EXTERNAL SCIENTIFIC REPORT

Inventory of Sources of Scientific Evidence Relevant to EFSA's Risk Assessments and Information Sessions on Literature Searching Techniques (CFT/EFSA/SAS/2011/03 Inventory Report)[1]

Julie Glanville, Danielle Varley, Hugh Brazier, Mick Arber, Hannah Wood, Gordon Dooley

York Health Economics Consortium, Metaxis

ABSTRACT

Regulation (EC) No 178/2002 recommends that risk assessments are undertaken by the European Food Safety Authority (EFSA) in an independent, objective and transparent manner, on the basis of all available scientific information and data. The systematic review (SR) method implemented by EFSA to inform risk assessment models ensures a methodologically rigorous stepwise process, minimising biases and emphasising transparency and reproducibility. To minimise bias, SRs include an extensive literature search. Locating all relevant information sources can be problematic and missing relevant scientific information may influence SR conclusions. The EFSA Scientific Assessment Support Unit contracted YHEC (CFT/EFSA/SAS/2011/03) to produce five deliverables to support literature searching to inform SRs of food and feed safety. This report describes the development of an inventory of information sources of relevance to systematic reviews of food and feed safety. The inventory uses a metadata schema to record information about each information source. 376 candidate information sources were identified from the EFSA SAS inventory of information sources and other catalogues and websites. The selection of information sources to include in the EFSA inventory were determined using selection criteria (1) relevance to EFSA research areas (2) currency of information in the information source (3) provision of searchable bibliographic data records or full text reports of research and (4) be accessible to EFSA staff. Metadata were identified and recorded in an Excel spreadsheet for the 199 information sources meeting these four criteria.

KEY WORDS

literature searching, inventory, systematic reviews, information sources, databases, relative recall.

DISCLAIMER

[1] Question No EFSA-Q-2011-01128.

Any enquiries related to this output should be addressed to amu@efsa.europa.eu

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SUMMARY

Regulation (EC) No 178/2002 recommends that risk assessments are undertaken by the European Food Safety Authority (EFSA) in an independent, objective and transparent manner, on the basis of all available scientific information and data. EFSA is implementing the systematic review (SR) method to inform risk assessment models. SRs adopt a methodologically rigorous stepwise process (to help to minimise biases), emphasising transparency and reproducibility.

To minimise bias SRs include an extensive literature search. Locating all relevant information sources can be problematic and missing relevant scientific information may influence SR conclusions. The EFSA Scientific Assessment Support Unit contracted YHEC (CFT/EFSA/SAS/2011/03) to produce five deliverables to support literature searching to inform SRs of food and feed safety.

This report describes the development of an inventory of information sources of relevance to systematic reviews of food and feed safety. The inventory uses a metadata schema to record information about each information source. 376 candidate information sources were identified from the EFSA SAS inventory of information sources and other catalogues and websites.

The selection of information sources to include in the EFSA inventory were determined using selection criteria:

- Relevance to EFSA research areas;
- Currency of information in the information source;
- Provide searchable bibliographic data records or full text reports of research;
- Accessible to EFSA staff.

199 information sources met these four criteria. Metadata were identified and recorded in an Excel spreadsheet.

This report also describes pilot tests to determine the best combination of information sources for specific review questions. The pilot tests used relative recall methods which can be used prospectively as part of SRs to build the evidence about best information source combinations for groups of review questions.

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BACKGROUND AS PROVIDED BY EFSA

Regulation (EC) No 178/2002 recommends that risk assessments (RA) are undertaken by the European Food Safety Authority (EFSA) in an independent, objective and transparent manner, on the basis of all available scientific information and data.

EFSA has analysed the use of systematic reviews (SR) to retrieve, appraise and synthesise publicly available and accessible scientific evidence to produce evidence-based risk assessments and, where possible, is implementing the SR method to inform EFSA's risk assessment models. The systematic review is a stepwise process whose fundamental principles are methodological rigour (which helps to minimise biases in the review), transparency and reproducibility.

These principles apply to all steps of the SR process including the first, i.e. the extensive literature search (ELS), which must be:

(a) Thorough and extensive, to ensure all studies relevant to the subject under review are located, reduce publication biases and reflect the variability across studies;

(b) Well-documented, to promote transparency and allow reproducibility of the search process.

The essential aspects of an ELS are the tailored search strategy/s (especially for searches in electronic bibliographic databases) and the extensive list of information sources used (i.e. electronic bibliographic databases and other sources accessed *via* hand-searching such as e.g. websites, journals, tables of content, theses, repositories, etc).

In a SR team the extensive literature search is normally undertaken by the Information Specialist, who has specific knowledge of database features and skills in capturing the concepts included in a review question into the search strategy. However, it is important that all reviewers commissioning and evaluating literature searches, as well as researchers new to the systematic review approach, have a clear understanding of the basics of search strategy development and hand-searching and are familiar with how searches are constructed and adapted to meet project needs.

When starting a SR in food and feed safety, locating all relevant information sources is not always easy and often there is the risk of overlooking relevant sources and consequently missing out relevant scientific information that may influence the conclusions of the final output. The need for a clear definition of the sources of scientific evidence relevant to an EFSA research topic has also recently been emphasised in the EFSA public Consultation on a draft Guidance on Submission of scientific peer-reviewed open literature for the approval of pesticide active substances. For these reasons, the EFSA Scientific Assessment Support Unit (referred to as SAS in this document) has carried out a preliminary exercise to identify and classify scientific information sources relevant to EFSA's risk assessment.

TERMS OF REFERENCE AS PROVIDED BY EFSA

This contract was awarded by EFSA to:

Contractor: York Health Economics Consortium

Contract title: Inventory of Sources of Scientific Evidence Relevant to EFSA's Risk

Assessments and Information Sessions on Literature Searching Techniques

Contract number: CFT/EFSA/SAS/2011/03

INTRODUCTION AND OBJECTIVES

The European Food Safety Agency (EFSA) has contracted YHEC (CFT/EFSA/SAS/2011/03) to deliver a series of deliverables to support literature searching to inform systematic reviews of food and feed safety:

1. A metadata schema;

2. An inventory of key data sources and evidence-based combinations of data sources;

3. A business analysis of IT tool or tools (compatible with the EFSA IT environment) for presenting and searching the sources identified in deliverable 2;

4. A technical manual for performing electronic literature searches (ELS) to inform systematic reviews in EFSA risk assessments;

5. Six training sessions tailored for EFSA to train EFSA staff and experts in searching techniques to inform systematic reviews in food and feed safety risk assessment.

EFSA requires the identification of the most reliable sources of publicly available scientific evidence and their classification by relevance to EFSA research areas. The information sources will be catalogued in an inventory using the metadata schema agreed with EFSA for deliverable. This report describes:

- The method and criteria applied for identifying reliable information sources;
- The methods of developing the inventory with documentation of key decisions;
- The methods of conducting research into the best combinations of information sources to be used when searching to inform systematic reviews.

The inventory is presented as an Excel spread sheet.

MATERIALS AND METHODS

The inventory was produced using the metadata schema to record information about each information source. The following sections describe:

- The definition of an information source;
- The identification of candidate information sources and their prioritisation;
- The collection of metadata elements and management of recording issues;
- Identification of published evidence on best combinations of information sources;
- Development of a method for undertaking exploration of the best combinations of sources of information;
- Identification of systematic reviews to use in the testing of best combinations;

- How the testing of best combinations was undertaken

1.1. Defining an information source

The decisions about which information sources to include in the EFSA inventory were determined based on a set of selection criteria (Table 1). The development of the criteria was informed by papers which discussed issues around quality assessed subject portals. The criteria were also informed by examining several major subject portals:

- The Waseda e-resource portal (http://www.wul.waseda.ac.jp/imas/help-e.html);
- Intute (http://www.intute.ac.uk/);
- INFOMINE (http://infomine.ucr.edu/).

The purpose of the EFSA inventory is to support the production of systematic reviews for EFSA. Information sources in the inventory will tend to be secondary sources of information rather than primary sources of information. Typically inventory information sources are bibliographic or full text databases. Such databases index and contain references to primary sources of information: documents of many different publication types. Bibliographic information sources contain information about the documents and sometimes the documents themselves. Primary information sources (such as individual research reports, organisational websites and other single subject sources) are too numerous to collect and maintain current in an inventory such as EFSA's. Primary information sources are best identified when trying to answer a specific systematic review question. This both ensures that the primary sources are current and relevant, and reduces the overhead of maintaining an inventory of sources which might never be used in a specific systematic review. In addition, the metadata schema is designed to capture information about secondary sources of information rather than primary sources. A wide range of information sources (such as individual online journals, conference websites, databanks, encyclopaedias, glossaries and dictionaries) are therefore, excluded from the EFSA inventory because they are not secondary sources.

Information sources which did not meet selection criteria 1 and 2 (Table 1) have been labelled 'genuine exclusions' and are in the 'Genuine Exclusions' worksheet of the EFSA inventory in the Excel spread sheet. Information sources which met criteria 1 and 2 but failed to meet criteria 3 or 4 were recorded in a worksheet labelled 'Supplementary list' in the EFSA inventory Excel spread sheet (also in Appendix A). These information sources may be of interest when searching for information for specific review questions but this list is not comprehensive or the result of a systematic search. Information sources which met all four criteria were added to the EFSA inventory worksheet and their metadata were collected. The selection process is illustrated in Figure 1.

Table 1: Selection criteria for information sources to be included in the inventory

	Explanation
Inclusion Criteria	
1. Relevance to EFSA research areas	Information sources focusing on research areas outside of EFSA's subject remit as defined by the **Subject** listing were excluded.
2. Currency of information	Prioritisation for inclusion in the inventory is given to information sources which are live and regularly updated. Closed information sources which are no longer being updated might be of interest to EFSA but would be viewed as lower priority than information sources which are actively adding new records.
3. Contain a collection of searchable bibliographic data records or full text reports of research	The information source must be a collection of reports of research findings or records of reports of research findings. This excludes: • Subject portals and catalogues which list information sources such as databases or websites (i.e. tertiary sources rather than secondary sources); • Individual journal websites; • Individual conference websites; • Websites describing individual projects (although the websites may also provide access to databases created by the projects- the latter are eligible for inclusion in the inventory); • Collections of data or databanks which contain unprocessed data or results; • Glossaries and dictionaries; • Encyclopaedias. Cross database search options e.g. Institutional Repository Search (http://irs.mimas.ac.uk/) or the International Clinical Trials Registry Platform (ICTRP) may be considered to be collections.
4 Accessible to EFSA staff	Private in-house databases (within organisations) such as manufacturers' in-house databases are excluded because access to these information sources is unlikely to be routinely available to EFSA.

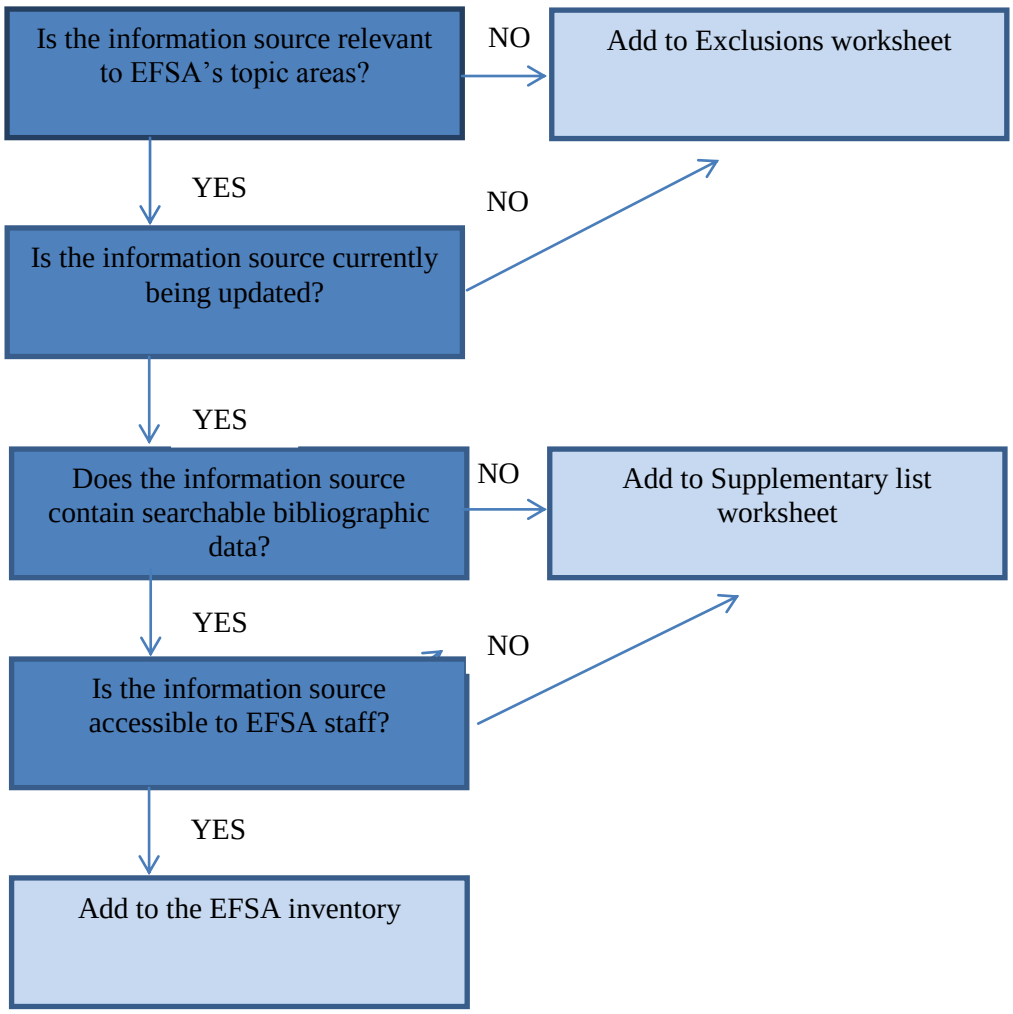

Figure 1: Selection process for EFSA inventory items

1.2. Identifying information sources for assessment

The candidate source list for the EFSA inventory was based on the EFSA SAS inventory of information sources. A range of other inventories, catalogues and websites were assessed to identify additional information sources. These listings were identified by searching EFSA documents, major national government websites, major relevant international organisation websites and selected library sites. The listings were also selected according to their coverage of the different EFSA topic areas. The listings were used to produce a resource list of candidate known and new information sources. The inventories, catalogues and websites searched to identify candidate information sources are shown in Table 2.

Table 2: Inventories, catalogues and websites searched for candidate information sources

	Reference or URL
Inventory/Catalogue	
SAS inventory	European Food Safety Agency (2011). Copy of LS Sources 09 2011(Excel file). Parma, European Food Safety Agency.
EFSA DACO report	European Food Safety Agency (2011). "Data collection for the identification of emerging risks related to food and feed." EFSA journal **9**(8): EN-185.
(US) Food and Drug Administration	http://www.fda.gov/
(US) Department of Agriculture resource list	http://www.nal.usda.gov/
UK Department for Environment, Food and Rural Affairs	http://www.defra.gov.uk/
International Portal on Food Safety, Animal and Plant Health	http://www.ipfsaph.org/En/default.jsp
University of Reading Library. Food and nutrition: useful websites.	http://www.reading.ac.uk/library/finding-info/subjects/food/lib-food-internet.aspx
Food and Agriculture Organization of the United Nations: VEST registry	http://aims.fao.org/vest-registry/browse-by-metadata-sets
Food and Agriculture Organization of the United Nations: WAICENT portal	http://www.fao.org/waicent/st/level_2.asp?main_id=12&sub_id=2467
WHO	http://www.who.int/en/
EFSA Information Exchange Platform (IEP)	http://www.efsa.europa.eu/en/fp/fpiep.htm
Pest risk assessment in the European Community: inventory of data sources (PRASSIS)	http://www.efsa.europa.eu/en/supporting/pub/29e.htm
Models for pest's epidemiology: review, documentation and evaluation for Pest Risk Analysis (MoPEST)	http://www.efsa.europa.eu/en/supporting/pub/28e.htm
IOWA State University e-Library	http://www.lib.iastate.edu/

	Reference or URL
Inventory/Catalogue	
INFOMINE	http://infomine.ucr.edu/
CABI	http://www.cabi.org/
NLM	http://www.nlm.nih.gov/
Gateway to Global Agricultural Knowledge	http://vlibrary.cgiar.org/V?RN=907342386
Foodrisk.org	http://foodrisk.org/databases/nutrition/

1.3. Collecting metadata elements and managing recording issues

Information sources in the resource list were assessed for relevance against the selection criteria (Table 1). Relevant information sources were then added to the inventory. Information was sought for each of the metadata elements from the information source's website and also from database guides such as those provided by Proquest Dialog (http://library.dialog.com/bluesheets/). Database guides can be helpful because they present data about information sources in a standard way.

376 information sources were identified and assessed (Figure 2). 199 have been included in the inventory list. 122 information sources are in a supplementary list because they are webpages, project pages, databanks or other non-database resources. 32 information sources have been excluded (recorded in the worksheet) and 23 duplicates have been identified and removed.

The collection of metadata is time consuming as few information sources provide information in a standard way. Compiling metadata for a single information source takes 30 minutes to an hour. At present the compilation of metadata is a manual task, but SAS may wish to investigate methods to extract as much metadata as possible automatically from information sources.

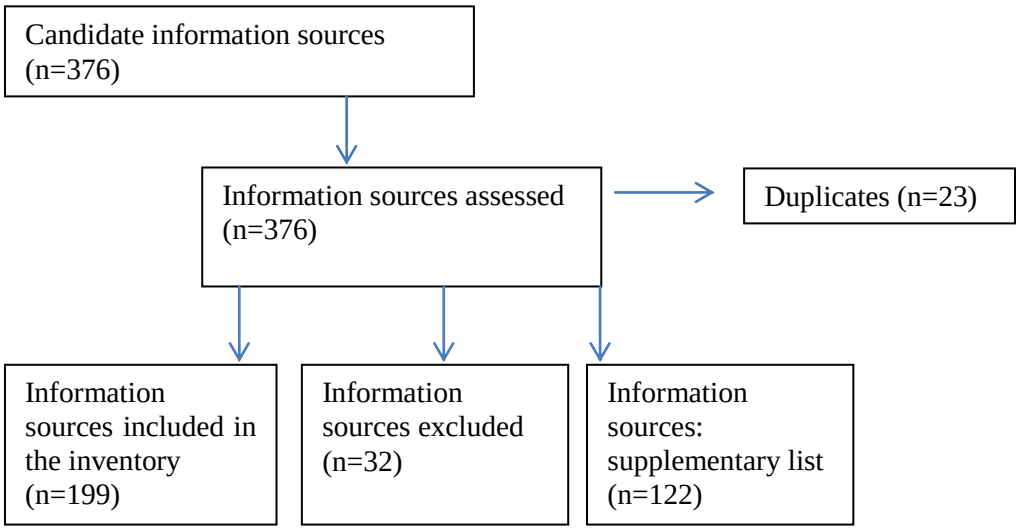

Figure 2: Identification of information sources

1.4. Identification of published evidence on best combinations of information sources

For any specific review topic a range of information sources may be relevant, but it may not be efficient or necessary to search all of the information sources because of overlap in their coverage of primary sources such as journals. For efficient information retrieval decisions on which information sources to search should ideally be informed by evidence from research on the most efficient combination of sources to search.

