

Searching the Veterinary Literature: A Comparison of the Coverage of Veterinary Journals by Nine Bibliographic Databases

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ABSTRACT

A thorough search of the literature to find the best evidence is central to the practice of evidence-based veterinary medicine. This requires knowing which databases to search to maximize journal coverage. The aim of the present study was to compare the coverage of active veterinary journals by nine bibliographic databases to inform future systematic reviews and other evidence-based searches. Coverage was assessed using lists of included journals produced by the database providers. For 121 active veterinary journals in the "Basic List of Veterinary Medical Serials, Third Edition," the percentage coverage was the highest for Scopus (98.3%) and CAB Abstracts (97.5%). For an extensive list of 1,139 journals with significant veterinary content compiled from a variety of sources, coverage was much greater in CAB Abstracts (90.2%) than in any other database, the next highest coverage being in Scopus (58.3%). The maximum coverage of the extensive journal list that could be obtained in a search without including CAB Abstracts was 69.8%. It was concluded that to maximize journal coverage and avoid missing potentially relevant evidence, CAB Abstracts should be included in any veterinary literature search.

Key words: evidence-based veterinary medicine, databases, searching, systematic reviews, veterinary literature

INTRODUCTION

Evidence-based medicine is a well-established concept in human medicine¹ but is still relatively new and undeveloped in the field of veterinary medicine.² Evidence-based medicine can be defined as "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients."^{2(p.3)} Central to the practice of evidence-based medicine, and systematic reviews in particular, is a systematic and thorough search of the scientific literature to find the best available evidence.^{3,4} This has been facilitated by the availability of online bibliographic databases in recent years.² Searching the literature is also an important way for veterinary practitioners to stay up to date with current research findings⁵ so that they can integrate research into practice.

In order to carry out a comprehensive search on a topic, it is important to know which databases to use to maximize the inclusion of relevant journals and articles published within these journals.^{6,7} For veterinary medicine and science, it might be necessary to search multiple databases, as potentially relevant research is published in a range of veterinary, agricultural, medical, and basic science journals.⁷

Several studies have assessed the coverage of journals in bibliographic databases for a variety of subject areas, such as psychiatry⁶ and agriculture.⁸ It appears that no similar quantitative study for veterinary medicine and science has been conducted since 1990, when Veenstra and Wright looked at the coverage of 60 "core" veterinary medical journals in 10 indexing and abstracting sources.⁹ Since that time, electronic bibliographic databases have been developed and much improved and new journals have appeared while others ceased publication. There is

thus a need for an up-to-date analysis, which could provide vital information to inform future evidence-based guidelines and systematic reviews. An analysis of this kind is also highly relevant for current awareness activities by veterinarians and librarians and for the teaching of evidence-based veterinary medicine.

The aim of this study was to compare the coverage of veterinary journals, and other journals with significant veterinary content, in nine bibliographic databases. Two analyses were carried out, one using a list of "core" veterinary journals (the "Basic List of Veterinary Medical Serials, Third Edition"¹⁰) and the other using an extensive list of journals of relevance to veterinary medicine and science compiled specially for this study. This study did not directly address other aspects of the utility of databases, such as the cost of access, ease of use, existence and quality of indexing, speed of adding new records, or the inclusion of content other than journal articles. These issues have been addressed elsewhere to some extent.^{5,7}

METHODS

Databases Included in Analysis

This analysis included nine bibliographic databases whose subject scope included topics relevant to veterinary medicine and science. Summary details of the databases analyzed are provided in Table 1.

The Thomson Reuters databases described in this study can all be searched using Web of Knowledge, which is not a database in itself but a search platform that allows the user to search multiple databases. The suite of databases included in Web of Knowledge is not fixed; rather,

