Antimicrobial prophylaxis in companion animal surgery: protocol for a scoping review

ADMINISTRATIVE INFORMATION

Title:

Antimicrobial prophylaxis in companion animal surgery: protocol for a scoping review

Registration:

The review protocol will be registered with the Systematic Reviews for Animals & Food (SYREAF) before initiation of the review.

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Contributions

(1) Contributed substantially to the conception and design of the study, the acquisition of data, or the analysis and interpretation;
(2) Drafted or provided critical revision of the article
(3) Provided final approval of the version to be published

TMS and NH drafted the protocol and developed the search strategy. All authors were consulted

to approve the search strategy, and contributed to the development of the selection criteria and data extraction criteria.
FA, TMS and NH will draft the manuscript.
SB, AV, MN, DV, JER and JSW provided expertise on surgical procedure groupings and relevance of review questions.
All authors read, provided feedback and approved the final protocol manuscript.

Amendments:
In the event of protocol amendments, the date of each amendment will be accompanied by a description of the change and the rationale

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INTRODUCTION

Rationale
Surgical antimicrobial prophylaxis is a significant contributor to antimicrobial use in both human and veterinary medicine. Currently available antimicrobial stewardship guidelines provide recommendations for antimicrobial use based largely on textbook and expert opinion and, at best, consensus opinion. The body of supportive literature underlying these recommendations has not been previously reviewed.

Objectives
The aim is 1) to evidence map the available published and ahead-of-print peer reviewed literature with regard to surgical antimicrobial prophylaxis in both dogs and cats, 2) to identify groups of surgeries for which enough evidence is available to proceed with a systematic review and meta-analysis. This will form the basis for future ENOVAT practice guidelines on antimicrobial stewardship for companion animal veterinarians.

The scoping review will answer the following question:
What scientific evidence is available for antimicrobial prophylaxis before, during or after surgical procedures in both dogs and cats, and which surgeries are represented?

METHODS

Eligibility criteria
Studies will be selected according to the prioritized criteria outlined below

1. Language: English title and abstract
2. Study designs: Original studies, including prospective studies, retrospective studies and case series.
3. Population: Dogs and/or cats
4. Population: Surgery* performed
5. Concept: Antimicrobial regimen pre-, peri- or post-surgery or no antimicrobial treatment
6. Context: All settings accepted

*including elective neutering, Caesarean sections and pyometra surgery, traumatic wounds,

abscesses, cutaneous tumour excision with or without reconstructive surgery, neurosurgery, orthopaedic surgery with or without implants, aseptic and septic abdominal surgery with or without incision to a viscus, dental procedures and thoracic surgery.

Exclusion criteria

1. Study design: Case reports or case series with fewer than 10 cases
2. Surgeries with an already established infection where treatment is not prophylactic but considered therapeutic

No restrictions/exclusion will be made a priori based on outcome measures, timing, settings or language of full text papers.

Information sources

In order to have the best coverage of veterinary literature databases CAB Abstract, Embase, MEDLINE, Scopus and Web of Science Core Collection will be searched through CAB Direct, Ovid, PubMed, Scopus and Web of Science interface, respectively (Grindlay et al., 2012).

Manual reference lists screening of all included studies and relevant reviews identified will be performed for additional, but missing relevant studies.

Search strategy

A sensitive literature search strategy will be developed using index terms from medical subject headings (MeSH), Emtree and CAB thesaurus, variations, related terms, synonyms and abbreviations according to the population and concept defined above. Optimization of the search strategy will follow the systematic approach described by Bramer et al. (2018). A separate search will be performed for dogs and cats, respectively.