Searches in a range of databases were undertaken to identify information retrieval research in food and feed safety to inform the research on best combinations and also to inform the development of the Handbook. The following databases were searched:

- MEDLINE and preMEDLINE (21/5/12);
- Science Citation index (21/5/12);
- ScienceDirect (21/5/12).

The searches are listed in detail in Appendix B.

7199 records were identified by the searches and downloaded into Endnote. After deduplication 3875 records were assessed for relevance to information source combinations and for the EFSA Manual. 446 records were reports of systematic reviews potentially relevant to food and feed safety. The majority relate to the health effects of a range of nutrients and dietary supplements, and a minority relate to food production processes and animal care. Reports of systematic reviews from this set of records were selected to assess best combinations of information sources.

Some research has been conducted into the best combinations of information sources in fields of relevance to food and feed safety. Only a few studies have been identified which provide information on coverage and overlap of databases. Grindlay and colleagues compared the coverage of veterinary

journals by nine bibliographic databases and found that CAB Abstracts gave the best coverage of 1139 veterinary journals. A large percentage of the veterinary journals were missed by MEDLINE. Another recent report by Murphy noted that no single database provides access to all the literature relevant to veterinary information.

1.5. Methods for identifying the best combinations of sources of information

EFSA require guidance on the 'best' combinations of information sources, which guarantee the retrieval of all relevant scientific evidence, for the main research areas of EFSA. 'Best' refers to a situation where as few resources as possible are searched with a high probability that most of the relevant research evidence will be identified. This involves identifying information sources which contribute unique records to the review and those which offer few or no unique records to a systematic review.

The best method to test out the performance of different information sources is to begin with identifying a gold standard of handsearched relevant records for a specific research question. The relevant records are then identified in each source and the yield (and unique yield) of each source is noted and a hierarchy of sources developed based on relative yield. Handsearching is, however, very resource intensive and cannot be accomplished within the budget of the current research. Following discussion with EFSA it was agreed to use relative recall methods which are used widely in information retrieval research in systematic reviews.

Relative recall involves identifying systematic reviews which have been conducted using sensitive searches of many information sources. The included studies of those reviews are regarded as a quasi gold standard set of records because of the extensive nature of the searches conducted to create the reviews. The included studies are treated as a set of relevant records and the performance of various sources can then be assessed, in terms of the number of relevant records retrieved from the sources and the number of records uniquely retrieved from each source. From this method a list of high-yield and low-yield resources can be identified along with information on the degree of overlap. The relative recall approach relies on identifying well-conducted systematic reviews in the areas of food and feed safety of relevance to EFSA. It is also reliant on high-quality searches and in any relative recall exercise an assessment of the quality of the searches conducted in the original reviews should be undertaken.

1.5.1. Objectives of the approach

Five relative recall exercises were undertaken:

- To assess the yield of databases from the inventory as a source of reports of studies relevant to EFSA work. This yield will be assessed in relation to EFSA relevant research areas covered by specific systematic reviews;
- To assess the best combination of information sources for maximum yield from fewest sources;
- To explore the strengths and weaknesses of the search strategies used in published systematic reviews of topics of relevance to EFSA.

1.5.2. Description of Methods

Systematic reviews relevant to different aspects of EFSA's remit were identified from the reviews retrieved by the literature search described in Section 1.4.

A relative recall study is only as good as the sum of the individual searches carried out for the systematic review. Therefore, it is important that the reviews selected were based on search strategies which were wide-ranging and fit for purpose (Sampson et al., 2006). Such searches mean that the included studies form a better proxy for the real gold standard of all relevant studies. Many systematic reviews, which were considered for the relative recall analysis, were rejected because the searches undertaken for the review were poorly reported.

When assessing the quality of a search strategy the following elements were considered:

- Explicit and detailed reporting of the search;
- Evidence that a range of electronic information sources had been searched;
- Evidence that the search had been carried out in an appropriate, robust and sensitive manner. This included the appropriate use of free text search terms and subject indexing in the strategy, search filters, Boolean operators, truncation, phrases, set combinations, and limits.

These elements are associated with the accuracy and completeness of the evidence base and were identified in the PRESS Report (Sampson et al., 2008) and the search conduct and reporting requirements of the Cochrane Collaboration's Methodological Expectations of Cochrane Intervention Reviews (MECIR).[2]

The following process was undertaken for each systematic review:

- The characteristics of the systematic review were recorded: the review question, inclusion criteria, information sources searched, and number of included studies. An EndNote Library was created to collate the references for the included studies. This formed the gold standard.
- Each included study was searched for within the information sources reported in the systematic review. Information sources not included in the review but relevant to the topic were also searched. The EndNote record for each study was labelled to show the information sources which contained the study bibliographic record. This permitted easy identification of the studies found using each source.
- The yield of each information source was recorded in a table and the relative recall of the source was calculated as follows:

$$\frac{\text{Number of included studies found in each source}}{\text{Total number of included studies in the review}}$$

- The EndNote Library was searched using the labels to explore the best combination of information sources for yield. The number of studies retrieved by each combination and the relative recall was recorded in the table.
- Overlap between sources and the unique studies retrieved by each source were identified using the EndNote search function.
- Any studies not identified by the reported sources were explored further to try to identity how the reports might have been retrieved by the systematic review team.

[2] http://www.editorial-unit.cochrane.org/mecir

- The original search strategies reported in the systematic review were re-run. Any reports that were indexed in the information source, but not retrieved by the strategy, were identified and the reasons for their non-retrieval were explored.

- Key messages from these exercises were reported along with any limitations of the relative recall studies.

1.6. Identification of systematic reviews to use in the testing of best combinations

Following a literature search, 446 reports of systematic reviews potentially relevant to food and feed safety were identified. The majority of these reviews address the human health effects of a range of dietary supplements and nutrients, and the remainder address animal and plant health issues.

Five reviews were selected to test the relative recall approach:

1. Boyle RJ, Bath-Hextall FJ, Leonardi-Bee J, Murrell DF, Tang MLK. Probiotics for treating eczema. Cochrane Database of Systematic Reviews 2008, Issue 4. Art. No.: CD006135. DOI: 10.1002/14651858.CD006135.pub2.

2. Dufour S, Fréchette A, Barkema HW, Mussell A, Scholl DT. Invited review: effect of udder health management practices on herd somatic cell count. J Dairy Sci. 2011 Feb;94(2):563-79. http://dx.doi.org/10.3168/jds.2010-3715

3. O'Connor AM, Denagamage T, Sargeant JM, Rajic A, McKean, J. Feeding management practices and feed characteristics associated with Salmonella prevalence in live and slaughtered market-weight finisher swine. A systematic review and summation of evidence from 1950-2005. Preventive Veterinary Medicine 2008, 84 (3/3) pp.231-228

4. Schoonees A, Visser J, Musekiwa A, Volmink J. Pycnogenol® (extract of French maritime pine bark) for the treatment of chronic disorders. Cochrane Database of Systematic Reviews 2012, Issue 4. Art. No.: CD008294. DOI: 10.1002/14651858.CD008294.pub4.

5. Scott O, Galicia-Connolly E, Adams D, Surette S, Vohra S, Yager JY. The safety of cruciferous plants in humans: a systematic review. Journal of Biomedicine and Biotechnology, Epub February 22 2012.

An example of the approach using a systematic review of probiotics in treating eczema in humans has is presented in Section 1.7. Additional test reviews are presented in Appendix C and summarised in Section 1.8. These tests may suggest combinations of information sources for one or two research areas. The suggested combinations would then need to be tested out in a variety of systematic review contexts prospectively. Any listing of the 'best' combination of sources is likely to be the result of an investigation of only a few subject topics, and therefore any recommendations should contain caveats relating to generalisability to all review questions.

1.7. Testing best combinations of information sources

This section describes in detail the conduct of a relative recall test. The following review was the subject of the test:

> Boyle RJ, Bath-Hextall FJ, Leonardi-Bee J, Murrell DF, Tang MLK. Probiotics for treating eczema. Cochrane Database of Systematic Reviews 2008, Issue 4. Art. No.: CD006135. DOI: 10.1002/14651858.CD006135.pub2.

1.7.1. Review details

This review was published in 2008 and the review question was to assess the effects of probiotics in treating eczema.

The review inclusion criteria were:

- Randomised controlled trials of probiotics for the treatment of eczema;
- Participants of any age with eczema diagnosed by a doctor. Participants with other specific forms of eczema such as allergic contact eczema were excluded;
- Interventions involving the ingestion of live micro-organisms, including bacteria fungus or yeasts, either singly or in combination;
- Comparators were no treatment, placebo or another active intervention. Studies using another probiotic as the sole comparator were excluded. Studies including an adjunct to the active treatment, such as antibiotics, were included;
- Primary outcomes were short term changes in quality of life and short term changes in participant/parent/primary carer-rated symptoms of eczema;
- Secondary outcomes were; long term changes in quality of life and participant/parent/primary carer-rated symptoms of eczema, short and long term changes in the need for other eczema treatment, investigator-rated eczema severity, short term changes in global eczema severity as measured by trained investigator or clinician, long term changes in global eczema severity as measured by participants/parent/principal carers /a clinician, changes in number of days lost from work or school during active treatment, adverse events during the treatment period.

Eight databases were searched: the Cochrane Skin Group Centralized Register, Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, EMBASE, PsycINFO, AMED, LILACS, ISI Web of Science.

12 studies, reported in 15 papers, were included in the systematic review. Two of the studies (Taniuchi 2005 & Weston 2005) were reported in more than one paper. The studies are listed below:

1. Brouwer ML, Wolt-Plompen SAA, Dubois AEJ, Van der Heide S, Jansen DF, Hoijer MA, et al. No effects of probiotics on atopic dermatitis in infancy: a randomized placebo-controlled trial. Clinical and Experimental Allergy 2006;36:899–906.

2. Folster-Holst R, Muller F, Schnopp N, Abeck D, Kreiselmaier I, Lenz T, et al. Prospective, randomized controlled trial on Lactobacillus rhamnosus in infants with moderate to severe atopic dermatitis. British Journal of Dermatology 2006;155:1256–61.

3. Gruber C, Wendt M, Sulser C, Lau S, Kulig M, Wahn U, et al. Randomised placebo-controlled trial of Lactobacillus rhamnosus GG as treatment of atopic dermatitis in infancy. Allergy 2007;62:1270–1276.

4. Isolauri E, Arvola T, Sutas Y, Moilanen E, Salminen S. Probiotics in the management of atopic eczema. Clinical and Experimental Allergy 2000;30:1604–10.

5. Kirjavainen PV, Salminen SJ, Isolauri E. Probiotic bacteria in the management of atopic disease: underscoring the importance of viability. Journal of Pediatric Gastroenterology and Nutrition 2003;36:223–7.

6. Majamaa H, Isolauri E. Probiotics: a novel approach in the management of food allergy. Journal of Allergy and Clinical Immunology 1997;99:179–85.

7. Passeron T, Lacour J-P, Fontas E, Ortonne J-P. Prebiotics and synbiotics: two promising approaches for the treatment of atopic dermatitis in children above 2 years. Allergy 2006; 61:431–7.

8. Rosenfeldt V, Benfeldt E, Nielsen SD, Michaelsen KF, Jeppesen DL, Valerius NH, et al. Effect of probiotic Lactobacillus strains in children with atopic dermatitis. Journal of Allergy and Clinical Immunology 2003;111: 389–95.

9. Sistek D, Kelly R, Wickens K, Stanley T, Fitzharris P, Crane J. Is the effect of probiotics on atopic dermatitis confined to food sensitized children? Clinical and Experimental Allergy 2006;36:629–33.

10. Hattori K, Yamamoto A, Sasai M, Taniuchi S, Kojima, T. Kobayashi Y, et al. Effects of administration of bifidobacteria on fecal microflora and clinical symptoms in infants with atopic dermatitis. Arerugi - Japanese Journal of Allergology 2003;52(1):20–30.

11. Taniuchi S, Hattori K, Yamamoto A, Sasai M, Hatano Y, Kojima T, et al. Administration of Bifidobacterium to infants with atopic dermatitis: changes in fecal microflora and clinical symptoms. The Journal of Applied Research 2005;5(2):387–96.

12. Viljanen M, Savilahti E, Haahtela T, Juntunen-Backman K, Korpela R, Poussa T, et al. Probiotics in the treatment of atopic eczema/dermatitis syndrome in infants: a double-blind placebo-controlled trial. Allergy 2005;60:494–500.

13. Weston S, Dunstan J, Roper J, Breckler L, Halbert A, Richmond P, et al. Probiotics provide clinical benefit in moderate and severe atopic dermatitis: a randomised controlled trial. The Journal of Investigative Dermatology 2005;125:596.

14. Weston S, Halbert A, Richmond P, Prescott SL. Effects of probiotics on atopic dermatitis: a randomised controlled trial. Archives of Disease in Childhood 2005;90(9):892–7.

15. Weston S, Richmond P, Halbert A, Prescott SL. Effects of probiotics in infants with atopic dermatitis: a randomised double blind placebo controlled trial. Australasian Journal of Dermatology 2004;45:A13.

1.7.2. Review results

An additional search in BIOSIS Previews was undertaken, in addition to the information sources listed in the review due to its relevance to both the topic and the work of EFSA.

Table 3 provides information on the yield and relative recall of each of the information sources. Table 4 shows the yield and relative recall of combinations of information sources. Table 5 presents the overlap between the information sources.

Table 3: Yield and relative recall for each information source

	Number of papers identified	Relative Recall
Information source searched		
AMED	0	0
CENTRAL	15	1
Cochrane Skin Group Specialised Register	14	0.93
EMBASE	13	0.86
ISI Web of Science	12	0.8
LILACS	0	0
MEDLINE	12	0.8
PsycINFO	0	0
BIOSIS Previews	12	0.8

As all the papers were found in CENTRAL, so this database was excluded from the combinations below. Databases which did not find any of the references were also excluded.

Table 4: Combinations of information sources by best relative recall

	Number of papers identified	Relative Recall
Information source combinations		
CENTRAL	**15**	**1**
EMBASE and CSGSR	15	1
EMBASE and BIOSIS Previews and CSGSR	15	1
EMBASE and ISI Web of Science and CSGSR	15	1
MEDLINE and EMBASE and CSGSR	15	1
BIOSIS Previews and CSGSR	14	0.9
EMBASE and BIOSIS Previews	14	0.9
EMBASE and ISI Web of Science	14	0.9
ISI Web of Science and CSGSR	14	0.9
MEDLINE and CSGSR	14	0.9
EMBASE and BIOSIS Previews and ISI Web of Science	14	0.9
ISI Web of Science and BIOSIS Previews and CSGSR	14	0.9

	Number of papers identified	Relative Recall
Information source combinations		
MEDLINE and EMBASE and ISI Web of Science	14	0.9
MEDLINE and EMBASE and BIOSIS Previews	14	0.9
MEDLINE and BIOSIS Previews and CSGSR	14	0.9
MEDLINE and ISI Web of Science and CSGSR	14	0.9
MEDLINE and BIOSIS Previews	13	0.86
MEDLINE and EMBASE	13	0.86
MEDLINE and ISI Web of Science	13	0.86
MEDLINE and BIOSIS Previews and ISI Web of Science	13	0.86
ISI Web of Science and BIOSIS Previews	12	0.8

Table 5: Overlap between information sources (excluding CENTRAL)

	Number of papers found in both information sources
Combination of information sources	
CSGSR and BIOSIS Previews	12
EMBASE and BIOSIS Previews	11
EMBASE and CSGSR	12
EMBASE and ISI Web of Science	11
ISI Web of Science and Biosis Previews	12
ISI Web of Science and CSGSR	12
MEDLINE and BIOSIS Previews	11
MEDLINE and CSGSR	12
MEDLINE and EMBASE	12
MEDLINE and ISI Web of Science	11

1.7.3. Performance of the search strategies

All of the papers in MEDLINE, CENTRAL and CSGSR were found by the review strategy. This was not the case for EMBASE where the strategy missed three papers, and Web of Science where seven papers were missed. In all cases, it appears to be the section of the search designed to find randomized controlled trials which is responsible for the missing studies. The EMBASE strategy was limited in its use of keywords and subject headings for this concept, unlike the search strategy for MEDLINE which was notably more extensive (and hence sensitive). Papers indexed with the EMTREE terms 'Controlled Trial' and' Controlled Clinical Trial' in EMBASE were missed as the strategy only

included the EMTREE heading 'Randomized Controlled Trial'. The free text search terms used in EMBASE were also not sensitive enough to retrieve these papers. Terms such as 'control$', which were included in the MEDLINE strategy, would have found the majority of the "missing" papers in EMTREE.

The Web of Science search was extremely basic. The search string 'atopic AND probiotic* AND (clinical AND trial)' were run in the Topic field. The search string 'atopic AND probiotic' alone was sufficient to have retrieved all of the papers. However, restricting the search to papers containing the terms 'clinical AND trial' caused over fifty per cent of the papers to be missed. The majority of papers did not use this terminology and instead contained text words such as 'controlled', 'placebo' and 'randomized'.

1.7.4. Discussion

CENTRAL had the highest relative recall of the information sources searched; it was the only resource to contain all fifteen of the included papers. The Cochrane Skin Group Specialised Register (a subset of CENTRAL) contained 14, giving it a relative recall rate of 0.9. Although these sources have been shown to be a very good source of randomized controlled trials in health, it should be noted that the choice of review may have influenced the results. As well as including records indexed in MEDLINE and EMBASE, CENTRAL contains controlled trials found by Cochrane Collaboration groups whilst compiling their systematic reviews. As the review was a Cochrane Review it would be expected that all of the references included within it would also be found in CENTRAL. This is particularly true given the time which has elapsed since the review was undertaken, allowing the Cochrane Skin Group Specialised Register to be added to CENTRAL. It should be noted that it is difficult to reconstruct the state of play of the information sources so that only records available at the time of the review searches are searched in the relative recall test.