Table 1: Summary details of bibliographic databases included in the analysis

Database	Publisher	Description	URLs for further information
BIOSIS Previews	Thomson Reuters Science	Specialist biological sciences database combining the journal coverage of Biological Abstracts with other content from Biological Abstracts/RRM. Available through Web of Knowledge or a variety of platform vendors.	http://thomsonreuters.com/products_services/science/science_products/a-z/biosis_previews/
CAB Abstracts	CABI	Applied life sciences database covering agriculture, environment, veterinary sciences, applied economics, food science, and nutrition. Available through the CAB Direct website or a variety of platform vendors. Articles tagged to the Veterinary Science subset of CAB Abstracts are also available as the Veterinary Science Database and in the online database VetMed Resource.	http://www.cabi.org http://www.cabdirect.org
Current Contents-Agriculture, Biology & Environmental Sciences	Thomson Reuters Science	Bibliographic database covering agriculture, biology, and environmental sciences. Available through Web of Knowledge or a variety of platform vendors.	http://thomsonreuters.com/products_services/science/science_products/a-z/cc_agriculture_biology_enviro/
Embase (formerly EMBASE)	Elsevier	Biomedical and pharmaceutical database. Since 2009 the database incorporates MEDLINE records from journals not indexed for Embase. Available through the Embase website or a variety of platform vendors.	http://www.embase.com
MEDLINE	US National Library of Medicine	Life sciences database concentrating on biomedicine. Available through a variety of platform vendors. Freely available via the PubMed website.	http://www.nlm.nih.gov/bsd/pmresources.html http://www.ncbi.nlm.nih.gov/pubmed
Science Citation Index Expanded	Thomson Reuters Science (formerly ISI)	Bibliographic and citation database covering science and technology. Available as part of Web of Science (see below) or through a variety of platform vendors.	http://thomsonreuters.com/products_services/science/science_products/a-z/science_citation_index_expanded/
Scopus	Elsevier	Multidisciplinary bibliographic and citation database, claimed by publishers to be "the world's largest abstract and citation database of peer-reviewed literature." Available through the SciVerse Scopus website.	http://www.scopus.com
Web of Science	Thomson Reuters Science (formerly ISI)	Multidisciplinary bibliographic and citation database incorporating Science Citation Index Expanded, Social Sciences Citation Index, and Arts & Humanities Citation Index, plus other content. Available through Web of Knowledge.	http://thomsonreuters.com/products_services/science/science_products/a-z/web_of_science/
Zoological Record	Thomson Reuters Science	Specialist zoology and animal science database. Available through Web of Knowledge or a variety of platform vendors.	http://thomsonreuters.com/products_services/science/science_products/a-z/zoological_record/

RRM = reports, reviews, and meetings.

the availability of a particular database is determined by the subscription of the respective institution.¹¹ Therefore, in addition to analyzing the results for Web of Science, Zoological Record, and BIOSIS Previews separately, the results for these databases were analyzed together to give a combination that might typically be searchable through Web of Knowledge in an academic institution with a veterinary department.

It should be noted that MEDLINE, as described in this study, is the bibliographic database available via PubMed. PubMed is probably better known to veterinarians as it is available for free on the Internet, and its use is often described in resources on evidence-based veterinary medicine.^{2,3,7} MEDLINE is also available for purchase from various database providers (like the other databases described in this study).

Two potentially relevant databases were omitted. One of these was AGRICOLA,¹² the catalog of the United States National Agricultural Library, which includes a free article citation database for agriculture and allied disciplines, including animal and veterinary sciences. At the time this study was conducted (May–July 2011), the list of journals indexed in AGRICOLA was not publicly available as the scope of the database was being reviewed and was subject to major revision. Hence, any analysis for AGRICOLA would soon be out of date and invalid. The ProQuest database Biological Sciences¹³ was also omitted as it does not index all articles published in many veterinary journals¹⁴ and veterinary medicine and science are not listed as specific subjects for inclusion in this database.¹⁵

Selection of Journals for Analysis

This study included only journals that were still being published at the time of assessment, referred to as “active” here. This was necessary as the different databases varied in whether they included journals that had ceased publication. The publication status of the journals was assessed using Ulrichsweb Global Serials Directory.¹⁶ For those journals not listed on Ulrichsweb, Web searches were carried out to determine if the journals were active and editorial offices were contacted if necessary.

Two separate analyses of journal coverage by databases were carried out. The first analysis used the core list of 123 veterinary medical journals published by Ugaz et al. in 2010 as the “Basic List of Veterinary Medical Serials, Third Edition.”¹⁰ The “Basic List of Veterinary Medical Serials” is a well-established and updated list produced by US veterinary librarians as an aid to library collection development. The list uses systematic methods to rank journals in order of quality, impact, and perceived value by librarians and veterinary practitioners. This study found that two journals in the latest (third) edition had been discontinued, so these were omitted: *Animal Research* (which merged to form *Animal* in 2007) and *Deutsche Tierärztliche Wochenschrift* (which merged to form *Berliner und Münchener Tierärztliche Wochenschrift* in 2010). However, both of the successor journals, *Animal* and *Berliner und Münchener Tierärztliche Wochenschrift*, were also on the list. Thus, 121 journals were included in the analysis based on this revised list.

