Salmonella in animal feeds: A scoping review protocol

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Abstract

Background: Salmonella spp. cause enteric illness in humans and animals. Animal feeds are a potential source of Salmonella spp. for livestock and poultry. A formal scoping review of the literature relevant to Salmonella in animal feed would help to identify areas for evidence synthesis and also gaps in the literature to target future research.

Objectives: This protocol describes the methods for a scoping review to address the question "What is the nature and volume of the primary research literature on Salmonella in livestock and poultry feeds or feed manufacturing?".

Eligibility criteria: Primary research studies published in English since 1995 that investigate Salmonella spp. of any serotype in feeds intended for livestock or poultry, or that investigate any serotype of Salmonella spp. in facilities, environments, or equipment related to manufacturing, transporting, storing, or administering of feed intended for consumption by livestock or poultry.

Sources of evidence: Searches will be conducted in MEDLINE® (Web of Science™), Agricola (ProQuest), CAB Direct (CABI), and Scopus.

Charting methods: Data charting will include study characteristics, setting or sector of the feed production system, serotypes of Salmonella investigated, and study purpose (including frequency, molecular characteristics, diagnostic test or surveillance system development or validation, risk factor identification, and intervention evaluation).

1. Introduction

1.1. Rationale

Salmonellosis is an important public health issue; in the US, there are over a million cases of salmonellosis per year, with foodborne transmission being a common route of exposure (Scallan
Salmonella spp. may be present in the faeces of a variety of food animal species, symptomatically or asymptomatically (Rukambile et al., 2019). One potential source of Salmonella for food animals is through the consumption of contaminated feed (Jones, 2011). To date, there has not been a published scoping review describing the literature related to Salmonella in animal feeds. A scoping review on this topic could be useful for identifying specific topics with a sufficient depth of literature to support a systematic review and also to identify research gaps.

1.2. Objectives

The objective of this protocol is to describe the methods that will be used to conduct a scoping review to address the following research question: "What is the nature and volume of the primary research literature on Salmonella in livestock and poultry feeds or feed manufacturing?" For the purposes of this review, "animal feed" will include feed intended for consumption by livestock or poultry. The scoping review will follow the methodological framework outlined by Arksey and O’Malley (1995).

2. Methods

2.1. Protocol and registration

This protocol was prepared using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) reporting guidelines (Tricco et al., 2018) and will be published on the University of Guelph Atrium (https://atrium.lib.uoguelph.ca/xmlui/handle/10214/10046). The protocol also will be available at SYREAF (www.syreaf.org).
2.2. Eligibility criteria

To be eligible for inclusion in this review, studies must be:

1) Available in English (although studies published in English from any country are eligible);
2) Available in full-text of at least 500 words, to allow sufficient detail for data characterization;
3) Published during or after 1995;
4) A primary research design, including descriptive study designs, experimental designs, and analytical observational designs. At full-text screening, the number of studies conducted as *in silico* models, risk assessments, formal guideline documents, systematic reviews, meta-analyses, or scoping reviews will be quantified, but these studies will not be further characterized.
5) Investigating any serotype of *Salmonella* spp. in feed intended for consumption by livestock or poultry, or
6) Investigating any serotype of *Salmonella* spp. in facilities, environments, or equipment related to manufacturing, transporting, storing, or administering of feed intended for consumption by livestock or poultry.

2.3. Information sources

Four electronic databases will be search for eligible studies from January 1, 1995 to the date of the search: MEDLINE® (Web of Science™), Agricola (ProQuest), CAB Direct (CABI), and Scopus. Given the anticipated size of the literature, a grey literature search will not be conducted.

The citations resulting from the database searches will be uploaded into Endnote® X9 Desktop and de-duplicated using internal algorithms. De-duplicated citations then will be imported into DistillerSR® (Evidence Partners, Ottawa, ON, Canada) review management software, where
addition de-duplication will be conducted prior to eligibility screening. Following full-text screening, an additional manual de-duplication will be conducted.

2.4. Search

The proposed search strategy is included in the Table below, restricted to publications from 1995 to present. The search will not include language or study design restrictions. The search will be formatted for implementation in other databases, including the use of MeSH terms where possible.

<table>
<thead>
<tr>
<th>1</th>
<th>(Salmonella OR “bacterial contamination” OR “microbiological assessment” OR “microbiological quality”)</th>
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<tbody>
<tr>
<td>2</td>
<td>(“Animal feed*” OR “in-feed” OR “feeding stuffs” OR “poultry feed*” OR “Hog feed*” OR “swine feed*” OR corn OR grain* OR barley OR silage OR “crops” OR meal* OR pelleted OR pellet OR pelleting OR “dry feed*” OR “wet feed*” OR “fermented feed*” OR “feed mill*” OR feedmill* OR manufacturing OR factory OR factories OR feedstuff* OR feedingstuff* OR feed* or ration* or TMR or “total mixed ration*” or diet* or ingredient*)</td>
</tr>
<tr>
<td>3</td>
<td>#1 AND #2</td>
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</tbody>
</table>