EMBASE, MEDLINE, Web of Science and BIOSIS also performed well providing access to 12 or 13 of the papers each. Despite covering complementary therapies such as dietary supplementation, none of the papers were found in AMED, suggesting that it is not a significant source of trials in this topic area.

All of the papers were found in more than one of the information sources. There were no information sources which contained a unique result and all the papers were found in more than one of the databases. There was significant overlap between the databases; in each combination tested between 73 and 80 per cent of the papers overlapped. This may be due to the characteristics of the reference standard. The majority of the papers were published in established, western health journals which are likely to be indexed by the information sources listed.

If CENTRAL was not included in the analysis, only combinations containing CSGSR were able to find all 15 of the papers. Although the choice of review may have influenced this, the results suggest it is important to include CENTRAL and relevant subsets when searching for randomized controlled trials in health. 'MEDLINE, EMBASE, CSGSR' and 'MEDLINE, EMBASE, Web of Science' proved the most effective combinations. The combination of 'Web of Science and BIOSIS' was the least effective, suggesting that it is necessary to include a clinically-focused database when searching for health related topics.

The search strategies used by the review in EMBASE and Web of Science did not perform as well as the strategies used in the other information sources. These strategies appeared to be less sensitive than those used in MEDLINE and CENTRAL. In particular the section of the searches designed to retrieve randomized controlled trials was weak. Future reviews in a similar topic area should take care when adapting searches for use in different databases in order to maintain the sensitivity of the strategy. The

strategy used in each database should be designed to achieve similar rates of recall and text words should be used consistently across databases where possible. The recall of searches for randomized controlled trials could be improved by using a sensitive search filter for this study design. The InterTASC Information Specialists' Sub-Group maintains the Search Filter Resource (www.york.ac.uk/inst/crd/intertasc/) which collates published and unpublished search filters. They additionally provide guidance on critically appraising search filters and surveys of their performance.

This test study is limited as relative recall using a quasi gold standard formed from the included studies in a review and the quasi gold standard is only as good as the sum of the individual searches carried out for the review. As some methodological weaknesses were identified in the reported search strategies it is possible that some papers were missing from the quasi gold standard. The Cochrane Skin Group Specialised Register provided high rates of relative recall. However, this resource is not likely to be useful beyond searches focused on eczema or other dermatological conditions and may not be accessible to all searchers. The inability to search the information sources as they were on the date they were searched by the reviewers also hampers an assessment of the genuine yield at that point in history: the results of the test reflect the records available in 2012.

1.8. Results of the other four relative recall tests

Similar to the Boyle review, CENTRAL was shown to be a very good source in the Schoonees review. This again reflects the likelihood that the review group contributed its studies to CENTRAL. However, in contrast to this, the Scott review found that CENTRAL had a poor performance regarding relative recall, as it contained only three of the papers. In the Dufour review, the relative recall found that none of the resources assessed contained all of the included papers. The Dufour review found that CABI and Web of Science had the highest relative recall of the assessed resources (having a relative recall of 0.81). CAB Abstracts had contrasting relative recall results in two of the reviews. In the O'Connor review, CAB Abstracts had the highest relative recall papers, whereas in the Scott review, CAB Abstracts demonstrated a low level of relative recall. AGRIS performed poorly in both the Dufour and O'Connor reviews. MEDLINE/PubMed had mixed results across the reviews, with a relative recall result of 0.69 in the Dufour review and performing fairly well in the O'Connor review: PubMed had a relative recall score of 0.83 in the Schoonees review, and MEDLINE (and EMBASE) scored the highest relative recall of the resources searched in the Scott review.

CONCLUSIONS

The inventory provides access to major information sources which can inform the search plans for specific systematic reviews. The population of the metadata for an information source is a time consuming manual process involving the collection of often scattered information. SAS may wish to investigate methods to extract as much metadata as possible automatically from information sources for new information sources or when updating the inventory records.

Before adding new information sources to the inventory it is advisable to use the selection criteria, which may evolve as the inventory is used in practice. Before adding a new information source it is advisable to check that the information source has not already been included in the inventory under a variant name or as part of a larger source, and also to check the Exclusions and Supplementary lists.

The identification of best combinations of information sources using the relative recall method has been shown to be workable and to provide useful information. The test examples show that a typical relative recall analysis can be performed in two to three days, depending on the number of included studies and the number of information sources searched. These tests are not able to recreate the databases as they were when the original searches were undertaken so the degree of overlap and relative yield is likely to be greater than prevailed when the searches were undertaken. This limitation can be overcome by planning relative recall analysis into systematic reviews as they are undertaken. If

search results are retained the actual retrieval capability can be explored at the end of the systematic review because the results per information source can be interrogated. In addition the relative recall assessment can be undertaken at a time closer to the original search date than has been possible with the tests undertaken for this report.

The relative recall results present information for single topics and generalisations should not be made from single results. The best combination picture can be developed over time if relative recall analysis is built into each systematic review conducted for or within EFSA.

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APPENDICES

Appendix A. Information sources in the supplementary list

Information sources	Reason for exclusion from the inventory	URL
Food Additives and Contaminants	Journal webpage	http://www.tandfonline.com/loi/tfac19
Environmental Health Perspectives	Journal webpage	http://ehp03.niehs.nih.gov/home.action
Environmental Science and Technology	Journal webpage	http://pubs.acs.org/journal/esthag/
Eurosurveillance	Journal webpage	http://www.eurosurveillance.org/Public/AboutUs/AboutUs.aspx
Public Library of Science	Publisher website	http://www.plos.org
Agriculture	Publisher website	http://www.nap.edu/topics.php?topic=276&t=p
Biology and Life Sciences	Publisher website	http://www.nap.edu/topics.php?topic=278&t=p
Environment and Environmental studies	Publisher website	http://www.nap.edu/topics.php?topic=285&t=p
Food and Nutrition	Publisher website	http://www.nap.edu/topics.php?topic=287&t=p
National Academies Press	Publisher website	http://www.nap.edu/
INASP Journals online	Publisher website	http://www.inasp.info/file/4fd988568504d4bcfa2f4cd855a07d45/jols.html
Institut de l'Elevage	Organisation/Corporate website	http://www.inst-elevage.asso.fr/
Chemisches und Veterinäruntersuchungsamt (CVUA)	Organisation/Corporate website	http://www.ua-bw.de/pub/default.asp?subid=3&Lang=DE
Food Standard Agency (FSA UK News Centre)	Organisation/Corporate website	http://www.food.gov.uk/
Food Safety Network	Organisation/Corporate website	http://www.uoguelph.ca/foodsafetynetwork/
FAO Agricultural development economics division	Organisation/Corporate website	http://www.fao.org/es/esa/en/pubs_wp.htm
Food Ingredients and Packaging	Organisation/Corporate website	http://www.fda.gov/Food/FoodIngredientsPackaging/default.htm
Food Standards Australia New Zealand	Organisation/Corporate website	http://www.foodstandards.gov.au/

Information sources	Reason for exclusion from the inventory	URL
Food Safety Research Information Office	Organisation/Corporate website	http://fnic.nal.usda.gov/
Confederation of the Food and Drink Industries in the EU	Organisation/Corporate website	http://www.fooddrinkeurope.eu/
National Food Institute, Technical University of Denmark	Organisation/Corporate website	http://www.food.dtu.dk/English.aspx
European Micronutrient Recommendations Aligned	Organisation/Corporate website	http://www.eurreca.org/everyone
eIFL	Organisation/Corporate website	
European Reference Laboratory for dioxins and PCBs in food and feed	Organisation/Corporate website	http://www.crl-freiburg.eu/dioxin/index.html
European Union Reference Laboratories	Organisation/Corporate website	http://ec.europa.eu/food/animal/diseases/laboratories/index_en.htm
Globally Important Agricultural Heritage Systems	Organisation/Corporate website	http://www.fao.org/nr/giahs/en/
Institute of Food Science and Technology	Organisation/Corporate website	http://www.ifst.org/
DEFRA Animal Health	Organisation/Corporate website	http://animalhealth.defra.gov.uk/imports-exports/index.htm
Greynet	Organisation/Corporate website	http://www.greynet.org
FAO Nutrition and Consumer Protection Division	Organisation/Corporate website	http://www.fao.org/food/en/
FAO Plant Production and Protection Home	Organisation/Corporate website	http://www.fao.org/agriculture/crops/en/
Wildlife Disease Association	Organisation/Corporate website	http://www.wildlifedisease.org/
Institute of Food Safety EU-RL	Organisation/Corporate website	http://www.rikilt.wur.nl/UK/
Federal Institute for Risk Assessment	Organisation/Corporate website	http://www.bfr.bund.de/en/home.html
Health Protection Agency	Organisation/Corporate website	http://www.hpa.org.uk/
National Toxicology Program	Organisation/Corporate website	http://ntp-server.niehs.nih.gov/
Carcinogenic Potency Database	Dictionaries/Thesauri/Encyclopaedias/Glossaries/Checklists	http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?CPDB
Dictionary of Common Names (Plant Press)	Dictionaries/Thesauri/Encyclopaedias/Glossaries/Checklists	http://webarchive.nationalarchives.gov.uk/20100428141142/plantpress.com/dictionary.html
Glossary of Biotechnology for Food and Agriculture	Dictionaries/Thesauri/Encyclopaedias/Glossaries/Checklists	http://www.fao.org/docrep/004/Y2775E/Y2775E00.HTM

Information sources	Reason for exclusion from the inventory	URL
Glossary of Soil Science Terms	Dictionaries/Thesauri/Encyclopaedias/Glossaries/Checklists	https://www.soils.org/publications/soils-glossary/
Fauna Italia	Dictionaries/Thesauri/Encyclopaedias/Glossaries/Checklists	http://faunaitalia.it/index.htm
Encyclopedia of Earth	Dictionaries/Thesauri/Encyclopaedias/Glossaries/Checklists	http://www.eoearth.org/
Catalogue of Life	Dictionaries/Thesauri/Encyclopaedias/Glossaries/Checklists	http://www.catalogueoflife.org/
Dictionary of UK Species	Dictionaries/Thesauri/Encyclopaedias/Glossaries/Checklists	http://www.nhm.ac.uk/research-curation/research/projects/species-dictionary/species/index.html
Distribution Maps of Plant Diseases	Dictionaries/Thesauri/Encyclopaedias/Glossaries/Checklists	http://www.cabi.org/DMPD/
Distribution Maps of Plant Pests	Dictionaries/Thesauri/Encyclopaedias/Glossaries/Checklists	http://www.cabi.org/DMPP/
Featured Creatures	Dictionaries/Thesauri/Encyclopaedias/Glossaries/Checklists	http://entnemdept.ufl.edu/creatures/
Offical Methods of Analysis	Dictionaries/Thesauri/Encyclopaedias/Glossaries/Checklists	http://www.eoma.aoac.org/
CONffIDENCE: Contaminants in food and feed: Inexpensive detection for control of exposure	Project website	http://www.conffidence.eu/
EFCOVAL: European Food Consumption Validation	Project website	http://www.efcoval.eu/
EUFOOD4LIFE: European Technology Platform for the Agro-Food Sector: Food for Life	Project website	http://cordis.europa.eu/search/index.cfm?fuseaction=proj.document&PJ_RCN=8820119
FAHRE database of funding programmes	Project website	http://www2.spi.pt/fahre/
GOGLOBAL Network	Project website	http://www.goglobalnetwork.eu/UK/
MONIQA Association	Project website	http://www.moniqa.org/
PlantLIBRA: PLANT food supplements: Levels of Intake, Benefit and Risk Assessment	Project website	http://www.plantlibra.eu/web/
FoodRisc: Food Risk Communication.	Project website	http://www.foodrisc.org/
WHO International Programme on Chemical Safety	Project website	http://www.who.int/ipcs/en/

Information sources	Reason for exclusion from the inventory	URL
NEWGENERIS	Project website	http://www.newgeneris.org/
NOVELQ: Novel processing methods for the production and distribution of high-quality and safe foods	Project website	http://www.novelq.org/Default.aspx
VEG-i-TRADE	Project website	http://www.veg-i-trade.org/
Leatherhead Food Research	Project website	http://www.leatherheadfood.com/
NUGO: European Nutrigenomics Organisation	Project website	http://www.nugo.org/everyone
Swine Vesicular Disease.	Project website	http://www.svd.org.uk/
EpiNorth	Project website	http://www.epinorth.org/
EUROPREVALL	Project website	http://www.europrevall.org/
SAFE FOODS	Project website	http://www.eufic.org/article/en/show/eu-initiatives/rid/safe-foods-risk-analysis/
BENERIS: Benefit-Risk Assessment for Food: an Iterative Value-of-Information Approach	Project website	http://www.ktl.fi/portal/english/research__people___programs/environmental_health/research/health_risk_analysis/research_projects/beneris/
Government of Canada Research Sites	Portal	http://search-recherche.gc.ca/s_r?s5t34d=canada&t3mpl1t34d=1&l7c1l3=eng
MedIND	Portal	http://medind.nic.in/
CIARD Ring	Portal	http://ring.ciard.net/
Gateway to animal welfare	Portal	http://www.fao.org/ag/againfo/themes/animal-welfare/en/
United States National Library of Medicine databases	Portal	http://wwwcf2.nlm.nih.gov/nlm_eresources/eresources/search_database.cfm#
United States Department of Agriculture. Foreign Agricultural Service	Portal	http://www.fas.usda.gov/
US National Library of Medicine. Environmental Health and Toxicology	Portal	http://sis.nlm.nih.gov/enviro/databasedescriptions.html
Biology Browser	Portal	http://www.biologybrowser.org/
United States Department of Agriculture. National Agricultural Statistics Service	Portal	http://www.nass.usda.gov/
FoodHolland	Portal	http://www.foodholland.nl/
National Food Safety Learning Portal: Food Safety	Portal	http://learn.nfstp.ca/mod/data/view.php?id=33

Information sources	Reason for exclusion from the inventory	URL
Database		
Harvester	Portal	http://harvester.fzk.de/harvester
Agency for Toxic Substances and Disease Registry	Portal	http://www.atsdr.cdc.gov/
Food Safety Centre	Portal	http://www.foodsafetycentre.com.au/locator.php
http://www.tripdatabase.com/	Portal	http://www.tripdatabase.com/
FAO Organic Agriculture	Portal	http://www.fao.org/organicag/en/
EuroFIR	Portal	http://www.eurofir.org/
Foodlineweb	Portal	http://services.leatherheadfood.com/foodline/index.aspx
Dietary Supplements Labels Database	Portal	http://dietarysupplements.nlm.nih.gov/dietary/
ChemIDplus	Portal	http://chem.sis.nlm.nih.gov/chemidplus/
WISM-GPA	Portal	http://www.pgrfa.org/gpa/selectcountry.jspx
International Veterinary Information Service	Portal	http://www.ivis.org/home.asp
Intute	Portal	http://www.intute.ac.uk/
ISI – Scientific WebPlus Beta	Portal	http://scientific.thomsonwebplus.com/BasicSearch.aspx?lbu=WebOfKnowledge&key=49jf934i20s0g4i290s0&SID=T1pKH85DiFjhlAem86b&page=FurtherInfo&URL=http%3a%2f%2fscientific.thomsonwebplus.com%2fDefault.aspx%3flbu%3dWebOfKnowledge
Science Accelerator	Portal	http://www.scienceaccelerator.gov
Signets	Portal	http://www.signets-universites.fr/
WorldWideScience service	Portal	http://worldwidescience.org
Virtual Health Library	Portal	http://regional.bvsalud.org
FAOSTAT	Databanks	http://faostat.fao.org/
Foodborne Diseases Active Surveillance Network	Databanks	http://www.cdc.gov/foodnet/
EUROSTAT	Databanks	http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/
EUBTNet	Databanks	http://eubtnet.izs.it/pls/btnet/BT_GESTMENU.bt_index1

Information sources	Reason for exclusion from the inventory	URL
CEDI	Databanks	http://www.accessdata.fda.gov/scripts/sda/sdNavigation.cfm?sd=edisrev
Centre for Ecology and Hydrology Information Gateway	Databanks	https://gateway.ceh.ac.uk/home
Nutri-RecQuest	Databanks	http://www.serbianfood.info/eurreca/index.php
Nutritional Phenotype Database (DbNP)	Databanks	http://www.dbnp.org/
National Agricultural Pest Information System	Databanks	http://pest.ceris.purdue.edu/index.php
Comparative Toxicogenomics Database	Databanks	http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?CTD
Outbreak Alert! Database	Databanks	http://www.cspinet.org/foodsafety/outbreak/pathogen.php
Pesticides online	Databanks	http://www.pesticides-online.com/
Great Lakes Fish Monitoring and Surveillance Program	Databanks	http://www.epa.gov/glnpo/monitoring/fish/index.html
Iowa Water Science Center	Databanks	http://ia.water.usgs.gov/
National Nutrient Database	Databanks	http://ndb.nal.usda.gov/
Food and Drug Administration Recalls, Market Withdrawals & Safety Alerts	Databanks	http://www.fda.gov/Safety/Recalls/default.htm
US Food Safety and Inspection Service (FSIS Recall Data)	Databanks	http://www.fsis.usda.gov/recalls/Recall_Case_Archive/index.asp
European Antimicrobial Resistance Surveillance Network interactive database	Databanks	http://www.ecdc.europa.eu/en/activities/surveillance/EARS-Net/about_EARS-Net/Pages/about_network.aspx
World Animal Health Information Database	Databanks	http://www.oie.int/wahis_2/public/wahid.php/Wahidhome/Home
Crop prospects and food situation	Review website	http://www.fao.org/giews/english/cpfs/index.htm
State of food and agriculture	Review website	http://www.fao.org/publications/sofa/en/
Decernis gComply	Review website	http://www.decernis.com/
Animal and Plant Health Inspection Service	Review website	http://www.aphis.usda.gov/animal_health/animal_diseases/
GRAS Substances (SCOGS) database	Review website	http://www.accessdata.fda.gov/scripts/fcn/fcnNavigation.cfm?rpt=scogsListing
Encyclopedia of Life Sciences	Review website	http://www.els.net/WileyCDA/

Information sources	Reason for exclusion from the inventory	URL
AgriFeeds	News service	http://www.agrifeeds.org/
Wildlife News Digest	News service	http://wdin.blogspot.co.uk/

Appendix B. Literature search to identify information retrieval research in food and feed safety

Searches were undertaken in the following databases:

- MEDLINE and preMEDLINE (21/5/12)
- Science Citation index (21/5/12)
- ScienceDirect (21/5/12)

The search strategies used are shown below.