The second analysis of database journal coverage used an extensive list of 1,139 journals that was intended to be as comprehensive as possible by combining lists from a wide variety of sources. As not all articles of relevance to veterinary medicine and science are published in veterinary journals, the list included other journals that contained a significant amount of content relevant to veterinary medicine and science. The following sources were used to identify journals for the extensive list (data as of May 5, 2011):

- “Basic List of Veterinary Medical Serials, Third Edition”¹⁰ (also used for the first analysis); 121 active titles.
- US National Library of Medicine catalog. MEDLINE journals indexed to “Veterinary Medicine” or “Laboratory Animal Science” as broad subject terms¹⁷; 128 active titles.

- Thomson Reuters Science *Focus On: Veterinary Science & Medicine* journal list¹⁸ and *Science Citation Index Expanded Veterinary Sciences* journal list¹⁹; 194 active titles.
- Zoological Record Veterinary Sciences journal list²⁰; 120 active titles.
- Scopus Sources²¹ with “Veterinary” as subject area; 175 active titles.
- Ulrichsweb Global Serials Directory¹⁶ using advanced search with subject as “Veterinary Science,” content type as “Academic/scholarly,” and excluding conference proceedings, irregular monographs, newsletters, current awareness publications, and annual reports; 369 active titles.
- The bibliometric analysis by Crawley-Low of the journals most cited in the *American Journal of Veterinary Research* from 2001 to 2003.²² Table 4 of that paper yielded a list of 74 veterinary and other journals, and from these, those still active were included; 68 active titles.
- A spreadsheet dated April 2, 2011 listing journals that had at least one article indexed to the Veterinary Science subset of the CAB Abstracts database over the last five years. This spreadsheet was provided by CAB in response to a query about veterinary journal coverage in CAB Abstracts. The list contained 5,130 journals, but most had only a small number of veterinary articles. The decision was made to include from this spreadsheet those journals that had 50 or more articles indexed as “Veterinary Science” in the last five years, which yielded 931 titles. Any other, specifically veterinary journals from the list (59 titles), were also included. Most of these were new journals or journals that appear at infrequent intervals; 990 active titles.

Once these active journals had been obtained from all the different sources, they were combined into a single spreadsheet and any duplicates were removed. The International Standard Serial Number (ISSN) was recorded for each journal to aid correct identification where journals had similar titles or where titles were expressed differently in different databases (for example non-English and translated titles). For journals published in online form only, the electronic ISSN was used. When discrepancies were found in ISSNs or journal titles, they were communicated to database producers and journal publishers to try to determine what was correct. In a few cases alternative ISSNs had to be used; this was the case if both were in widespread use and there was disagreement between sources on what was correct.

Assessment of Coverage of Journals in Databases

The sources used to assess the inclusion of journals in the different databases are given in Table 2. For the first analysis using the “Basic List of Veterinary Medical Serials, Third Edition,” the date of assessment of journal coverage was May 5, 2011. For the second analysis using the extensive list of 1,139 journals, it took several days to assess each database, and the overall assessment period lasted from mid-May to mid-July 2011.

Table 2: Sources used to assess inclusion of journals in the databases studied*

Database	Source	URL	Date of assessment for extensive journal list
CAB Abstracts	CAB Abstracts serials cited	http://www.cabi.org/default.aspx?site=170&page=1016&pid=125	June 23–24, 2011
BIOSIS Previews; Current Contents-Agriculture, Biology & Environmental Sciences; Science Citation Index Expanded; Web of Science; Zoological Record	Thomson Reuters Master Journal List	http://ip-science.thomsonreuters.com/mjl	July 1–11, 2011
Embase	Embase journals list, spreadsheet dated 26 March 2011	http://www.embase.com (link on right of home page)	July 12–15, 2011
MEDLINE	National Library of Medicine Catalog: Limit "Journals currently indexed in MEDLINE."	http://www.ncbi.nlm.nih.gov/nlmcatalog	June 28–30, 2011
Scopus	Scopus sources search	http://www.scopus.com/source/browse.url?zone=TopNavBar&origin=sbrowse	May 17–19, 2011

* For the first analysis using the "Basic List of Veterinary Medical Serials, Third Edition," journal coverage was assessed on May 5, 2011.

