CONSULTED

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5. O'Connor AM, Anderson KM, Goodell CK, Sargeant JM. Conducting systematic reviews of intervention questions I: Writing the review protocol, formulating the question and searching the literature. Zoonoses Public Health. 2014;61 Suppl 1:28-38. doi:10.1111/zph.12125.
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