Database: Ovid MEDLINE(R) <1946 to May Week 2 2012>

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1 "Information Storage and Retrieval"/ (14865)
2 (search adj2 strateg$).ti,ab. (11142)
3 (information adj2 retrieval).ti,ab. (1707)
4 ((electronic or bibliographic or database$ or literature or evidence or systematic) adj2 (search or searches or searching)).ti,ab. (26917)
5 (handsearch$ or (hand adj3 search$) or (manual$ adj3 search$)).ti,ab. (6522)
6 (journal search$ or full text search$).ti,ab. (108)
7 ((grey or gray) adj2 literature).ti,ab. (764)
8 ((publication or language) adj2 bias).ti,ab. (2149)
9 or/1-8 (56570)
10 exp Food/ (955771)
11 Food Additives/ (6023)
12 exp Food Preservatives/ (6762)
13 exp Food Preservation/ (10332)
14 exp Food Contamination/ (47984)
15 exp Foodborne Diseases/ (14337)
16 exp Food Handling/ (31057)
17 Food Inspection/ (2544)
18 exp Animal Feed/ (70746)
19 exp Animal Welfare/ (9413)
20 exp Veterinary Medicine/ (19322)
21 Veterinary Drugs/ (1506)
22 Veterinarians/ (2175)
23 Pesticides/ (12622)
24 (food$1 or feed$1).ti,ab. (257000)
25 (animal$1 adj2 (health or welfare or cruelty)).ti,ab. (5511)
26 (veterinary or veterinarian$).ti,ab. (27759)
27 ((foodborne or food borne) adj3 disease$1).ti,ab. (1343)
28 ((food or dietary) adj2 supplement$).ti,ab. (13000)
29 ((food or meat) adj3 inspection).ti,ab. (916)
30 (pesticide$ or fungicide$ or herbicide$).ti,ab. (36419)
31 or/10-30 (1220629)
32 9 and 31 (2478)

Database: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <May 18, 2012>

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1 (search adj2 strateg$).ti,ab. (447)
2 (information adj2 retrieval).ti,ab. (130)

3 ((electronic or bibliographic or database$ or literature or evidence or systematic) adj2 (search or searches or searching)).ti,ab. (2394)
4 (handsearch$ or (hand adj3 search$) or (manual$ adj3 search$)).ti,ab. (536)
5 (journal search$ or full text search$).ti,ab. (9)
6 ((grey or gray) adj2 literature).ti,ab. (130)
7 ((publication or language) adj2 bias).ti,ab. (237)
8 or/1-7 (3470)
9 (food$1 or feed$1).ti,ab. (17102)
10 (animal$1 adj2 (health or welfare or cruelty)).ti,ab. (536)
11 (veterinary or veterinarian$).ti,ab. (2192)
12 ((foodborne or food borne) adj3 disease$1).ti,ab. (101)
13 ((food or dietary) adj2 supplement$).ti,ab. (840)
14 ((food or meat) adj3 inspection).ti,ab. (83)
15 (pesticide$ or fungicide$ or herbicide$).ti,ab. (2781)
16 or/9-15 (22731)
17 10 and 16 (536)

SCI (WoS). 1899 – 2012-05-18
Databases=SCI-EXPANDED Timespan=All Years
Lemmatization=Off

1 10,280 TS=(search NEAR/2 strateg*)
2 10,237 TS=(information NEAR/2 retrieval)
3 31,912 TS=((electronic or bibliographic or database* or literature or evidence or systematic) NEAR/2 (search or searches or searching))
4 5,404 TS=(handsearch* or (hand NEAR/3 search*) or (manual* NEAR/3 search*))
5 188 TS=("journal search*" or "full text search*")
6 760 TS=((grey or gray) NEAR/2 literature)
7 3,095 TS=((publication or language) NEAR/2 bias)
8 56,220 #1 or #2 or #3 or #4 or #5 or #6 or #7
9 508,973 TS=(food$ or feed$)
10 12,828 TS=(animal$ NEAR/2 (health or welfare or cruelty))
11 40,022 TS=(veterinary or veterinarian*)
12 1,944 TS=((foodborne or "food borne") NEAR/3 disease$)
13 16,915 TS=(dietary NEAR/2 supplement*)
14 917 TS=(meat NEAR/3 inspection)
15 105,704 TS=(pesticide* or fungicide* or herbicide*)
16 666,837 #9 or #10 or #11 or #12 or #13 or #14 or #15
17 1,492 #8 and #16

ScienceDirect. (www.sciencedirect.com/)

TITLE-ABSTR-KEY((search W/2 strategy) OR (information W/2 retrieval) OR ((electronic OR bibliographic OR database OR literature OR evidence OR systematic) W/2 (search OR searches OR searching)) OR handsearch OR "grey literature" OR "gray literature" OR (publication W/2 bias) OR (language W/2 bias)) AND (food OR feed OR (animal W/2 health) OR (animal W/2 welfare) OR (animal W/2 cruelty) OR veterinary OR veterinarian OR (foodborne W/3 disease) OR ("food borne" W/3 disease) OR (dietary W/2 supplement) OR (meat W/3 inspection) OR pesticide or fungicide or herbicide)

2,693 records

search W/2 strategy OR information W/2 retrieval

((electronic OR bibliographic OR database OR literature OR evidence OR systematic) W/2 (search OR searches OR searching))

handsearch OR "grey literature" OR "gray literature" OR publication W/2 bias OR language W/2 bias

food OR feed OR (animal W/2 health) OR (animal W/2 welfare) OR (animal W/2 cruelty) OR veterinary OR veterinarian OR (foodborne W/3 disease) OR ("food borne" W/3 disease) OR (dietary W/2 supplement) OR (meat W/3 inspection) OR pesticide or fungicide or herbicide

NB searches for plural terms automatically.

Appendix C. Additional Relative Recall Analyses

Dufour S, Fréchette A, Barkema HW, Mussell A, Scholl DT. Invited review: effect of udder health management practices on herd somatic cell count. J Dairy Sci. 2011 Feb;94(2):563-79. http://dx.doi.org/10.3168/jds.2010-3715

Year of publication: 2011

Review question: the objective of this study was to perform a standardized review of the literature on associations between management practices used on dairy farms and herd-level SCC. A specific objective was to distinguish between management practices that have consistently shown association with SCC when applied at the herd level, and management practices for which evidence of an association with herd-level SCC is lacking.

Review inclusion criteria:

To be included in the review, a manuscript had to meet the additional following criteria:

1. Intervention studied was a management practice applied or observed at the herd level and used as an udder health control strategy;

2. SCC was measured using cell counting methods rather than California mastitis test (CMT) or rapid mastitis test (immucell, portland, me);

3. Study design was not case report or case series;

4. Mean 305-d milk production of the herds studied was ≥7,000 kg; and

5. Mean herd size of the herds studied was ≥40 milking cows.

Number of databases searched: 5 (Pubmed, Medline, CAB, Agricola, And Web Of Science)

Search date: April 22, 2009

Search restrictions: Original research published in French, English, or Dutch; restricted to manuscripts published later than 1979.

Number of included studies: 36

1. Bach, N. Valls, A. Solans, T. Torrent. Associations between nondietary factors and dairy herd performance. J. Dairy sci., 91 (2008), pp. 3259–3267

2. N. Bareille, H. Seegers, C. Fourichon, F. Beaudeau, X. Malher. Survenue et expression des mammites cliniques et subcliniques en troupeaux bovins laitiers: facteurs de risque liés à la conception et à l'utilisation du bâtiment. Rencontres autour des recherches sur les ruminants institut de l'élevage, paris, france (1998) pages 297–300

3. N. Bareille, H. Seegers, M.B. Kiebre-Toe, F. Beaudeau, C. Fourichon. Risk factors for elevated milk somatic cell counts during early lactation in dairy heifers. Proceedings of the 10th International Congress on Animal Hygiene, Maastricht, the Netherlands, Animal Health Services, Maastricht, the Netherlands (2000), pp. 509–514

4. H.W. Barkema, Y.H. Schukken, T.J.G.M. Lam, M.L. Beiboer, H. Wilmink, G. Benedictus, A. Brand. Incidence of clinical mastitis in dairy herds grouped in three categories by bulk milk somatic cell counts. J. Dairy Sci., 81 (1998), pp. 411–419

5. H.W. Barkema, Y.H. Schukken, T.J.G.M. Lam, M.L. Beiboer, G. Benedictus, A. Brand. Management practices associated with low, medium, and high somatic cell counts in bulk milk. J. Dairy Sci., 81 (1998), pp. 1917–1927

6. J. Barnouin, M. Chassagne, S. Bazin, D. Boichard. Management practices from questionnaire surveys in herds with very low somatic cell score through a national mastitis program in France. J. Dairy Sci., 87 (2004), pp. 3989–3999

7. P.C. Bartlett, G.Y. Miller, S.E. Lance, L.E. Heider. Environmental and managerial determinants of somatic-cell counts and clinical mastitis incidence in Ohio dairy herds. Prev. Vet. Med., 14 (1992), pp. 195–207

8. J. Bewley, R.W. Palmer, D.B. Jackson-Smith . A comparison of free-stall barns used by modernized Wisconsin dairies. J. Dairy Sci., 84 (2001), pp. 528–541

9. P. Billon, F. Tournaire . Impact of automatic milking systems on milk quality and farm management: The French experience. 1st N. Am. Conf. Robotic Milking, Toronto, ON, Canada, Wageningen Press, Wageningen, the Netherlands (2002), pp. V59–V63

10. S. De Vliegher, H. Laevens, H.W. Barkema, I.R. Dohoo, H. Stryhn, G. Opsomer, A. de Kruif . Management practices and heifer characteristics associated with early lactation somatic cell count of Belgian dairy heifers. J. Dairy Sci., 87 (2004), pp. 937–947

11. K.A. Ellis, G.T. Innocent, M. Mihm, P. Cripps, W.G. McLean, C.V. Howard, D. Grove-White . Dairy cow cleanliness and milk quality on organic and conventional farms in the UK. J. Dairy Res., 74 (2007), pp. 302–310

12. R.J. Erskine, R.J. Eberhart, L.J. Hutchinson, S.B. Spencer. Herd management and prevalence of mastitis in dairy herds with high and low somatic cell counts. J. Am. Vet. Med. Assoc., 190 (1987), pp. 1411–1416

13. R.J. Erskine, R.J. Eberhart, L.J. Hutchinson, R.W. Scholz . Blood selenium concentrations and glutathione peroxidase activities in dairy herds with high and low somatic cell counts. J. Am. Vet. Med. Assoc., 190 (1987), pp. 1417–1421

14. R.J. Erskine, R.J. Eberhart . Post-milking teat dip use in dairy herds with high or low somatic cell counts. J. Am. Vet. Med. Assoc., 199 (1991), pp. 1734–1736

15. W.K. Fulwider, T. Grandin, D.J. Garrick, T.E. Engle, W.D. Lamm, N.L. Dalsted, B.E. Rollin . Influence of free-stall base on tarsal joint lesions and hygiene in dairy cows. J. Dairy Sci., 90 (2007), pp. 3559–3566

16. W.J. Goodger, J.C. Galland, V.E. Christiansen. Survey of milking management practices on large dairies and their relationship to udder health and production variables. J. Dairy Sci., 71 (1988), pp. 2535–2542

17. C.T. Hutton, L.K. Fox, D.D. Hancock . Mastitis control practices: Differences between herds with high and low milk somatic cell counts. J. Dairy Sci., 73 (1990), pp. 1135–1143

18. C.T. Hutton, L.K. Fox, D.D. Hancock. Risk-factors associated with herd-group milk somatic-cell count and prevalence of coagulase-positive staphylococcal intramammary infection. Prev. Vet. Med., 11 (1991), pp. 25–35

19. B.M. Jayarao, S.R. Pillai, A.A. Sawant, D.R. Wolfgang, N.V. Hegde. Guidelines for monitoring bulk tank milk somatic cell and bacterial counts. J. Dairy Sci., 87 (2004), pp. 3561–3573

20. M.L. Khaitsa, T.E. Wittum, K.L. Smith, J.L. Henderson, K.H. Hoblet. Herd characteristics and management practices associated with bulk-tank somatic cell counts in herds in official Dairy Herd Improvement Association programs in Ohio. Am. J. Vet. Res., 61 (2000), pp. 1092–1098

21. G.H. Klungel, B.A. Slaghuis, H. Hogeveen. The effect of the introduction of automatic milking systems on milk quality. J. Dairy Sci., 83 (2000), pp. 1998–2003

22. J.J. Lievaart, H.W. Barkema, W.D.J. Kremer, J. van den Broek, J.H.M. Verheijden, J.A.P. Heesterbeek. Effect of herd characteristics, management practices, and season on different categories of the herd somatic cell count. J. Dairy Sci., 90 (2007), pp. 4137–4144

23. A.K. Nyman, U. Emanuelson, A.H. Gustafsson, K.P. Waller. Management practices associated with udder health of first-parity dairy cows in early lactation. Prev. Vet. Med., 88 (2009), pp. 138–149

24. M.D. Rasmussen, J.Y. Blom, L.A.H. Nielsen, P. Justesen. Udder health of cows milked automatically. Livest. Prod. Sci., 72 (2001), pp. 147–156

25. M.D. Rasmussen, M. Bjerring, P. Justesen, L. Jepsen. Milk quality on Danish farms with automatic milking systems. J. Dairy Sci., 85 (2002), pp. 2869–2878

26. A.C. Rodrigues, D.Z. Caraviello, P.L. Ruegg. Management of Wisconsin dairy herds enrolled in milk quality teams. J. Dairy Sci., 88 (2005), pp. 2660–2671

27. J.W. Smith, L.O. Ely. The influence of feeding and housing systems on production, reproduction, and somatic sell count scores of southern Holstein herds. Prof. Anim. Sci., 13 (1997), pp. 155–16. (**Note:** The reference is given as found in the review. 'Sell' is used in the review reference list. It appears to be a typographical error).

28. J.W. Smith, L.O. Ely, W.M. Graves, W.D. Gilson. Effect of milking frequency on DHI performance measures. J. Dairy Sci., 85 (2002), pp. 3526–3533

29. Svensson, A.K. Nyman, K.P. Waller, U. Emanuelson. Effects of housing, management, and health of dairy heifers on first-lactation udder health in Southwest Sweden. J. Dairy Sci., 89 (2006), pp. 1990–1999

30. Y. van der Vorst, H. Hogeveen. Automatic milking systems and milk quality in the Netherlands. Proceedings of the International Symposium Robotic Milking, Lelystad, the Netherlands, Wageningen Press, Wageningen, the Netherlands (2000), pp. 73–82

31. van der Vorst, Y., K. Knappstein, and M. D. Rasmussen. 2002. Milk quality on farm with an automatic milking system. Effects of automatic milking on the quality of produced milk. Report D8 EU Project. Implications of the introduction of automatic milking on dairy farms (QLK5 2000–31006). Accessed July 5, 2010. http://www.automaticmilking.nl

32. van der Vorst, Y., K. Bos, W. Ouweltjes, and J. Poelarends. 2003. Milk quality on farms with an automatic milking system: Farm and management factors affecting milk quality. Report D9 of the EU Project. Implications of the introduction of automatic milking on dairy farms (QLK5–2000–31006). Accessed July 5, 2010. http://www.automaticmilking.nl/

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34. W.P. Weiss, J.S. Hogan, K.L. Smith, K.H. Hoblet. Relationships among selenium, vitamin E, and mammary gland health in commercial dairy herd. Dairy Sci., 73 (1990), pp. 381–390

35. J.R. Wenz, S.M. Jensen, J.E. Lombard, B.A. Wagner, R.P. Dinsmore. Herd management practices and their association with bulk tank somatic cell count on United States dairy operations. J. Dairy Sci., 90 (2007), pp. 3652–3659

36. D.J. Wilson, R.N. Gonzalez, P.M. Sears. Segregation or use of separate milking units for cows infected with Staphylococcus aureus: Effects on prevalence of infection and bulk tank somatic cell count. J. Dairy Sci., 78 (1995), pp. 2083–2085

Results

Yield and relative recall for each resource

BIOSIS Citation Index was searched in addition to the resources listed in the review due to its relevance to both the topic and the work of EFSA.

Table C.1: Yield and relative recall for each resource

	Number of papers found	Relative Recall
Database searched		
PubMed	25	0.69
Medline (via Ovid MEDLINE(R)1946 to August Week 2 2012)	25	0.69
CABI: CAB Abstracts	29	0.81
Agricola (via http://agricola.nal.usda.gov/ - both Agricola databases searched)	27	0.75
Web of Science	29	0.81
BIOSIS Citation Index	26	0.72

Table C.2: Yield and relative recall by combination of resource

	Number of papers found	Relative Recall
Database combinations		
PubMed and Medline and Agricola and Web of Science and CABI	31	0.86
PubMed and Agricola and Web of Science and CABI	31	0.86

	Number of papers found	Relative Recall
Database combinations		
Medline and Agricola and Web of Science and CABI	31	0.86
Agricola and Web of Science and CABI	31	0.86
PubMed and Medline and Agricola and Web of Science and BIOSIS Citation Index and CABI	31	0.86
PubMed and Agricola and Web of Science and BIOSIS Citation Index and CABI	31	0.86
Medline and Agricola and Web of Science and BIOSIS Citation Index and CABI	31	0.86
Agricola and Web of Science and BIOSIS Citation Index and CABI	31	0.86
PubMed and Medline and Agricola and BIOSIS Citation Index and CABI	31	0.86
PubMed and Agricola and BIOSIS Citation Index and CABI	31	0.86
Medline and Agricola and BIOSIS Citation Index and CABI	31	0.86
Agricola and BIOSIS Citation Index and CABI	31	0.86
PubMed and Medline and Agricola and CABI	31	0.86
PubMed and Agricola and CABI	31	0.86
Medline and Agricola and CABI	31	0.86
CABI and Agricola	31	0.86
PubMed and Medline and Agricola and Web of Science	30	0.83
PubMed and Agricola and Web of Science	30	0.83
Medline and Agricola and Web of Science	30	0.83
Agricola and Web of Science	30	0.83
PubMed and Medline and Agricola and Web of Science and BIOSIS Citation Index	30	0.83
PubMed and Agricola and Web of Science and BIOSIS Citation Index	30	0.83
Medline and Agricola and Web of Science and BIOSIS Citation Index	30	0.83
Agricola and Web of Science and BIOSIS Citation Index	30	0.83
PubMed and Medline and Web of Science and CABI	30	0.83
PubMed and Web of Science and CABI	30	0.83
Medline and Web of Science and CABI	30	0.83
PubMed and Medline and Web of Science and BIOSIS Citation Index and CABI	30	0.83
PubMed and Web of Science and BIOSIS Citation Index and CABI	30	0.83
Medline and Web of Science and BIOSIS Citation Index and CABI	30	0.83