Two of the databases, Embase and CAB Abstracts, had an alphabetical list of included journals, but for the other databases the journal lists were in the form of searchable online databases. Titles were first searched in the alphabetical lists where available, ensuring that the ISSN matched. If there was no alphabetical list, or if a title could not be found (for example if it was written in a different format or language), then searching was done using the ISSN. If titles were still not found, a final search was done using single keywords; this was necessary where different ISSNs were in use by different databases or where no ISSN was recorded.

The Thomson Reuters Master Journal List did not list the journals included in Web of Science. Instead, it listed the journals in its component databases—Science Citation Index Expanded, Social Sciences Citation Index, and Arts & Humanities Citation Index. From this, the journals in Web of Science were derived for this study.

Inclusion of each journal by the different databases was recorded in an Excel spreadsheet for both of the journal lists analyzed. The Excel COUNTIF function was used to count the number of included and omitted journals for each database and database combination studied in order to avoid possible errors in manual counting. The percentage coverage of the journal lists was then calculated in each case.

RESULTS

Coverage of Journals from "Basic List of Veterinary Medical Serials, Third Edition"

Coverage of the 121 active journals taken from the "Basic List of Veterinary Medical Serials, Third Edition" is shown in Table 3. The original spreadsheet recording the inclusion of each journal by the databases studied is available

online as Appendix 1. Scopus gave the best coverage and included 98.3% of the journals with only two omissions: *Animal Law* and *Journal of the American Holistic Veterinary Medical Association*. CAB Abstracts had similar coverage at 97.5% coverage with three journals omitted: *Animal Law*, *Veterinary Economics* and *Veterinary Heritage*. Science Citation Index Expanded gave slightly less coverage at 92.6%, omitting nine journals, among them the clinical veterinary journals *Journal of Veterinary Cardiology*, *Veterinary Clinics of North America: Exotic Animal Practice*, and *Veterinary Medicine*. In the Thomson Reuters Master Journal List, no extra journals were found in the other component databases within Web of Science, so the coverage for Web of Science shown in Table 3 is the same as for Science Citation Index Expanded.

The other Thomson Reuters databases, Current Contents-Agriculture, Biology & Environmental Sciences, Zoological Record, and BIOSIS Previews, all gave relatively poor coverage of the journals in the "Basic List." These databases omitted many veterinary and animal science journals from the list, and the inclusion of veterinary journals was particularly poor in Zoological Record. The combination of Web of Science, Zoological Record, and BIOSIS Previews, which is possible via the Web of Knowledge platform depending on subscription (see Table 1), added only one extra journal compared to Web of Science alone, namely, *Veterinary Clinics of North America: Exotic Animal Practice* (which was included in Zoological Record).

For the biomedical databases MEDLINE and Embase, coverage was lower than in Scopus, CAB Abstracts, and Science Citation Index Expanded. MEDLINE gave 82.6% coverage, omitting 21 journals and Embase gave 85.1% coverage, omitting 18 journals. The extra journals in Embase compared to MEDLINE were *Animal Welfare*, *Scandinavian Journal of Laboratory Animal Science*, and *Veterinary Quarterly*. Both MEDLINE and Embase missed several

Table 3: Coverage of 121 active journals from the "Basic list of veterinary medical serials, third edition" (Ugaz et al. 2010) by a range of bibliographic databases and database combinations. Data as of 5 May 2011

Database	Number of journals included	Percentage coverage
Scopus	119	98.3%
CAB Abstracts	118	97.5%
Web of Science, Zoological Record, and BIOSIS Previews	113	93.4%
Science Citation Index Expanded	112	92.6%
Web of Science (includes Science Citation Index Expanded)	112	92.6%
Embase	103	85.1%
MEDLINE	100	82.6%
Current Contents-Agriculture, Biology & Environmental Sciences	93	76.9%
BIOSIS Previews	85	70.2%
Zoological Record	48	39.7%

Table 4: Coverage of the extensive list of 1,139 active veterinary journals, and journals with significant veterinary content, by a range of bibliographic databases and database combinations. Data as of May–July 2011