2.5. Selection of sources of evidence

Study selection will be conducted in DistillerSR® (Evidence Partners, Ottawa, Canada). Eligibility will be assessed by two reviewers working independently, first based on the title/abstract and then, for studies identified as potentially eligible, based on the full text. For the title/abstract screening, agreement will be at the form level, whereas agreement will be at the question level for the full-text screening. For both levels, any disagreements will be resolved by consensus or in consultation with a third reviewer if consensus cannot be reached. Due to the anticipated large number of citations that will be included for the title/abstract screening,
Distiller’s internal AI ranking program will be used. An initial training set of 1000 references will be used, after which the remaining references will be ranked by likelihood of being eligible. The program will re-rank citations after every 1000 citations that are screened. At the point where no additional eligible citations have been identified for 500 consecutively ranked references (as agreed by consensus of 2 reviewers), further screening will not be conducted and it will be assumed that all eligible references have been identified.

The title/abstract screening form will be pre-tested by all reviewers on 100 records and revised as needed for clarity and consistency, before screening begins. This form will comprise the following question:

1) Does the title or abstract describe a study investigating *Salmonella* (any serotype) in feed intended for consumption by livestock or poultry, or in facilities, environments, or equipment used for animal feeds?
   a. YES (neutral response)
   b. NO (exclude)
   c. UNCLEAR (neutral response)

2) Based on the title or abstract, is the study a primary research study?
   a. YES (neutral response)
   b. NO, but is an *in silico* model, risk assessment, guideline document, systematic review, meta-analysis, or scoping study (neutral response)
   c. NO (exclude)
   d. UNCLEAR (neutral response)
3) Is the article published in English?
   a. YES  (acquire full text and move to full text screening)
   b. NO    (exclude)
   c. UNCLEAR  (acquire full text and move to full text screening)

The full-text screening form will be pre-tested by all reviewers on five records and revised for clarity and consistency prior to the beginning of screening. This form comprises the following questions:

1) Is the study available as full text of at least 500 words?
   a. YES  (neutral response)
   b. NO    (exclude)

2) Is the full text of the study published in English?
   a. YES  (neutral response)
   b. NO    (exclude)

3) Does the full text describe a study investigating *Salmonella* (any serotype) in feed intended for consumption by livestock or poultry, or in facilities, environments, or equipment used for animal feeds?
   a. YES  (neutral response)
   b. NO    (exclude)

4) Based on the full text, is the study a primary research study?
   a. YES  (advance article to data characterization stage)
   b. NO, but is an *in silico* model (exclude)
   c. NO, but is a risk assessment  (exclude)
   d. NO, but is a guideline document (exclude)
e. NO, but is a systematic review and / or meta-analysis  (exclude)

f. NO, but is a scoping study  (exclude)

g. NO  (exclude)

The total number of articles originating from each database searched, the number of unique citations following de-duplication, the number of studies assessed for eligibility based on the titles and abstracts, and number of studies assessed for eligibility based on review of the full-text screening (with reasons for exclusions at this stage) will be reported in a PRISMA Flow Diagram (Moher et al., 2009).

2.6. Data charting process

Data charting will be conducted in DistillerSR® by two reviewers working independently. The data charting form will be pre-tested by all reviewers on five studies, following which modifications will be made, if necessary, for question clarity. Conflicts will be resolved by consensus or, if consensus cannot be reached, a third reviewer will be consulted. Authors will not be contacted for clarification or to obtain additional information on eligible studies. If an article describes more than one study, the data will be charted at the article level (i.e., information from all studies within an article will be extracted into a single DistillerSR® form).

2.7. Data items

The proposed information that will be extracted from each eligible article for data charting is summarized as follows, noting that additional response options for the charting questions may be included as the review evolves:

- Country(ies) where study was conducted
Study design

Month(s) and year(s) when study was conducted

Study setting where feed contamination was investigated

For each setting reported in the study:

- Type(s) of feedstuffs evaluated
- Species for which the feedstuff is intended
- Sources tested for *Salmonella*
- *Salmonella* serotypes investigated
- *Salmonella* outcomes reported

Purpose of the study (check all that apply)

- Development or validation of methods for detecting *Salmonella* in feeds,
- Development or validation of surveillance methods for monitoring *Salmonella* in feeds,
- Estimating prevalence of *Salmonella*
- Estimating concentration of *Salmonella*
- Estimating survival times for *Salmonella*
- Molecular epidemiology of *Salmonella*
- Identification of risk factors for prevalence, concentration, or survival of *Salmonella*
- Evaluation of interventions
- Evaluation of linkages between *Salmonella* in animal feed and illness in humans.

The study results from eligible studies will not be extracted, as this is a scoping review.
2.8. Critical appraisal of individual sources of evidence

A critical appraisal of the literature will not be conducted, as this is a scoping review.

2.9. Synthesis of results

Descriptive statistics will be used to summarize the results of the data charting. The summaries will be presented using a combination of tables, figures, and narrative text. Research gaps will be identified if present, and a narrative summary of research areas with potentially sufficient bodies of evidence to support systematic reviews will be provided.

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References