	Number of papers found	Relative Recall
Database combinations		
Web of Science and BIOSIS Citation Index and CABI	30	0.83
PubMed and Medline and BIOSIS Citation Index and CABI	30	0.83
PubMed and BIOSIS Citation Index and CABI	30	0.83
Medline and BIOSIS Citation Index and CABI	30	0.83
PubMed and Medline and CABI	30	0.83
CABI and Medline	30	0.83
CABI and PubMed	30	0.83
CABI and Web of Science	30	0.83
CABI and Biosis Citation Index	30	0.83
PubMed and Medline and Web of Science	29	0.81
PubMed and Web of Science	29	0.81
Medline and Web of Science	29	0.81
PubMed and Medline and Web of Science and BIOSIS Citation Index	29	0.81
PubMed and Web of Science and BIOSIS Citation Index	29	0.81
Medline and Web of Science and BIOSIS Citation Index	29	0.81
PubMed and Medline and Agricola and BIOSIS Citation Index	29	0.81
PubMed and Agricola and BIOSIS Citation Index	29	0.81
Medline and Agricola and BIOSIS Citation Index	29	0.81
Agricola and BIOSIS Citation Index	29	0.81
Web of Science and BIOSIS Citation Index	29	0.81
PubMed and Medline and BIOSIS Citation Index	28	0.78
PubMed and BIOSIS Citation Index	28	0.78
Medline and BIOSIS Citation Index	28	0.78
PubMed and Medline and Agricola	27	0.75
PubMed and Agricola	27	0.75
Medline and Agricola	27	0.75
PubMed and Medline	25	0.69

Table C.3: Overlap between resources

	Number of papers found in both / all of listed databases
Combination of databases	
CAB and Web of Science	28
Agricola and Web of Science	26
Web of Science and BIOSIS Citation Index	26
Agricola and Web of Science and CABI	25
Web of Science and BIOSIS Citation Index and CABI	25
PubMed and Medline and Agricola and Web of Science	25
PubMed and Medline and Agricola	25
PubMed and Medline and Web of Science	25
PubMed and Agricola and Web of Science	25
Medline and Agricola and Web of Science	25
PubMed and Medline	25
PubMed and Agricola	25
PubMed and Web of Science	25
Medline and Agricola	25
Medline and Web of Science	25
CAB and Agricola	25
CAB and BIOSIS Citation Index	25
PubMed and Medline and Agricola and Web of Science and CABI	24
PubMed and Medline and Agricola and CABI	24
PubMed and Medline and Web of Science and CABI	24
PubMed and Agricola and Web of Science and CABI	24
Medline and Agricola and Web of Science and CABI	24
PubMed and Medline and CABI	24
PubMed and Agricola and CABI	24
PubMed and Web of Science and CABI	24
Medline and Agricola and CABI	24
Medline and Web of Science and CABI	24
Agricola and Web of Science and BIOSIS Citation Index	24
Agricola and BIOSIS Citation Index	24
CAB and PubMed	24
CAB and Medline	24
Agricola and Web of Science and BIOSIS Citation Index and CABI	23
Agricola and BIOSIS Citation Index and CABI	23
PubMed and Medline and Agricola and Web of Science and BIOSIS Citation Index	23
PubMed and Agricola and Web of Science and BIOSIS Citation Index	23
Medline and Agricola and Web of Science and BIOSIS Citation Index	23
PubMed and Medline and Web of Science and BIOSIS Citation Index	23

	Number of papers found in both / all of listed databases
Combination of databases	
PubMed and Web of Science and BIOSIS Citation Index	23
Medline and Web of Science and BIOSIS Citation Index	23
PubMed and Medline and Agricola and BIOSIS Citation Index	23
PubMed and Agricola and BIOSIS Citation Index	23
Medline and Agricola and BIOSIS Citation Index	23
PubMed and Medline and BIOSIS Citation Index	23
PubMed and BIOSIS Citation Index	23
Medline and BIOSIS Citation Index	23
PubMed and Medline and Agricola and Web of Science and BIOSIS Citation Index and CABI	22
PubMed and Agricola and Web of Science and BIOSIS Citation Index and CABI	22
Medline and Agricola and Web of Science and BIOSIS Citation Index and CABI	22
PubMed and Medline and Web of Science and BIOSIS Citation Index and CABI	22
PubMed and Web of Science and BIOSIS Citation Index and CABI	22
Medline and Web of Science and BIOSIS Citation Index and CABI	22
PubMed and Medline and Agricola and BIOSIS Citation Index and CABI	22
PubMed and Agricola and BIOSIS Citation Index and CABI	22
Medline and Agricola and BIOSIS Citation Index and CABI	22
PubMed and Medline and BIOSIS Citation Index and CABI	22
PubMed and BIOSIS Citation Index and CABI	22
Medline and BIOSIS Citation Index and CABI	22

Table C.4: Unique references

	Number of papers found only in this database
Database	
PubMed	0
Medline	0
Agricola	1
Web of Science	0
CABI	1
BIOSIS Citation Index	0

Performance of the review search strategies

The database search methods as described in the review are given below:

"Five databases (PubMed, MEDLINE, CAB, Agricola, and Web of Science) were searched on April 22, 2009, for original research published in French, English, or Dutch. To ensure that the retrieved manuscripts would be relevant for modern dairy herds, searches were restricted to manuscripts published later than 1979. Search strategies were developed with the help of a librarian and consisted of Boolean search statements using medical subject heading (MeSH) terms specific to each database. The MeSH terms used were descriptors of the population (dairy cows) and outcome (SCC) of interest; MeSH is a system of medical metadata consisting of sets of terms naming descriptors in a hierarchical structure that permits searching at various levels of specificity. The Boolean search strategies and MeSH terms used were "cattle" and "cell count" and "milk" for MEDLINE and PubMed; "dairy cattle" and "somatic cell count" for CAB; "cow" and "somatic cell count" for Agricola; and "cow" or "cows" or "cattle" or "bovine" and "somatic cell count" for Web of Science. Manuscripts retrieved from the different databases were collated and duplicates were eliminated. Only manuscripts for which an abstract was available were considered."

Reporting of search methodology for this review is limited and less than optimal. Search strategies for each resource are not described in enough detail to reproduce with confidence. Examples of missing / unclear methodology include: details on interfaces used to access databases, fields searched (it states that the search consisted of Boolean statements using MesH terms specific to each database - in fact, MeSH is only used by the PubMed / MEDLINE databases – search strategies on other databases are therefore unclear), use of explosion in MeSH, use of phrases. For the purposes of this exercise, the review search methodology has been interpreted as outlined below. As we cannot reproduce the search strategies with any confidence however, any conclusions about the performance of the review search strategies must be treated with caution.

PubMed

#4	Add	Search #1 and #2 and #3	1252
#3	Add	Search milk[mh]	60703
#2	Add	Search Cell Count[mh]	171321
#1	Add	Search cattle[mh:noexp]	279013

Ovid MEDLINE(R) 1946 to August Week 3 2012

1	Cattle/	282036	Advanced
2	exp Cell Count/	173336	Advanced
3	exp Milk/	61271	Advanced
4	1 and 2 and 3	1257	Advanced

Agricola

Database Name: Article Citation Database, NAL Catalog
Search Request: Search = (cow)[in Keyword Anywhere] AND (somatic AND cell AND count)[in Keyword Anywhere]

Search Results: 386 entries.

Web of Science

#3 2,809 #1 and #2
2 4,126 TS=(somatic cell count)
1 338,570 TS=(cow or cows or cattle or bovine)

CABI

#3 4,891 #1 and #2

2 8,002 TS=(somatic cell count)

1 197,476 TS=(dairy cattle)

Performance of the review search strategies (as interpreted above)

None of the review search strategies for each database (as interpreted above) successfully retrieved all studies indexed. All search strategies appear basic. There is very limited use of available synonyms / alternate terms. No use is made of truncation. The potential of controlled vocabulary / textword searches does not appear to have been fully exploited. The PubMed and MEDLINE strategies as interpreted above retrieved 18 out of a possible 25 studies. The main reasons for the 7 missing studies appear to relate to key limitations in the search strategy i.e. limited use of available MeSH terms and no use of textword searches. The Agricola search strategy as interpreted above performed particularly poorly, retrieving only 11 studies out of a possible 27. The main reasons for the 16 missing studies again appears to be key limitations of the search strategy i.e. limited use of search terms and no use of truncation, particularly for the population. Only the term 'cow' was used – therefore missing studies with other terms which indicated a potentially relevant population e.g. cows, cow's, bovine, cattle, dairy, herd/s, farm/s/ing, heifer/s, calf, calves, calving etc. The Web of Science search strategy as interpreted above retrieved 22 out of a possible 29 studies. Limited use of search terms appears responsible for the 7 missing studies e.g. only searching on cow, cows, cattle, bovine, therefore again missing studies using other terms indicating a potentially relevant population. The CABI search as interpreted above retrieved 24 out of a possible 29 studies. Again, limited use of search terms appears responsible for the 5 missing studies e.g. only searching on 'dairy cattle'.

Discussion

None of the resources assessed contained all of the included papers. CABI and Web of Science have the highest relative recall of the resources we assessed, containing 29 of the 36 included papers – giving them a relative recall of 0.81. Agricola contained 27 papers, giving a relative recall of 0.75. PubMed and MEDLINE had the worst yield, each containing 25 papers, giving a relative recall of 0.69. This would seem to confirm the importance of searching beyond PubMed / Medline for systematic reviews. BIOSIS Citation Index retrieved 26 papers, with a relative recall of 0.72. Adding BIOSIS Citation Index to the sources searched by the review did not increase the overall yield of the total database search, containing no unique references.

Of the 36 included studies, 5 were not found in any of the 6 databases we assessed. 2 of these appear to be from conference proceedings, and 3 are reports sourced online. In addition to the 5 databases they searched, the authors also used iterative screening of references to identify relevant literature – the 5 studies may have been identified via these sources. The fact that the 5 included references not

contained in the databases assessed are from conferences / online sources perhaps suggests the importance of searching conference literature and grey literature in this topic area.

The best performing database combinations retrieved 31 of the 36 papers, with a relative recall of 0.86. Searching only Agricola and CABI was one of these combinations, and the others all included both Agricola and CABI. This may suggest Agricola and CABI are useful databases to include as search sources in this topic area. Only Agricola and CABI contained unique results (1 each).

In general, there was significant overlap between the databases. Of the 31 studies contained across the 6 databases, 22 could be found in each database. MEDLINE and PubMed had 100% overlap in papers contained. As the PubMed database contains MEDLINE this is perhaps unsurprising, and suggests one should consider carefully the value of searching both PubMed and MEDLINE.

As outlined above, reporting of search methodology in the review was less than optimal, so we were unable to replicate and assess exact versions of the database strategies. The interpreted versions of the strategies which we ran performed relatively poorly, each failing to retrieve a significant number of studies indexed in the database being searched. The strategy for Agricola performed particularly poorly. As it was not possible to run exact versions of the strategies, it is difficult to give definitive comment on their performance. From the details given however it is clear that there are a number of issues which potentially limit their effectiveness as robust, sensitive search strategies. Future reviews in a similar topic area should take care when constructing search strategies to consider carefully key aspects of search strategy design. Wherever possible both controlled vocabulary and textword searches should be used. Reviewers should ensure searches include all relevant search terms, including synonyms / alternate terms, and that terms are included consistently across databases where possible. Database functionality such as controlled vocabulary and truncation should be fully exploited. Reviewers should consider consulting an information specialist experienced in designing search strategies for systematic reviews. Reviewers should also ensure that search methodology is reported in clear, full detail – searches should be reproducible. Any retrospective assessment of the performance of review search strategies is limited in that the search functionality of the database may have changed since the date of the review's search i.e. the same search strategy may perform differently when carried out now compared to the original search. This limitation should be considered in relation to the assessments made of the search strategies.

Conclusion

Our study is limited in a number of ways. Relative recall using a reference standard formed from a review's included references is only as good as the sum of the individual searches carried out for the review. As methodological weaknesses were identified in the reported search strategies for this review, it is possible that some papers were missing from our "gold standard" reference. Moreover, as the included studies were drawn from only one review, the generalizability of the results may be limited. In relation to assessing the performance of the review's search strategies, as search reporting was less than optimal we were unable to replicate strategies with full confidence - our assessment of their performance should be considered in this context.

Bearing in mind these limitations however, for reviews in this topic area we can cautiously make the following conclusions:

- Searching both Pubmed and MEDLINE is unnecessary;
- Searching beyond Pubmed / MEDLINE is essential;
- Agricola and CABI databases may be important to include as search sources;
- Although there was a significant degree of overlap across databases, searching a number of databases may be important to retrieve all relevant references;
- Searching the conference literature and the grey literature may be important;
- Care should be taken when constructing search strategies and an experienced information specialist should be consulted;
- Care should be taken to report search methodology clearly and with full detail.

O'Connor AM, Denagamage T, Sargeant JM, Rajic A, McKean, J. Feeding management practices and feed characteristics associated with Salmonella prevalence in live and slaughtered market-weight finisher swine. A systematic review and summation of evidence from 1950-2005. Preventive Veterinary Medicine 2008, 84 (3/3) pp.231-228

Year of publication: 2008

Review question: Is there an association between Salmonella prevalence in market-weight finisher swine and feeding management practices and feed characteristics?

Review inclusion criteria:

- Study population must be market-weight finisher swine raised by production systems in the European Union or the developed nations of the Pacific Rim;
- Interventions of interest should be related to either a) the timing and location of feed offered to pigs or b) the texture, pH, moisture content or form of feed offered to pigs;
- Outcomes of interest are the ante-mortem or post-mortem prevalence of Salmonella, based on antibodies or culture;

- Studies must be primary research papers from peer reviewed journals, PhD theses, and conference proceedings. The studies must have been designed to test a hypothesis;

- Papers must be written in English.

Databases searched: 13 (AGRICOLA 1970-2005, AGRIS 1975-2005, Biological & Agricultural Index 1983-2005, Biological Abstracts 1980-1989, BIOSIS Previews 1980-2005, CAB Abstracts 1972-2005, Current Contents 1998-2005, Dissertation Abstracts 1961-2005, Food Science & Technology Abstracts 1969-2005, Ingenta Gateway 1997-2005, MEDLINE 1950-2000, PubMed 1965-2005, Web of Science 1945-2005).

Number of included studies: 15

1. Bahnson PJ et al. Herd-level risk for Salmonella culture positive status in slaughtered pigs. Proceedings of the 4th International Symposium on the Epidemiology and Control of Salmonella and other Food Borne Pathogens in Pork, Leipzig, Germany, 9–11 September 2001: 244–249.

2. Beloeil PA et al. Impact of the Salmonella status of market-age pigs and the pre-slaughter process on Salmonella caecal contamination at slaughter. Veterinary Research 2004; 35: 513-530.

3. Beloeil PA et al. Risk factors for Salmonella enterica subsp. Enterica shedding by market-age pigs in French farrow-to-finish herds. Preventative Veterinary Medicine 2004; 60: 103-120.

4. Dahl J et al. An intervention study of the effect of introducing salmonella controlling feed strategies in salmonella high prevalence herds. Proceedings of the 4th International Symposium on the Epidemiology and Control of Salmonella and other Food Borne Pathogens in Pork, Leipzig, Germany, 5–8 August 1999: 340–342.

5. Dahl J. Cross sectional epidemiological analysis of the relations between different herd factors and Salmonella seropositivity. Epidemiologie et Sante Animale 1997; 31/32: 1-3.

6. Jorgensen J et al. The effect of feeding pellets, meal and heat treatment on the Salmonella prevalence of finishing pigs. Proceedings of the 4th International Symposium on the Epidemiology and Control of Salmonella and other Food Borne Pathogens in Pork, Leipzig, Germany, 5–8 August 1999: 308–312.

7. Kjeldsen NJ et al. The effect of feeding non-heat treated, non-pelleted feed compared to feeding pelleted, heat treated feed on the Salmonella prevalence of finishing pigs. Proceedings of the 3rd International Symposium on the Epidemiology and Control of Salmonella and other Food Borne Pathogens in Pork, Leipzig, Germany, 5–8 August 1999: 313–316.

8. Kranker S et al. Bacteriological and serological examination and risk factor analysis of Salmonella occurrence in sow-herds, including risk factors for high Salmonella seroprevalence in receiver finishing herds. Berliner und Münchener tierärztliche Wochenschrift 2001; 114: 350-352.

9. Letellier A et al. Assessment of various treatments to reduce carriage of Salmonella in swine. Canadian Journal of Veterinary Research 2000; 64: 37-31.

10. Lo Fo Wong J et al. Herd-level risk factors for subclinical Salmonella infection in European finishing-pig herds. Preventative Veterinary Medicine 2004; 62: 253-266.

11. Morrow WE et al. Effect of withdrawing feed from swine on meat quality and prevalence of Salmonella colonization at slaughter. Journal of the American Veterinary Medical Association 2002; 220: 497-502.

12. Nollet N et al. Risk factors for the herd level bacteriologic prevalence of Salmonella in Belgian slaughter pigs. Preventative Veterinary Medicine 2004; 65: 63-75.

13. Urlings H A et al. Microbial and nutritional aspects of feeding fermented feed (poultry by-products) to pigs. The Veterinary Quarterly 1993; 15: 146-151.

14. Van der Wolf PJ et al. Salmonella infections in finishing pigs in the Netherlands: bacteriological herd prevalence, serogroup and antiobiotic resistance of isolates and risk factors for infections. Veterinary Microbiology 1999; 67: 263-275.

15. Van der Wolf PJ et al. Herd-level husbandry factors associated with the serological Salmonella prevalence in finishing pig-herds in the Netherlands. Veterinary Mircobiology 2001; 78: 205-219.