Database	Number of journals included	Percentage coverage
CAB Abstracts	1,027	90.2%
Web of Science, Zoological Record & BIOSIS Previews	761	66.8%
Scopus	664	58.3%
Science Citation Index Expanded	607	53.3%
Web of Science (includes Science Citation Index Expanded)	607	53.3%
BIOSIS Previews	542	47.6%
Embase	443	38.9%
MEDLINE	416	36.5%
Zoological Record	388	34.1%
Current Contents-Agriculture, Biology & Environmental Sciences	314	27.6%

veterinary journals, such as *Australian Veterinary Practitioner*, *Equine Veterinary Education*, *Journal of Equine Veterinary Science*, *Journal of Exotic Pet Medicine*, *Journal of Swine Health and Production*, *Revue de Médecine Vétérinaire*, and *Veterinary Medicine*. They also omitted several animal science journals—*Animal*, *Anthrozoös*, *Applied Animal Behaviour Science*, *Canadian Journal of Animal Science*, and *Small Ruminant Research*.

Coverage of the Extensive List of Journals

The coverage of the 1,139 journals in the extensive list is shown in Table 4. The Excel spreadsheet, recording all the journals and their inclusion by each database, is available online as Appendix 2. CAB Abstracts gave by far the best coverage (90.2%). Many of the 112 journals not included in CAB Abstracts were non-English language publications that had been identified from Ulrichsweb Global Serials Directory. Also omitted from CAB Abstracts were a small number of specialist publications aimed at particular animal species and some recently-launched veterinary journals. After CAB Abstracts, the databases that gave the next best coverage of the extensive list of journals were Scopus with 58.3% coverage and Science Citation Index Expanded with 53.3% coverage. The coverage for Web of Science was the same as for Science Citation Index Expanded, as there were no extra journals in

the other constituent databases of Web of Science. Zoological Record and BIOSIS Previews gave relatively poor coverage, but when combined with Web of Science (as possible in Web of Knowledge) coverage was increased to 66.8%. The other database from Thomson Reuters, Current Contents-Agriculture and Biology & Environmental Sciences, had the lowest coverage of all the databases studied (27.6%). MEDLINE and Embase, with 36.5% and 38.9% coverage respectively, had much poorer coverage than BIOSIS Previews, Science Citation Index Expanded and Scopus, and included less than half the number of journals covered by CAB Abstracts.

Table 5 shows the number of unique journals, that is, journals included in one database only, that were in the extensive list of journals. CAB Abstracts had 261 unique journals out of the total 1,139 that were analyzed. When this figure is combined with the 83 journals that were not indexed in any of the databases studied, it indicates that the maximum coverage that could be obtained without including CAB Abstracts in a search would be 795 journals (69.8% of the total). The journals unique to CAB Abstracts included many veterinary and animal science journals from outside North America and Western Europe and from non-English speaking countries. Although Zoological Record gave the second lowest coverage of all the

Table 5: Numbers of unique journals (journals included in one database only) for the extensive list of 1,139 active journals

Database	Number of unique journals	Percentage of total journal number
CAB Abstracts	261	22.9%
Zoological Record	13	1.1%
Scopus	4	0.35%
BIOSIS Previews	2	0.18%
Science Citation Index Expanded or Web of Science	2	0.18%
Current Contents-Agriculture, Biology & Environmental Sciences	0	0%
Embase	0	0%
MEDLINE	0	0%
Journals in none of the databases	83	7.3%

Table 6: Coverage of the extensive list of 1,139 active journals by pairing CAB Abstracts with other databases included in the analysis

Database combined with CAB Abstracts	Number of additional journals	Number of journals included	Percentage coverage
<i>CAB Abstracts alone</i>		1,027	90.2%
Zoological Record	18	1,045	91.7%
Scopus	10	1,037	91.0%
Science Citation Index Expanded	8	1,035	90.9%
Web of Science (includes Science Citation Index Expanded)	8	1,035	90.9%
BIOSIS Previews	5	1,032	90.6%
Embase	4	1,031	90.5%
MEDLINE	4	1,031	90.5%
Current Contents-Agriculture, Biology & Environmental Sciences	3	1,030	90.4%

databases studied, after CAB Abstracts it had the greatest number of unique journals (13). These were mostly veterinary journals and specialist journals about particular animal groups. The only other databases with unique journals were Scopus (4), Science Citation Index (2), and BIOSIS Previews (2).

This analysis has included two database combinations: Web of Science, which includes Science Citation Index as a component, and the combination of Web of Science, Zoological Record, and BIOSIS Previews. There are many other possible permutations for combinations of the databases studied. As the maximum possible coverage would be 69.8% in any search that omitted CAB Abstracts, then CAB Abstracts would have to be included in any database combination to maximise journal coverage. The coverage obtained by pairing CAB Abstracts with each of the other databases in turn is shown in Table 6. CAB Abstracts combined with Zoological Record gave the best coverage (91.7%), and CAB Abstracts combined with Scopus gave the next best coverage (91.0%).

To maximise journal coverage, those databases that contained unique journals would need to be added to CAB Abstracts. Table 7 shows the cumulative effect of adding in successive databases in order of the number of unique journals they contain. Having added Zoological Record, and thus increasing the journal coverage from 90.2% to

91.7%, the addition of Scopus, Science Citation Index Expanded, and BIOSIS Previews only further increased the coverage to 92.7%. This is the maximum coverage that could be obtained with any combination of the databases in the analysis.

DISCUSSION

This study has found considerable differences in the inclusion of journals relevant to veterinary medicine and science by different databases. The question of which database or databases to use depends on the purpose. For example, carrying out a comprehensive search for a systematic review, finding key references for teaching, answering a simple clinical question, and locating a specific article may require different information sources. Ideally, all searches should be as thorough as possible, but there is no one database that is perfect. Therefore, an understanding of the relevance, coverage, and uniqueness of the available databases is essential.

If the aim of searching databases is to gain current awareness of important new research findings, which requires access to a core of high-impact and high-quality veterinary journals, then coverage of the "Basic List of Veterinary Medical Serials, Third Edition" may be one indicator of the usefulness of the different databases, with speed of

Table 7: Cumulative coverage of the extensive list of 1,139 active journals by successively adding other databases to CAB Abstracts in order of the number of unique journals they contain

Databases added successively	Number of additional journals	Cumulative number of journals included	Percentage coverage
CAB Abstracts alone		1,027	90.2%
Zoological Record	18	1,045	91.7%
Scopus	6	1,051	92.3%
Science Citation Index Expanded	3	1,054	92.5%
BIOSIS Previews	2	1,056	92.7%

indexing also being an important factor. However, the extent to which this list represents journals that veterinary clinicians use in practice is not known. Scopus, CAB Abstracts, Science Citation Index Expanded, and Web of Science gave almost complete coverage of the clinical and scientific journals in this list, so they could each be appropriate for current awareness purposes to enable clinicians to access important new evidence. The omission of *Animal Law*, *Veterinary Economics*, and *Veterinary Heritage* in databases with otherwise complete coverage is probably not significant for answering clinical questions. *Veterinary Heritage* and *Animal Law* were in fact included in the "Basic List of Veterinary Medical Serials, Third Edition," along with *Journal of the American Holistic Veterinary Medical Association*, *Veterinary Technician*, *Historia Medicinae Veterinariae*, and *Animal Biotechnology* in order to provide "more complete subject representation" in veterinary libraries, despite coming below the threshold for inclusion in the prioritisation criteria that were used by Ugaz et al.^{10(p.287)} The relatively low coverage of the "Basic List of Veterinary Medical Serials, Third Edition" by Current Contents-Agriculture, Biology & Environmental Sciences, Zoological Record, and BIOSIS Previews suggests these databases are of limited value for current awareness in veterinary medicine and science, at least when used alone.

For comprehensive coverage of the veterinary literature, assessed here using the extensive list of 1,139 veterinary journals and journals with significant veterinary content, CAB Abstracts emerged as the best database by a considerable margin. This is in line with the conclusion over 20 years ago by Veenstra and Wright that *Index Veterinarius*, the paper equivalent of the veterinary journals in CAB Abstracts, gave the best coverage of a much smaller sample of core veterinary journals.⁹ Two key findings of the present study were that CAB Abstracts on its own covered just over 90% of journals in the extensive list of journals, but if CAB Abstracts was not used, the greatest possible coverage using a combination of the other databases tested would be 69.8%. It therefore appears essential to include CAB Abstracts in any search to avoid missing potentially relevant evidence. The publishers of CAB Abstracts specifically aim to give comprehensive, international coverage, including less well-known and non-English journals.²³ Those journals that are missed by the other databases may not necessarily be perceived as the most high quality journals, but the definition of "quality" is subjective and depends on purpose. In addition to its indexing of journals, which was the focus of this study,

a further advantage of CAB Abstracts is its extensive coverage of "grey" literature, for example conference proceedings, reports, monographs, and theses.²⁴