Results

Table C.5: Yield and relative recall for individual resources

Database searched	Number of papers found	Relative Recall
AGRICOLA	5	0.333333333
AGRIS	2	0.133333333
Biological & Agricultural Index	Unable to access	N/A
Biological Abstracts	Unable to access	N/A
BIOSIS Previews	9	0.6
CAB Abstracts	11	0.733333333
Current Contents	Unable to access	N/A
Dissertation Abstracts	Unable to access	N/A
Food Science & Technology Abstracts	Unable to access	N/A
Ingenta Gateway	2	0.133333333
MEDLINE	10	0.666666667
PubMed	10	0.666666667
Web of Science	12	0.8

Table C.6: Yield and relative recall by combination of resources

Database combinations	Number of papers found	Relative Recall
AGRICOLA and CAB Abstracts and Web of Science	11	0.733333333
AGRIS and CAB Abstracts and Web of Science	11	0.733333333
BIOSIS and CAB Abstracts and Web of Science	11	0.733333333
CAB Abstracts and INGENTA and Web of Science	11	0.733333333
CAB Abstracts and MEDLINE and Web of Science	11	0.733333333
CAB Abstracts and PubMed and Web of Science	11	0.733333333
CAB Abstracts and Web of Science	11	0.733333333
AGRICOLA and AGRIS and CAB Abstracts	11	0.733333333
AGRICOLA and BIOSIS and CAB Abstracts	11	0.733333333
AGRICOLA and CAB Abstracts	11	0.733333333
AGRICOLA and CAB Abstracts and INGENTA	11	0.733333333
AGRICOLA and CAB Abstracts and MEDLINE	11	0.733333333
AGRICOLA and CAB Abstracts and PubMed	11	0.733333333
AGRIS and BIOSIS and CAB Abstracts	11	0.733333333
AGRIS and CAB Abstracts	11	0.733333333
AGRIS and CAB Abstracts and INGENTA	11	0.733333333
AGRIS and CAB Abtstracts and MEDLINE	11	0.733333333
AGRIS and CAB Abstracts and PubMed	11	0.733333333
BIOSIS and CAB Abstracts	11	0.733333333
BIOSIS and CAB Abstracts and INGENTA	11	0.733333333
BIOSIS and CAB Abstracts and MEDLINE	11	0.733333333
BIOSIS and CAB Abstracts and PubMed	11	0.733333333
CAB Abstracts and INGENTA	11	0.733333333
CAB Abstracts and INGENTA and MEDLINE	11	0.733333333
CAB Abstracts and INGENTA and PubMed	11	0.733333333
CAB Abstracts and MEDLINE	11	0.733333333
CAB Abstracts and MEDLINE and PubMed	11	0.733333333
CAB Abstracts and PubMed	11	0.733333333
AGRICOLA and AGRIS and Web of Science	10	0.666666667
AGRICOLA and BIOSIS and Web of Science	10	0.666666667
AGRICOLA and INGENTA and Web of Science	10	0.666666667
AGRICOLA and MEDLINE and Web of Science	10	0.666666667
AGRICOLA and PubMed and Web of Science	10	0.666666667
AGRICOLA and Web of Science	10	0.666666667
AGRIS and BIOSIS and Web of Science	10	0.666666667
AGRIS and INGENTA and Web of Science	10	0.666666667
AGRIS and MEDLINE and Web of Science	10	0.666666667
AGRIS and PubMed and Web of Sceince	10	0.666666667
AGRIS and Web of Science	10	0.666666667

BIOSIS and MEDLINE and Web of Science	10	0.666666667
BIOSIS and PubMed and Web of Science	10	0.666666667
BIOSIS and Web of Science	10	0.666666667
INGENTA and MEDLINE and Web of Science	10	0.666666667
INGENTA and PubMed and Web of Science	10	0.666666667
INGENTA and Web of Science	10	0.666666667
MEDLINE and PubMed and Web of Science	10	0.666666667
MEDLINE and Web of Science	10	0.666666667
AGRICOLA and AGRIS and MEDLINE	10	0.666666667
AGRICOLA and AGRIS and PubMed	10	0.666666667
AGRICOLA and BIOSIS and MEDLINE	10	0.666666667
AGRICOLA and BIOSIS and PubMed	10	0.666666667
AGRICOLA and INGENTA and MEDLINE	10	0.666666667
AGRICOLA and INGENTA and PubMed	10	0.666666667
AGRICOLA and MEDLINE	10	0.666666667
AGRICOLA and MEDLINE and PubMed	10	0.666666667
AGRICOLA and PubMed	10	0.666666667
AGRIS and BIOSIS and MEDLINE	10	0.666666667
AGRIS and BIOSIS and PubMed	10	0.666666667
AGRIS and INGENTA and MEDLINE	10	0.666666667
AGRIS and INGENTA and PubMed	10	0.666666667
AGRIS and MEDLINE	10	0.666666667
AGRIS and MEDLINE and PubMed	10	0.666666667
AGRIS and PubMed	10	0.666666667
BIOSIS and MEDLINE	10	0.666666667
BIOSIS and MEDLINE and PubMed	10	0.666666667
BIOSIS and PubMed	10	0.666666667
INGENTA and MEDLINE	10	0.666666667
INGENTA and MEDLINE and PubMed	10	0.666666667
INGENTA and PubMed	10	0.666666667
MEDLINE and PubMed	10	0.666666667
AGRICOLA and AGRIS and BIOSIS	9	0.6
AGRICOLA and BIOSIS	9	0.6
AGRICOLA and BIOSIS and INGENTA	9	0.6
AGRIS and BIOSIS	9	0.6
AGRIS and BIOSIS and INGENTA	9	0.6
AGRICOLA and AGRIS	6	0.4
AGRICOLA and AGRIS and INGENTA	6	0.4
AGRICOLA and INGENTA	5	0.333333333
AGRIS and INGENTA	3	0.2

Table C.7: Results ordered by relative recall

	Number of papers found	Relative Recall
Information source combinations		
CAB Abstracts and Web of Science and FSTA	11	0.73
AGRICOLA and AGRIS and CAB Abstracts	11	0.73
AGRICOLA and BIOSIS and CAB Abstracts	11	0.73
AGRICOLA and CAB Abstracts	11	0.73
AGRICOLA and CAB Abstracts and FSTA	11	0.73
AGRICOLA and CAB Abstracts and INGENTA	11	0.73
AGRICOLA and CAB Abstracts and MEDLINE	11	0.73
AGRICOLA and CAB Abstracts and PubMed	11	0.73
AGRICOLA and CAB Abstracts and Web of Science	11	0.73
AGRIS and BIOSIS and CAB Abstracts	11	0.73
AGRIS and CAB Abstracts	11	0.73
AGRIS and CAB Abstracts and FSTA	11	0.73
AGRIS and CAB Abstracts and INGENTA	11	0.73
AGRIS and CAB Abtstracts and MEDLINE	11	0.73
AGRIS and CAB Abstracts and PubMed	11	0.73
AGRIS and CAB Abstracts and Web of Science	11	0.73
BIOSIS and CAB Abstracts	11	0.73
BIOSIS and CAB Abstracts and FSTA	11	0.73
BIOSIS and CAB Abstracts and INGENTA	11	0.73
BIOSIS and CAB Abstracts and MEDLINE	11	0.73
BIOSIS and CAB Abstracts and PubMed	11	0.73
BIOSIS and CAB Abstracts and Web of Science	11	0.73
CAB Abstracts and FSTA	11	0.73
CAB Abstracts and INGENTA	11	0.73
CAB Abstracts and INGENTA and FSTA	11	0.73
CAB Abstracts and INGENTA and MEDLINE	11	0.73
CAB Abstracts and INGENTA and PubMed	11	0.73
CAB Abstracts and MEDLINE	11	0.73
CAB Abstracts and MEDLINE and FSTA	11	0.73
CAB Abstracts and MEDLINE and PubMed	11	0.73
CAB Abstracts and MEDLINE and Web of Science	11	0.73
CAB Abstracts and PubMed	11	0.73
CAB Abstracts and PubMed and FSTA	11	0.73
CAB Abstracts and PubMed and Web of Science	11	0.73
CAB Abstracts and Web of Science	11	0.73
INGENTA and MEDLINE and Web of Science	10	0.66
AGRICOLA and AGRIS and MEDLINE	10	0.66
AGRICOLA and AGRIS and PubMed	10	0.66
AGRICOLA and AGRIS and Web of Science	10	0.66

	Number of papers found	Relative Recall
Information source combinations		
AGRICOLA and BIOSIS and MEDLINE	10	0.66
AGRICOLA and BIOSIS and PubMed	10	0.66
AGRICOLA and BIOSIS and Web of Science	10	0.66
AGRICOLA and INGENTA and MEDLINE	10	0.66
AGRICOLA and INGENTA and PubMed	10	0.66
AGRICOLA and MEDLINE	10	0.66
AGRICOLA and MEDLINE and FSTA	10	0.66
AGRICOLA and MEDLINE and PubMed	10	0.66
AGRICOLA and MEDLINE and Web of Science	10	0.66
AGRICOLA and PubMed	10	0.66
AGRICOLA and PubMed and FSTA	10	0.66
AGRICOLA and PubMed and Web of Science	10	0.66
AGRICOLA and Web of Science	10	0.66
AGRICOLA and Web of Science and FSTA	10	0.66
AGRIS and BIOSIS and MEDLINE	10	0.66
AGRIS and BIOSIS and PubMed	10	0.66
AGRIS and BIOSIS and Web of Science	10	0.66
AGRIS and INGENTA and MEDLINE	10	0.66
AGRIS and INGENTA and PubMed	10	0.66
AGRIS and INGENTA and Web of Science	10	0.66
AGRIS and MEDLINE	10	0.66
AGRIS and MEDLINE and FSTA	10	0.66
AGRIS and MEDLINE and PubMed	10	0.66
AGRIS and MEDLINE and Web of Science	10	0.66
AGRIS and PubMed	10	0.66
AGRIS and PubMed and FSTA	10	0.66
AGRIS and PubMed and Web of Science	10	0.66
AGRIS and Web of Science	10	0.66
AGRIS and Web of Science and FSTA	10	0.66
BIOSIS and MEDLINE	10	0.66
BIOSIS and MEDLINE and FSTA	10	0.66
BIOSIS and MEDLINE and PubMed	10	0.66
BIOSIS and MEDLINE and Web of Science	10	0.66
BIOSIS and PubMed	10	0.66
BIOSIS and PubMed and FSTA	10	0.66
BIOSIS and PubMed and Web of Science	10	0.66
BIOSIS and Web of Science	10	0.66
BIOSIS and Web of Science and FSTA	10	0.66
CAB Abstracts and INGENTA and Web of Science	10	0.66
INGENTA and MEDLINE	10	0.66
INGENTA and MEDLINE and FSTA	10	0.66

	Number of papers found	Relative Recall
Information source combinations		
INGENTA and MEDLINE and PubMed	10	0.66
INGENTA and PubMed	10	0.66
INGENTA and PubMed and FSTA	10	0.66
INGENTA and PubMed and Web of Science	10	0.66
INGENTA and Web of Science	10	0.66
INGENTA and Web of Science and FSTA	10	0.66
MEDLINE and FSTA	10	0.66
MEDLINE and PubMed	10	0.66
MEDLINE and PubMed and FSTA	10	0.66
MEDLINE and PubMed and Web of Science	10	0.66
MEDLINE and Web of Science	10	0.66
MEDLINE and Web of Science and FSTA	10	0.66
Web of Science and FSTA	10	0.66
AGRICOLA and AGRIS and BIOSIS	9	0.6
AGRICOLA and BIOSIS	9	0.6
AGRICOLA and BIOSIS and FSTA	9	0.6
AGRICOLA and BIOSIS and INGENTA	9	0.6
AGRIS and BIOSIS	9	0.6
AGRIS and BIOSIS and FSTA	9	0.6
AGRIS and BIOSIS and INGENTA	9	0.6
BIOSIS and FSTA	9	0.6
AGRICOLA and AGRIS	6	0.4
AGRICOLA and AGRIS and FSTA	6	0.4
AGRICOLA and AGRIS and INGENTA	6	0.4
AGRICOLA and FSTA	5	0.33
AGRICOLA and INGENTA	5	0.33
AGRICOLA and INGENTA and FSTA	5	0.33
AGRICOLA and INGENTA and Web of Science	5	0.33
AGRIS and INGENTA and FSTA	4	0.26
AGRIS and FSTA	3	0.2
AGRIS and INGENTA	3	0.2
INGENTA and FSTA	3	0.2

Table C.8: Overlap between information sources

Combination of databases	Number of papers found in both
CAB Abstracts and MEDLINE	10
CAB Abstracts and PubMed	10
CAB Abstracts and Web of Science	10
MEDLINE and PubMed	10
MEDLINE and Web of Science	10
PubMed and Web of Science	10
BIOSIS and CAB Abstracts	9
BIOSIS and MEDLINE	9
BIOSIS and PubMed	9
BIOSIS and Web of Science	9
AGRICOLA and BIOSIS	5
AGRICOLA and CAB Abstracts	5
AGRICOLA and MEDLINE	5
AGRICOLA and PubMed	5
AGRICOLA and Web of Science	5
AGRICOLA and INGENTA	2
AGRIS and BIOSIS	2
AGRIS and MEDLINE	2
AGRIS and PubMed	2
AGRIS and Web of Science	2
BIOSIS and INGENTA	2
CAB Abstracts and INGENTA	2
INGENTA and MEDLINE	2
INGENTA and PubMed	2
INGENTA and Web of Science	2
AGRIS and CAB Abstracts	2
AGRICOLA and AGRIS	1
AGRIS and INGENTA	1

Unique references

Dahl (1997) was found only in CAB Abstracts.

References not found in any database

- Jorgensen J et al. The effect of feeding pellets, meal and heat treatment on the Salmonella prevalence of finishing pigs. Proceedings of the 3rd International Symposium on the Epidemiology and Control of Salmonella and other Food Borne Pathogens in Pork, Leipzig, Germany, 5–8 August 1999: 308–312.

- Kjeldsen NJ et al. The effect of feeding non-heat treated, non-pelleted feed compared to feeding pelleted, heat treated feed on the Salmonella prevalence of finishing pigs. Proceedings

of the 3rd International Symposium on the Epidemiology and Control of Salmonella and other Food Borne Pathogens in Pork, Leipzig, Germany, 5–8 August 1999: 313–316.

- Dahl J et al. An intervention study of the effect of introducing salmonella controlling feed strategies in salmonella high prevalence herds. Proceedings of the 3rd International Symposium on the Epidemiology and Control of Salmonella and other Food Borne Pathogens in Pork, Leipzig, Germany, 5–8 August 1999: 340–342.

- Bahnson PJ et al. Herd-level risk for Salmonella culture positive status in slaughtered pigs. Proceedings of the 4th International Symposium on the Epidemiology and Control of Salmonella and other Food Borne Pathogens in Pork, Leipzig, Germany, 9–11 September 2001: 244–249.

Evaluation of search strategies

The reporting of the search methodology undertaken for this review is insufficient. The authors report that they "combined" three sets of terms and then give a list of synonyms for each of these sets. However, there is no indication of how Boolean operators were used, the fields searched, whether subject headings were used where applicable, and how they accounted for phrases in the search. This confirms the conclusions of researchers undertaking initial research into the methodological soundness of systematic reviews of food safety intervention research. In all studies conducted to date, authors have observed a lack of structured and replicable methodological approaches and a failure to fully report the review process (Waddell et al., 2007). In order to be able to assess the performance of the search used in this review, the strategy was interpreted as follows:

(hogs OR hog OR swine OR pig OR pigs OR gilts OR sows OR market-weight finishers OR boars OR porcine) AND (feed grains OR feed meals OR hay OR mash feed OR meals OR protected fat OR silage OR stover OR total mixed rations OR pelleted feeds OR middlings OR feed rations OR corn OR diet OR dietary carbohydrate OR dietary energy sources OR dietary fat OR dietary fiber OR dietary minerals OR dietary nutrient sources OR dietary supplements OR finishing OR grazing OR soy OR wheat OR barley) AND (carcass swabs OR culture OR serology OR prevalence OR incidence OR risk factors OR cecal lymph nodes OR pharyngeal swabs OR faeces OR fecal contents OR rectal swab OR rectal contents OR mesenteric lymph nodes OR salmonell*)

As we cannot reproduce the search strategies with any confidence, any conclusions about the performance of the review search strategies must be treated with caution.

Table C.9: Number of included papers found by search strategy

	Number of included papers found by search strategy
Database	
AGRICOLA	Unable to recreate reported strategy
AGRIS	1
BIOSIS	8
CAB Abstracts	8
FSTA	1
INGENTA	0
MEDLINE	7
PUBMED	8
Web of Science	9

The search strategy failed (as interpreted above) successfully retrieved all studies indexed in any of the information sources. In the majority of cases it was the synonyms for feed management or feed

characteristics which were responsible for the missed papers. Although a reasonable range of synonyms was used, key terms such as fasting, probiotics and feed management were not included.

Moreover, a small number of the papers were not retrieved as they did not make explicit the type of intervention in the title and abstract. Although it would have been difficult to retrieve these papers using title and abstract searching, the use of subject headings in the databases which offer this feature might have allowed these records to be retrieved. The methodology section of the review gave no indication that subject headings were used in CAB Abstracts, MEDLINE and PubMed.

The precision of the search is also questionable. Although the inclusion criteria stated that the only outcome of interest was Salmonella prevalence, the search terms used to describe the outcomes were very broad and included terms such as culture and incidence. Although this would not have affected the recall of the search, it does represent an additional weakness of the search methodology.

Discussion

CAB Abstracts had the highest relative recall of the resources searched; it contained 11 of the 15 papers. MEDLINE/PubMed, Web of Science and BIOSIS also performed fairly well finding between 9 and 10 of the papers. Surprisingly AGRICOLA and AGRIS, the specialist agricultural resources, had amongst the low rates of relative recall and none of the papers they contained were unique. FSTA also performed poorly.

No combination of databases was able to retrieve more than 11 of the 15 papers. The combinations containing CAB Abstracts performed the strongest as all 11 of the papers were found in this resource. CAB Abstracts was also the only resource to contain a unique result, suggesting it is an important database for information in this topic area. This supports the conclusions of a 2012 study which assessed the coverage of key veterinary journals by bibliographic databases (Grindlay, 2012). It was concluded that CAB Abstracts should be included in all literature searches in this field as it indexed a large number of unique journal titles.

Four of the studies from the reference standard were not found in any of the databases. These were all papers given at the same conference; they were not found even though Web of Science contains the Conference Proceedings Citation Index. This suggests that blibliographic databases are not sufficient for a systematic review in this topic. Hand searching is also required to retrieve conference abstracts and other grey literature. The authors of the review hand searched the proceedings of several conferences; it is suspected that this is how they found the 4 papers not included in the databases searched.

Future reviews in a similar topic area should take care to consider carefully key aspects of search strategy design. Wherever possible both controlled vocabulary and textword searches should be used for each concept. Reviewers should ensure searches include all relevant search terms, including synonyms / alternate terms, and that terms are included consistently across databases where possible. Database functionality such as controlled vocabulary and truncation should be fully exploited. Reviewers should consider consulting an information specialist experienced in designing search strategies for systematic reviews. Reviewers should also ensure that search methodology is reported in explicitly. An important feature of a systematic review is that the methodology is reproducible.

Conclusion

Our study is limited in a number of ways. Relative recall using a reference standard formed from a review's included references is only as good as the sum of the individual searches carried out for the review. As methodological weaknesses were identified in the reported search strategies for this review, it is possible that some papers were missing from our "gold standard" reference. Moreover, as the included studies were drawn from only one review, the generalizability of the results may be limited. In addition, we were unable to access a number of the information sources used by the reviewers and so cannot judge their performance.

However, we can cautiously make the following conclusions:

- Care should be taken to report search methodology clearly and with full detail to enable replication;
- A sensitive search strategy should be created in consultation with an information specialist;
- CAB abstracts is a key information source in this topic area. Databases within Web of Science, Biosis and Medline/PubMed were also found to contain a reasonably large number of relevant results;
- Bibliographic databases are not sufficient to retrieve all relevant conference papers; this is likely to be achieved only by hand searching.

Schoonees A, Visser J, Musekiwa A, Volmink J. Pycnogenol® (extract of French maritime pine bark) for the treatment of chronic disorders® for the treatment of chronic disorders. Cochrane Database of Systematic Reviews 2012, Issue 4. Art. No.: CD008294. DOI: 10.1002/14651858.CD008294.pub4.

Year of publication: 2012

Review question: To assess the efficacy and safety of Pycnogenol® for the treatment of chronic disorders.

Review inclusion criteria: Randomised controlled trials evaluating the effectiveness of Pycnogenol® in adults or children with any chronic disorder were included. We assessed clinical outcomes directly related to the disorder (stratified as participant- and investigator-reported) and all-cause mortality as primary outcomes. We also assessed adverse events and biomarkers of oxidative stress.

Number of databases searched: 6: MEDLINE (accessed via PubMed), Clinical Trials (CENTRAL) database (accessed via the Cochrane Library), EMBASE (accessed via Ovid), ClinicalTrials.gov, Current Controlled Trials and World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP).

Search date: Sep / Oct 2010

Search restrictions: We used a comprehensive and exhaustive search strategy in order to identify all relevant studies regardless of language or publication status (published, unpublished, in press and in progress).

Number of included studies: 18. Note: 15 studies were included in the systematic review, but 18 references are included in the list of references to studies included in the review (4 articles from 1 study were published, addressing different outcomes). For the purpose of this relative recall exercise, all 18 references are included).

1. Arcangeli P. Pycnogenol® in chronic venous insufficiency. *Fitoterapia* 2000;**71**(3):236-44.

2. Belcaro G, Cesarone MR, Errichi BM, Ledda A, Di Renzo A, Stuard S. Diabetic ulcers: microcirculatory improvement and faster healing with Pycnogenol. *Clinical and Applied Thrombosis/Hemostasis* 2006;**12**(3):318-23.

3. Belcaro B, Cesarone MR, Errichi S, Zulli C, Errichi BM, Vinviguerra. Treatment of osteoarthritis with Pycnogenol®.The SVOS (San Valentino Osteo-arthrosisStudy). Evaluation of signs, symptoms, physical performance and vascular aspects. Phytotherapy Research 2008;22(4):518-23.

4. Cisár P, Jány R, Waczulíková I, Sumegová K, Muchová J, Vojtaššák J. Effect of pine bark extract (Pycnogenol®)on symptoms of knee osteoarthritis. Phytotherapy Research 2008;22(8):1087-92.

5. Ďuračková Z, Trebatický B, Novotný V, Žitňanová I, Breza J. Lipid metabolism and erectile function improvement by Pycnogenol®, extract from the bark of Pinus pinaster in patients suffering from erectile dysfunction - a pilot study. Nutrition Research 2003;23(9):1189-98.

6. Farid R, Mirfeizi Z, Mirheidari M, Z Rezaieyazdi, Mansouri H, Esmaelli H. Pycnogenol supplementation reduces pain and stiffness and improves physical function in adults with knee osteoarthritis. Nutrition Research 2007;27(11):692-7.

7. Hosseini S, Pishnamazi S, Sadrzadeh SMH, Farid F, Farid R, Watson RR. Pycnogenol® in the management of asthma. The Journal of Medicinal Food 2001;4(4):201-9.

8. Hosseini S, Lee J, Sepulveda RT, Rohdewald P, Watson RR. A randomized, double-blind, placebo-controlled, prospective, 16 week crossover study to determine the role of Pycnogenol in modifying blood pressure in mildly hypertensive patients. Nutrition Research 2001;21(9):1251-60.

9. Lau BH, Riesen SK, Truong KP, Lau EW, Rohdewald P, Barreta RA. Pycnogenol® as an adjunct in the management of childhood asthma. Journal of Asthma 2006;41(8):825-32.

10. Liu X, Wei J, Tan F, Zhou S, Würthwein, Rohdewald P. Antidiabetic effect of Pycnogenol® French maritime pine bark extract in patients with diabetes type II. Life Sciences 2004;75(21):2505-13.

11. Liu X, Wei J, Tan F, Zhou S, Würthwein G, Rohdewald P. Pycnogenol®, French maritime pine bark extract, improves endothelial function of hypertensive patients. Life Sciences 2004;74(7):855-62.

12. Petrassi C, Mastromarino A, Spartera C. Pycnogenol® in chronic venous insufficiency. Phytomedicine 2000;7(5):383-8.

13. Steigerwalt R, Belcaro G, Cesarone MR, Di Renzo A, Grossi MG, Ricci A. Pycnogenol® improves microcirculation, retinal edema, and visual acuity in early diabetic retinopathy. Journal of Ocular Pharmacology and Therapeutics 2009;25(6):537-40.

14. Chovanová Z, Muchová J, Sivonová M, Dvoráková M, Zitnanová I, Waczulíková I, et al. Effect of polyphenolic extract, Pycnogenol ® , on the level of 8-oxoguanine in children suffering from attention deficit/hyperactivity disorder. Free Radical Research 2006;40(9):1003-10.

15. Dvoráková M, Jezová D, Blazícek P, Trebatická J, Skodácek I, Suba J, et al. Urinary catecholamines in children with attention deficit hyperactivity disorder (ADHD): Modulation by a polyphenolic extract from pine bark (Pycnogenol®). Nutritional Neuroscience 2007;10(3-4):151-7.

16. Dvořáková M, Sivoňová M, Trebatická J, Škodáček I, Waczuliková I, Muchová J, et al. The effect of polyphenolic extract from pine bark, Pycnogenol® on the level of glutathione in children suffering from attention deficit hyperactivity disorder (ADHD). Redox Report 2006;11(4):163-172(10).

17. Trebatická J, Kopasová S, Hradečná Z, Činovský K, Škodáček I, Šuba J. Treatment of ADHD with French maritime pine bark extract, Pycnogenol®. European Child & Adolescent Psychiatry 2006;15(6):329-35.

18. Zibadi S, Rohdewald PJ, Park D, Watson RR. Reduction of cardiovascular risk factors in subjects with type 2 diabetes by Pycnogenol supplementation. Nutrition Research 2008;28(5):315-20.

Results

Table C.10: Yield and relative recall for each resource

	Number of papers found	Relative Recall
Database searched		
MEDLINE (via PubMed)	15	0.83
EMBASE	18	1.00
CENTRAL	18	1.00
Clinicaltrials.gov	0	0.00
Current Controlled Trials	0	0.00
WHO ICTRP	0	0.00

Yield and relative recall by combination of resource

As all the papers were found in EMBASE and CENTRAL, and no references were found in clinicaltrials.gov, Current Controlled Trials and WHO ICTRP, analysis of database combinations was not carried out.

Overlap between resources

As all the papers were found in EMBASE and CENTRAL, and no references were found in clinicaltrials.gov, Current Controlled Trials and WHO ICTRP, analysis of database overlap was not carried out.

Unique references

As all the papers were found in EMBASE and CENTRAL, and no references were found in clinicaltrials.gov, Current Controlled Trials and WHO ICTRP, analysis of database unique reference was not carried out.

Performance of the review search strategies

MEDLINE (via PubMed): As reported in the review, the main intervention search line used is - Pycnogenol® [tiab]. Replicating the search exactly using this, the PubMed search strategy retrieves only 9 out of the 15 references available in PubMed. However, it is perhaps possible / likely that the reviewers actually searched on Pycnogenol [tiab]), with the ® being added at a later stage in the review write-up. When the search is run using Pycnogenol [tiab]), the strategy retrieves all 15 of the available references.

CENTRAL: Again, the search strategy as reported in the review uses the ® - (Pycnogenol®):ti,ab,kw in Clinical Trials. Run using this, the strategy only retrieves 9 out of the 18 studies available in CENTRAL. If the search was actually run using - (Pycnogenol):ti,ab,kw – as is likely, the strategy retrieves 14 out of the 18 available studies (using the current online version of the Cochrane Library – Issue 9 of 12, September 2012). The reason for the 4 studies being missed appears to be because the search lines are limited with the syntax 'in Clinical Trials', rather than using 'in Trials' or no syntax. If search lines were limited by the syntax 'in Trials', or if no limiting syntax had been used and the searcher just gone to the subset of CENTRAL results, all the studies would have been retrieved. The strategy includes the use of a study design filter. It may be useful to note that inclusion of a study design filter is not recommended for searching CENTRAL. As CENTRAL aims to contain only reports with study designs possibly relevant for inclusion in Cochrane reviews (and therefore other systematic reviews of therapeutic interventions), searches of CENTRAL should not use a study design filter.

EMBASE: Replicating the EMBASE strategy as given in the review is problematic. Although the reviewers explicitly state they search EMBASE via the OVID interface (both in the methods section and in the appendix), the search syntax they give in the appendix 3 appears to be for EMBASE via the Embase.com interface (see below).

EMBASE (Ovid) search strategy

1 random*:ti OR random*:ab OR factorial*:ti OR factorial*:ab OR cross?over:ti OR cross?over:ab OR crossover*:ti OR crossover*:ab OR placebo*:ti OR placebo*:ab OR (doubl*:ti AND blind*:ti) OR (doubl*:ab AND blind*:ab) OR (singl*:ti AND blind*:ti) OR (singl*:ab AND blind*:ab) OR assign*:ti OR assign*:ab OR volunteer*:ti OR volunteer*:ab OR 'crossover procedure'/exp OR 'double-blind procedure'/exp OR 'single-blind procedure'/exp OR 'randomized controlled trial'/exp OR allocat*:ti OR allocat*:ab AND [embase]/lim

2 'Pycnogenol'/exp OR 'pine bark' AND [embase]/lim

3 'pine'/exp AND 'bark'/exp AND [embase]/lim

4 #2 OR #3

5 #1 AND #4

For the purpose of this exercise the syntax above has been translated into the OVID interface, as follows.

	Searches	Results
1	random*.ti. or random*.ab. or factorial*.ti. or factorial*.ab. or cross?over.ti. or cross?over.ab. or crossover*.ti. or crossover*.ab. or placebo*.ti. or placebo*.ab. or (doubl* and blind*).ti. or (doubl* and blind*).ab. or (singl* and blind*).ti. or (singl* and blind*).ab. or assign*.ti. or assign*.ab. or volunteer*.ti. or volunteer*.ab. or exp crossover procedure/ or exp double-blind procedure/ or exp single-blind procedure/ or exp randomized controlled trial/ or allocat*.ti. or allocat*.ab.	1270271
2	exp pycnogenol/ or "pine bark".af.	742
3	exp pine/ and exp bark/	225
4	2 or 3	842
5	1 and 4	111

Translated for OVID in this way, the search strategy retrieves 17 out of the 18 available references. The one study was missed as it was not retrieved by the terms used in the study design filter.

Discussion

Both CENTRAL and EMBASE contained all 18 of the included papers. Although CENTRAL has been shown to be a very good source of randomized controlled trials in health, it should be noted that the choice of review may have influenced the results. As well as including records indexed in MEDLINE and EMBASE, CENTRAL contains controlled trials found by Cochrane Collaboration groups whilst compiling their systematic reviews. As our reference standard was obtained from a Cochrane Review it would be expected that all of the references would be found in CENTRAL.

Of the three main bibliographic databases, PubMed had the worst yield, containing 15 papers, giving a relative recall of 0.83. This would seem to confirm the importance of searching beyond PubMed / Medline for systematic reviews.

No reference was contained in any of the three trial registry databases (ClinicalTrials.gov, Controlled Clinical Trials, World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP). Since July 2005 all member journals of the International Committee of Medical Journal Editors (ICMJE) have required that clinical trials must be registered in a public trials register before they are considered for publication. 10 of the 18 studies in our gold standard were published from 2006 onwards, so one might expect to these to be contained in trial registry databases. The fact that not one reference was found in the any of the three registry databases seems to indicate that despite the move towards trial registration, at this stage trail registry information sources should still be used in conjunction with the major bibliographic databases such as MEDLINE, EMBASE and CENTRAL (as in the review). Searching for trials using only register sources, rather than major bibliographic databases, would not be an effective method for informing a systematic review.

Overall, the performance of the review search strategies in terms of retrieval (if the assumption that ® was not included in the actual PubMed and CENTRAL strategies is correct) appears to be reasonably good, though not optimal. The PubMed strategy retrieved all 15 of the available references. The CENTRAL strategy (as performed on the current version of Cochrane - Issue 9 of 12, September 2012) retrieves 14 out of the 18 available studies. As outlined above, the 4 studies appear to be missed due to the use of the 'in Clinical Trials' syntax to limit the search. If search lines are limited by the syntax 'in Trials', or if no limiting syntax is used and the searcher just goes to the subset of CENTRAL results, all the studies are retrieved. Searchers should note that when seeking to identify CENTRAL records in the Cochrane library there is no practical advantage to limiting each search line. Searches can be run across the whole library – the searcher can then go to the results page and click on

'Trials' to isolate the CENTRAL subset. It is also important to note that inclusion of a study design filter is not recommended for searching CENTRAL. As CENTRAL aims to contain only reports with study designs possibly relevant for inclusion in Cochrane reviews (and therefore other systematic reviews of therapeutic interventions), searches of CENTRAL should not use a study design filter [1].

One study was missed by the EMBASE strategy (as interpreted above) as it was not retrieved by the terms used in the study design filter. Use of a more sensitive study design filter (see the InterTasc website for examples of filters [2]) would have ensured the study was retrieved. The use of sensitive search study design filters (or no study design filters) should be considered for systematic reviews, particularly for topics where the overall size of the literature is relatively small (such as this one). Although in this instance it did not impact on retrieval, another potential weakness of the EMBASE strategy (as interpreted above) is the absence of a textword search on the main intervention term of pycnogenol. Systematic reviews should use a robust combination of controlled vocabulary and text words. [1].

Any retrospective assessment of the performance of review search strategies is limited in that the search functionality of the database may have changed since the date of the review's search i.e. the same search strategy may perform differently when carried out now compared to the original search. This limitation should be considered in relation to the assessments made of the search strategies.

As indicated in the results section above, there were two issues with the review's reporting of search methodology which impacted on the ability to confidently replicate searches – firstly the inclusion of ® in the reported PubMed and CENTRAL strategies, and secondly the confusion caused by stating clearly that EMBASE had been searched via OVID, but then reporting the strategy in syntax which appears designed for EMBASE via Embase.com. These two issues highlight the importance of careful, unambiguous, clear reporting of search methodology – ensuring methodology is explicit and reproducible.

Conclusion

Our study is limited in a number of ways. Relative recall using a reference standard formed from a review's included references is only as good as the sum of the individual searches carried out for the review. As methodological weaknesses were identified in the reported search strategies for this review, it is possible that some papers were missing from our "gold standard" reference. Moreover, as the included studies were drawn from only one review, the generalizability of the results may be limited. Bearing in mind these limitations however, for reviews on this topic area we can cautiously make the following conclusions:

- Searching beyond Pubmed / MEDLINE is essential;
- Both CENTRAL and EMBASE appear to be a good source of studies;
- Trials register databases alone cannot be relied upon for informing systematic reviews – they should continue to be used as potentially useful supplementary resources;
- Care should be taken when constructing search strategies and an experienced information specialist should be consulted;
- Care should be taken to report search methodology clearly and with full detail.

Scott O, Galicia-Connolly E, Adams D, Surette S, Vohra S, Yager JY. The safety of cruciferous plants in humans: a systematic review. Journal of Biomedicine and Biotechnology, Epub February 22 2012.

Year of publication: 2012

Review question: To systematically collect and synthesize all published reports of human adverse events associated with exposure to cruciferous plants.

Review inclusion criteria:

- Study population is all human subjects;
- Interventions of interest share all types of exposure (oral, topical and respiratory) to cruciferous plants and their derivatives or constituents;
- Papers with or without a comparator group. Papers without a control group will be included in order to include all potential adverse events;
- Outcomes of interest are the presence or absence of adverse events;
- All study designs are included. There are no limits by language.

Databases searched: 4 (MEDLINE, EMBASE, PASCAL, International Pharmaceutical Abstracts).
Number of included studies: 50

1. T. A. Shapiro, J.W. Fahey, A. T. Dinkova-Kostova et al., "Safety, tolerance, and metabolism of broccoli sprout glucosinolates and isothiocyanates: a clinical phase I study," Nutrition and Cancer, vol. 55, no. 1, pp. 53–62, 2006.
2. J. Figueroa, C. Blanco, A. G. Dumpierrez et al., "Mustard allergy confirmed by double-blind placebo-controlled food challenges: clinical features and cross-reactivity with mugwort pollen and plant-derived foods," Allergy, vol. 60, no. 1, pp. 48–55, 2005.
3. E. J. Pantuck, C. B. Pantuck, and W. A. Garland, "Stimulatory effect of brussels sprouts and cabbage on human drug metabolism," Clinical Pharmacology and Therapeutics, vol. 25, no.1, pp. 88–95, 1979.
4. E. J. Pantuck, C. B. Pantuck, and K. E. Anderson, "Effect of brussels sprouts and cabbage on drug conjugation," Clinical Pharmacology and Therapeutics, vol. 35, no. 2, pp. 161–169, 1984.
5. L. Ovesen, S. Lyduch, andM. L. Idorn, "The effect of a diet rich in brussels sprouts on warfarin pharmacokinetics," European Journal of Clinical Pharmacology, vol. 34, no. 5, pp. 521–523, 1988.
6. V. Vovolis, G. Poulios, and N. Koutsostathis, "IgE-mediated allergy to raw cabbage but not to cooked," Allergy, vol. 64, no.6, pp. 964–965, 2009.
7. C. A. Rosen, G. E.Woodson, J.W. Thompson, A. P. Hengesteg, and H. L. Bradlow, "Preliminary results of the use of indole-3-carbinol for recurrent respiratory papillomatosis," Otolaryngology—Head and Neck Surgery, vol. 118, no. 6, pp. 810–815,1998.

8. T. W. Kensler, J. G. Chen, P. A. Egner et al., "Effects of glucosinolate-rich broccoli sprouts on urinary levels of aflatoxin-DNA adducts and phenanthrene tetraols in a randomized clinical trial in He Zuo township, Qidong, People's Republic of China," Cancer Epidemiology Biomarkers and Prevention, vol. 14, no. 11, pp. 2605–2613, 2005.