This study found that databases such as Scopus, Science Citation Index Expanded, Web of Science, and BIOSIS Previews gave much lower coverage of the extensive list of journals than CAB Abstracts, and would only increase coverage slightly when added to CAB Abstracts. However, there is still potential benefit in including these databases in any search if the aim is to be as comprehensive as possible. Searching across multiple databases allows for missing records, delays in adding records, errors in citations, and differences in indexing between those databases that use thesaurus terms. It is also appropriate to include databases relevant to the specific topic when searching for relevant veterinary research.⁷ Thus, MEDLINE and Embase can be included for biomedical topics, and Zoological Record and BIOSIS Previews can be included if the topic has a biological slant. Although Zoological Record gave relatively poor coverage of both the "Basic List of Veterinary Medical Serials, Third Edition" and the extensive journal list, it does appear to have value as a supplement to CAB Abstracts to increase journal coverage. The topic scope of Zoological Record means it is likely to be of particular relevance for zoo, exotic, and wildlife medicine and for animal behavior.

The less than optimal coverage by MEDLINE for both the "Basic List of Veterinary Medical Serials, Third Edition" and, in particular, the extensive list of journals, is noteworthy. The omission of several important veterinary journals by MEDLINE is already known among veterinary librarians.^{7,24} However, this study quantifies the coverage by MEDLINE and puts it in the context of other databases with much wider journal coverage for veterinary medicine and science, such as CAB Abstracts, Scopus, and Web of Science. The other biomedical database, Embase, gave only slightly better coverage than MEDLINE, due to its indexing of some extra journals and inclusion of MEDLINE records for journals not indexed for Embase. The findings here call into question the value of using MEDLINE or Embase alone in comprehensive searches for the published evidence without combining them with other databases.

PubMed, the open-access database provided by the US National Library of Medicine, includes MEDLINE and gives equivalent journal coverage, except for some additional life science journals that submit full text to PubMedCentral.²⁵

Veterinarians often do not have institutional access to bibliographic databases and may be unable to afford the subscription costs, so PubMed is attractive given its free availability on the Internet. A further incentive to using PubMed is its wide application in human medicine and its use as an example in educational resources about evidence-based veterinary medicine.^{2,3} But veterinarians, researchers, and systematic reviewers should be aware of the limitations of their search if using only MEDLINE or PubMed for a veterinary topic.

A feature of this study is that a large number of the journals included in the extensive list for the second analysis were derived from CAB Abstracts, which would favor this database in the results. An attempt was made to compensate for this by including journals derived from as many other sources as possible. However, it was inevitable that CAB Abstracts contributed so much to the extensive list of journals simply because of its relatively comprehensive coverage of the veterinary literature; this is demonstrated by the large number of journals that were found to be unique to CAB Abstracts. Furthermore, the consistent indexing of articles to the Veterinary Science subset of CAB Abstracts meant it was the only source that could be found to identify journals that were not specifically veterinary but had significant veterinary content, apart from the study by Crawley-Low.²² While there is a "Veterinary Science" subset available in PubMed, it is not produced by indexing of individual articles but by a complex search strategy using animal terms and specific journal titles.²⁶

Another potential limitation of this study is that it only looked at active journals. Retrospective coverage of existing journals, and the inclusion of journals that are no longer active, are important considerations, particularly for more recently introduced databases. Even in the long-established database MEDLINE, which has citations dating back to the mid-1940s, not all years are indexed for a given journal.²⁴ A related factor is the degree of partial indexing, where not all articles in a given journal issue may be indexed depending on the topic scope of the database. It is difficult to ascertain and generalize about such differences between databases, and this is another reason to search across multiple databases whenever possible.

In conclusion, both Scopus and CAB Abstracts give almost complete coverage of the core list of veterinary journals in the "Basic List of Veterinary Medical Serials, Third Edition." However, where the aim is to find all the published research evidence on a specific veterinary topic, for example for a systematic review, this study suggests that CAB Abstracts should be searched. Otherwise, many journals with potentially relevant veterinary content will be missed. The addition of Scopus, Science Citation Index Expanded or Web of Science, BIOSIS Previews, and Zoological Record would increase the journal coverage slightly and provide an insurance against a citation being missed in any one particular database. MEDLINE, PubMed, or Embase could be useful to include if there was a biomedical aspect to the search question, but cannot be relied on to give comprehensive coverage of the veterinary literature on their own.

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