9. R. B. Singh, M. A. Niaz, J. P. Sharma, R. Kumar, V. Rastogi, and M. Moshiri, "Randomized, double-blind, placebo-controlled trial of fish oil and mustard oil in patients with suspected acute myocardial infarction: the Indian experiment of infarct survival," Cardiovascular Drugs and Therapy, vol. 11, no. 3, pp. 485–491, 1997.

10. S. Jood, M. Gupta, S. K. Yadav, and N. Khetarpaul, "Effect of supplementation on haemoglobin and serum retinol levels and nutritional status of school children of Northern India," Nutrition and Health, vol. 15, no. 2, pp. 97–111, 2001.

11. C. A. Rosen and P. C. Bryson, "Indole-3-carbinol for recurrent respiratory papillomatosis: long-term results," Journal of Voice, vol. 18, no. 2, pp. 248–253, 2004.

12. M. A. Riedl, A. Saxon, and D. Diaz-Sanchez, "Oral sulforaphane increases phase II antioxidant enzymes in the human upper airway," Clinical Immunology, vol. 130, no. 3, pp. 244– 251, 2009.

13. T. Dinkova-Kostova, J. W. Fahey, K. L. Wade et al., "Induction of the phase 2 response in mouse and human skin by sulforaphane-containing broccoli sprout extracts," Cancer Epidemiology Biomarkers and Prevention, vol. 16, no. 4, pp. 847– 851, 2007.

14. P. J. Fell, S. Soulsby, M. M. Blight, and J. Brostoff, "Oilseed rape—a new allergen?" Clinical and Experimental Allergy, vol. 22, no. 4, pp. 501–505, 1992.

15. W. Hemmer, M. Focke, F. Wantke, S. Jager, M. Gotz, and R. Jarisch, "Oilseed rape pollen is a potentially relevant allergen," Clinical and Experimental Allergy, vol. 27, no. 2, pp. 156–161, 1997.

16. D. Parratt, W. H. Macfarlane Smith, G. Thomson, L. A. Cameron, and R. D. Butcher, "Evidence that oilseed rape (Brassica napus ssp. oleifera) causes respiratory illness in rural dwellers," Scottish Medical Journal, vol. 40, no. 3, pp. 74–76, 1995.

17. A. Lerbæk, S. C. Rastogi, and T. Menn´e, "Allergic contact dermatitis from allyl isothiocyanate in a Danish cohort of 259 selected patients," Contact Dermatitis, vol. 51, no. 2, pp. 79–83, 2004.

18. F. Sakauchi, M. M. H. Khan, M. Mori et al., "Dietary habits and risk of ovarian cancer death in a large-scale cohort study (JACC study) in Japan," Nutrition and Cancer, vol. 57, no. 2, pp. 138–145, 2007.

19. J. J. Michnovicz and H. L. Bradlow, "Altered estrogen metabolism and excretion in humans following consumption of indole-3-carbinol," Nutrition and Cancer, vol. 16, no. 1, pp. 59–66, 1991.

20. D. S. Michaud, P. Pietinen, P. R. Taylor, M. Virtanen, J. Virtamo, and D. Albanes, "Intakes of fruits and vegetables, carotenoids and vitamins A, E, C in relation to the risk of bladder cancer in the ATBC cohort study," British Journal of Cancer, vol. 87, no. 9, pp. 960–965, 2002.

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22. A. Memon, A. Varghese, and A. Suresh, “Benign thyroid disease and dietary factors in thyroid cancer: a case-control study in Kuwait,” British Journal of Cancer, vol. 86, no. 11, pp. 1745–1750, 2002.

23. M. R. Galanti, L. Hansson, R. Bergstrom et al., “Diet and the risk of papillary and follicular thyroid carcinoma: a population-based case-control study in Sweden and Norway,” Cancer Causes and Control, vol. 8, no. 2, pp. 205–214, 1997.

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25. K. Sato, N. Kawakami, T. Ohtsu et al., “Broccoli consumption and chronic atrophic gastritis among Japanese males: an epidemiological investigation,” Acta Medica Okayama, vol. 58, no.3, pp. 127–133, 2004.

26. K. D. Lust, J. E. Brown, and W. Thomas, “Maternal intake of cruciterous vegetables and other foods and colic symptoms in exclusively breast-fed infants,” Journal of the American Dietetic Association, vol. 96, no. 1, pp. 46–48, 1996.

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30. C. D. Caldan, “Contact urticaria from cabbage (brassica),” Contact Dermatitis, vol. 7, no. 5, p. 279, 1981.

31. A. Chakrabarti, L. Prais, and I. S. Foulds, “Allergic contact dermatitis to broccoli,” British Journal of Dermatology, vol. 148, no. 1, pp. 172–173, 2003.

32. C. J. Dannaker and I. R.White, “Cutaneous allergy to mustard in salad maker,” Contact Dermatitis, vol. 16, no. 4, pp. 212–214, 1987.

33. G. R. Di Giacomo, P. Boschetto, P. Maestrelli, and G. Moro, “Asthma and rhino-conjunctivitis from exposure to rape flour: a clinical case report,” Medicina del Lavoro, vol. 89, no. 3, pp. 226–231, 1998 (Italian).

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40. N. Rosenberg and P. Gervais, “Occupational asthma and food allergy: an association of underestimated frequency,” Presse Medicale, vol. 15, no. 34, pp. 1712–1714, 1986 (French).

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42. S. Schulze and U. Wollina, “Mustard allergy,” Kosmetische Medizin, vol. 24, no. 2, pp. 63–65, 2003 (German).

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46. L. Widstrom and S. G. O. Johansson, “IgE-mediated anaphylaxis to mustard,” Acta Dermato-Venereologica, vol. 66, no. 1, pp. 70–71, 1986.

47. V. Zawar, “Pityriasis rosea-like eruptions due to mustard oil application,” Indian Journal of Dermatology, Venereology and Leprology, vol. 71, no. 4, pp. 282–284, 2005.

48. F. B. Walker 4th, “Myocardial infarction after diet-induced warfarin resistance,” Archives of Internal Medicine, vol. 144, no.10, pp. 2089–2090, 1984.

49. S. J. Kempin, “Warfarin resistance caused by broccoli,” The New England Journal of Medicine, vol. 308, no. 20, pp. 1229–1230, 1983.

50. J. Geier, “Mustard wrap-dermatitis,” Dermatosen in Beruf und Umwelt, vol. 39, no. 1, pp. 17–18, 1991 (German)

Results

Table C.11: Yield and relative recall for individual resources

Database searched	Number of papers found	Relative Recall
AGRICOLA	5	0.333333333
AGRIS	2	0.133333333
Biological & Agricultural Index	Unable to access	N/A
Biological Abstracts	Unable to access	N/A
BIOSIS Previews	9	0.6
CAB Abstracts	11	0.733333333
Current Contents	Unable to access	N/A
Dissertation Abstracts	Unable to access	N/A
Food Science & Technology Abstracts	Unable to access	N/A
Ingenta Gateway	2	0.133333333
MEDLINE	10	0.666666667
PubMed	10	0.666666667
Web of Science	12	0.8

Table C.12: Yield and relative recall by combination of resources (Results ordered logically)

	Number of papers found	Relative Recall
Database combinations		
EMBASE and MEDLINE	50	1
EMBASE and MEDLINE and BIOSIS	50	1
EMBASE and MEDLINE and CAB Abstracts	50	1
EMBASE and MEDLINE and CENTRAL	50	1
EMBASE and MEDLINE and Web of Science	50	1
EMBASE and BIOSIS	49	0.98
EMBASE and BIOSIS and CAB Abstracts	49	0.98
EMBASE and BIOSIS and CENTRAL	49	0.98
EMBASE and BIOSIS and Web of Science	49	0.98
EMBASE and CENTRAL	48	0.96
EMBASE and CENTRAL and CAB Abstracts	48	0.96
EMBASE and CENTRAL and Web of Science	49	0.98
EMBASE and Web of Science	49	0.98
EMBASE and Web of Science and CAB Abstracts	49	0.98
EMBASE and CAB Abstracts	48	0.98
MEDLINE and BIOSIS	45	0.9
MEDLINE and BIOSIS and CAB Abstracts	45	0.9
MEDLINE and BIOSIS and CENTRAL	45	0.9
MEDLINE and BIOSIS and Web of Science	46	0.92

	Number of papers found	Relative Recall
Database combinations		
MEDLINE and CENTRAL	45	0.9
MEDLINE and CENTRAL and CAB	45	0.9
MEDLINE and CENTRAL and Web of Science	46	0.92
MEDLINE and Web of Science	46	0.92
MEDLINE and Web of Science and CAB Abstracts	46	0.92
MEDLINE and CAB Abstracts	45	0.9
BIOSIS and CENTRAL	35	0.7
BIOSIS and CENTRAL and CAB Abstracts	37	0.74
BIOSIS and CENTRAL and Web of Science	41	0.82
BIOSIS and CAB Abstracts	37	0.74
BIOSIS and Web of Science	41	0.82
BIOSIS and Web of Science and CAB Abstracts	42	0.84
CENTRAL and Web of Science	40	0.8
CENTRAL and Web of Science and CAB Abstracrs	41	0.82
CENTRAL and CAB Abstracts	12	0.24

Table C.13: Yield and relative recall by combination of resources (results ordered by relative recall)

	Number of papers found	Relative Recall
Database combinations		
EMBASE and MEDLINE	50	1
EMBASE and MEDLINE and BIOSIS	50	1
EMBASE and MEDLINE and CAB Abstracts	50	1
EMBASE and MEDLINE and CENTRAL	50	1
EMBASE and MEDLINE and Web of Science	50	1
EMBASE and BIOSIS	49	0.98
EMBASE and BIOSIS and CAB Abstracts	49	0.98
EMBASE and BIOSIS and CENTRAL	49	0.98
EMBASE and BIOSIS and Web of Science	49	0.98
EMBASE and CENTRAL and Web of Science	49	0.98
EMBASE and Web of Science	49	0.98
EMBASE and Web of Science and CAB Abstracts	49	0.98
EMBASE and CAB Abstracts	48	0.98
EMBASE and CENTRAL	48	0.96
EMBASE and CENTRAL and CAB Abstracts	48	0.96
MEDLINE and BIOSIS and Web of Science	46	0.92
MEDLINE and CENTRAL and Web of Science	46	0.92
MEDLINE and Web of Science	46	0.92
MEDLINE and Web of Science and CAB Abstracts	46	0.92
MEDLINE and BIOSIS	45	0.9
MEDLINE and BIOSIS and CAB Abstracts	45	0.9
MEDLINE and BIOSIS and CENTRAL	45	0.9
MEDLINE and CENTRAL	45	0.9
MEDLINE and CENTRAL and CAB	45	0.9
MEDLINE and CAB Abstracts	45	0.9
BIOSIS and Web of Science and CAB Abstracts	42	0.84
BIOSIS and CENTRAL and Web of Science	41	0.82
BIOSIS and Web of Science	41	0.82
CENTRAL and Web of Science and CAB Abstracts	41	0.82
CENTRAL and Web of Science	40	0.8
BIOSIS and CENTRAL and CAB Abstracts	37	0.74
BIOSIS and CAB Abstracts	37	0.74
BIOSIS and CENTRAL	35	0.7
CENTRAL and CAB Abstracts	12	0.24

Table C.14: Overlap between information sources

CENTRAL and BIOSIS	**3**
EMBASE and BIOSIS	**34**
EMBASE and CENTRAL	3
EMBASE and Web of Science	39
Web of Science and BIOSIS	34
Web of Science and CENTRAL	3
MEDLINE and BIOSIS	35
MEDLINE and CENTRAL	3
MEDLINE and EMBASE	43
MEDLINE and Web of Science	39

Unique results

The following paper was only found in MEDLINE:

V. Vovolis, G. Poulios, and N. Koutsostathis, "IgE-mediated allergy to raw cabbage but not to cooked," *Allergy*, vol. 64, no.6, pp. 964–965, 2009.

The following papers were only found in EMBASE:

- J. S. Pasricha, R. Gupta, and S. K. Gupta, "Contact hypersensitivity to mustard khal and mustard oil," Indian Journal of Dermatology, Venereology and Leprology, vol. 51, no. 2, pp. 108–110, 1985;
- Lingelbach, J. Rakoski, and J. Ring, "Exercise-induced anaphylaxis to cabbage and mustard," Allergy and Clinical Immunology International, vol. 15, no. 4, pp. 181–183, 2003;
- S. Schulze and U. Wollina, "Mustard allergy," Kosmetische Medizin, vol. 24, no. 2, pp. 63–65, 2003 (German);
- L. Valero, P. Amat, M. Bescos, M. Lluch, E. Serra, and A.Malet, "Mustard seed allergy: report of five cases," Revista Espanola de Alergologia e Inmunologia Clinica, vol. 10, no. 4, pp. 193–198, 1995 (Spanish).

Evaluation of search strategies

The MEDLINE strategy retrieved 41 of the 45 included papers found in this information source. The EMBASE strategy retrieved 33 of the 48 papers.

Some of the papers were missed because of the section of the search strategy designed to find the exposure aspect of the review question. The text-word searches neglected some cruciferous plants; papers discussing cabbage, mustard seed, turnip and oil seed rape were missed for this reason. In addition, relevant index terms were not fully explored. The databases tended to index using the name of the individual plant, rather than the broader index terms such as "Brassicaceae" employed by the strategy. The reviewers also failed to explode the index terms used for this aspect of the search; exploding "Brassicaceae" to also include the more specific term "Brassica" would have resulted in fewer papers being missed by EMBASE.

The remainder of the papers were missed due to the section of the search designed to retrieve papers describing adverse effects. Both the EMBASE and the MEDLINE strategy made use of floating subheadings (ae, co, po, to, de) to identify papers describing adverse effects. This worked well in MEDLINE; papers from the gold reference standard were overwhelmingly indexed in this way allowing the included studies to be retrieved. However, the strategy was not sufficient to retrieve all of the papers in EMBASE as floating subheadings are only applied to index terms for either drugs or diseases in this database. As the exposure in this case was plants very few of the records from the reference standard contained the floating subheadings and the studies were missed.

Further weaknesses in the search strategy also failed to identity the adverse effects papers in EMBASE. Many of the included papers described allergic reactions or anaphylaxis. These papers did not use the generic adverse effects terminology included in the search strategy; instead the free text and index terms that are specific to allergy. This clearly illustrates the difficulty in designing a sensitive strategy for adverse effects reported in the information retrieval literature; information is not described and indexed in a consistent way (CRD, 2008).

Discussion

MEDLINE and EMBASE had the highest relative recall of the resources searched and each contained at least one unique result. Web of Science and BIOSIS also performed well; however they did not find any papers not indexed in MEDLINE and EMBASE. The high level of overlap suggests that it is not efficient or necessary to search these additional resources in this topic area.

CENTRAL performed poorly, containing only three of the papers. This is to be expected as very few of the studies that made up the reference standard were controlled trials. In topic areas where a broader range of study designs is expected the use of CENTRAL is limited. CAB also demonstrated a low level of relative recall. Whilst studies have shown it to have excellent coverage of the veterinary literature (Grindlay 2012) it appears to be less strong in its coverage of human health topics.

The most efficient combination of resources was MEDLINE and EMBASE; this combination retrieved all 50 papers.

The search strategy employed by this review was flawed in both the terms used for the exposure of interest, and the filter used to identity adverse effects. A key weakness of the strategy was a failure to fully explore relevant text words and index terms; care should be taken to ensure that both specific and general terms for each concept are used (e.g. cabbage and brassica). An initial scoping search can help to build up search terms; relevant papers can be analysed to identify additional vocabulary used by authors and the index terms applied to key papers can be checked. The thesaurus of each database should also be consulted where available. This can alert the reviewer to any index terms which should be exploded to catch relevant narrower terms; something that is particularly important as indexers will usually apply the most specific term possible.

The section of the search designed to retrieve adverse effects also resulted in papers being missed. It is difficult design a sensitive search for this type of data due to poor indexing and reporting. Although filters have been designed for this purpose (The InterTASC Information Specialists' Sub-Group collates a selection of these at www.york.ac.uk/inst/crd/intertasc/), their sensitivity and precision is not clear (CRD, 2008). An adverse effects filter will work best if it includes both generic adverse effects terms, and terms designed to find specific adverse effects. If the adverse effects are not known in advance then it may be possible to identity some of the most significant or widely reported using an initial scoping search. It is suggested that any filter for adverse effects be tested with the rest of the strategy during the search development process. Looking at a sample of the results removed by the filter will allow the reviewer to assess whether relevant studies are being lost.

Conclusions

Our study is limited in a number of ways. Relative recall using a reference standard formed from a review's included references is only as good as the sum of the individual searches carried out for the review. As methodological weaknesses were identified in the reported search strategies for this review, it is possible that some papers were missing from our "gold standard" reference. Moreover, as the included studies were drawn from only one review, the generalizability of the results may be limited. In addition, we were unable to access a number of the databases used by the reviewers and so cannot judge their performance.

However, we can suggest the following conclusions:

- EMBASE, MEDLINE, BIOSIS, Web of Science and CAB Abstracts were useful information sources for this topic and demonstrated high levels of relative recall. However, the significant overlap between these information sources suggests that it is not necessary or efficient to search them all. MEDLINE and EMBASE provide the most efficient combination.

- Floating subject-headings should not be used in EMBASE searches unless the subject of the search is a drug or disease.

- Subject headings should be exploded if there are potentially relevant narrower terms.

- Adverse effects are difficult to identify, particularly when specific effects are not known in advance. A highly sensitive filter should be employed; it is advisable to investigate the impact this has on the results of the search to ensure that it does not exclude potentially relevant material.

ABBREVIATIONS

AgNIC	Agriculture Network Information Center
AGRIS	Internation Information System for the Agricultural Sciences and Technology
AHAW	EFSA's panel on Animal Health and Welfare
AP	application profile
CRD	Centre of Reviews and Dissemination
DACO	EFSA working group on data collection for the identification of emerging risks related to food and feed
DC	Dublin Core
DCMI	Dublin Core Metadata Initiative
EC	European Commission
EFCOVAL	European Food Consumption Validation Project
EFSA	European Food Safety Agency
ELS	electronic literature searches
EU	European Union
EURL	European Union Reference Laboratory
FSTA	Food Science and Technological Literature
ICTRP	International Clinical Trials Registry Platform
IEP	Information Exchange Platform
ISO	International Standards Organisation
IT	Information Technology
MECIR	Methodological Expectations of Cochrane Intervention Reviews
NIM	National Intelligence Model
NLM	National Library of Medicine
RA	risk assessment
SAS	Scientific Assessment Support Unit
SR	systematic review

UK	United Kingdom
US	United States (of America)
WHO	World Health Organization
YHEC	York Health Economics Consortium