Population – Species generic	(***Pets*** [MeSH] OR Pets [tiab] OR Pet [tiab] OR Companion Animal [tiab] OR Companion Animals [tiab]) AND
Population – Species 1	***Dogs*** [MeSH] OR Dogs [tiab] OR Dog [tiab] OR Canis familiaris [tiab] OR Canine [tiab] OR Canines [tiab] AND
Population – Species 2	(***Cats*** [MeSH] OR Cats [tiab] OR Cat [tiab] OR Feline [tiab] OR Felines [tiab] OR Felis sylvestris catus [tiab] OR Felis domestica [tiab] OR Felis domesticus [tiab] OR Domestic Cat [tiab] OR Domestic Cats [tiab] OR Felis catus [tiab]) AND
Population - Procedures	(***Surgical Procedures, Operative*** [MeSH] OR Surgical OR Operative Procedure [tiab] OR Operative Procedures [tiab] OR Postoperative Complication [tiab] OR Postoperative Complications [tiab] OR Surgery [tiab] OR Surgeries [tiab] OR Resection [tiab] OR Resections [tiab] OR Excision [tiab] OR Excisions [tiab] OR ***Elective Surgical Procedures*** [MeSH] OR Castration [MeSH] OR Castration [tiab] OR Castrations [tiab] OR Gonadectomy [tiab] OR Gonadectomies [tiab] OR Ovariectomy [MeSH] OR Ovariectomy [tiab] OR Ovariectomies [tiab] OR Oophorectomy [tiab] OR Oophorectomies [tiab] OR Neuter [tiab] OR Neutering [tiab] OR Neutered [tiab] OR Spay [tiab] OR Spaying [tiab] OR Spayed [tiab] OR Sterilization [tiab] OR Orchiectomy [tiab] OR Orchiectomies [tiab] OR Orchidectomy [tiab] OR Orchidectomies [tiab] OR ***Cesarean Section*** [MeSH] OR Obstetric Surgical Procedures [MeSH] OR Hysterotomy [MeSH] OR Pyometra [MesH] OR Cesarean Section [tiab] OR Caesarean Section [tiab] OR Cesarean Sections [tiab] OR Caesarean Sections [tiab] OR Abdominal Delivery [tiab] OR Abdominal Deliveries [tiab] OR C-Section [tiab] OR C-Sections [tiab] OR Obstetric [tiab] OR Obstetrical [tiab] OR Hysterectomy [tiab] OR Hysterotomies [tiab] OR Pyometra [tiab] OR Pyometras [tiab] OR ***Orthopedic Procedures*** [MeSH] OR Orthopedics [MeSH] OR Osteology [MeSH] OR Amputation [MeSH] OR Fracture Fixation [MeSH] OR Orthopedic Procedure [tiab] OR Orthopaedic Procedure

	[tiab] OR Orthopedic Procedures [tiab] OR Orthopaedic Procedures [tiab] OR Orthopedics [tiab] OR Orthopaedics [tiab] OR Osteology [tiab] OR Osteotomy [tiab] OR Tibial Plateau Leveling Osteotomy [tiab] OR Tibial Plateau Leveling Osteotomies [tiab] OR TPLO [tiab] OR Tibial Tuberosity advancement [tiab] OR Tibial Tuberosity advancements [tiab] OR TTA [tiab] OR Amputation [tiab] OR Amputations [tiab] OR Fracture Fixation [tiab] OR Fracture Fixations [tiab] OR Skeletal Fixation [tiab] OR Skeletal Fixations [tiab] OR Arthrotomy [tiab] OR Arthrotomies [tiab] OR ***Reconstructive Surgical Procedures*** [MeSH] OR Mastectomy, Segmental [MeSH] OR Tumorectomy [tiab] OR Tumorectomies [tiab] OR Tumourectomy [tiab] OR Tumourectomies [tiab] OR Lumpectomy [tiab] OR Lumpectomies [tiab] OR Operative reconstruction [tiab] OR Operative reconstructions [tiab] OR Surgical reconstruction [tiab] OR Surgical reconstructions [tiab] OR Mastectomy [tiab] OR Mastectomies [tiab] OR Abscess [MeSH] OR Abscess [tiab] OR Abscesses [tiab] OR ***Neurosurgery*** [MeSH] OR Neurosurgical Procedures [MeSH] OR Neurosurgery [tiab] OR Neurosurgeries [tiab] OR Neurosurgical [tiab] OR Hemilaminectomy [tiab] OR Hemilaminectomies [tiab] OR Laminectomy [tiab] OR Laminectomies [tiab] OR ***Thoracic Surgery*** [MeSH] OR Thoracic Surgical Procedures [MeSH] OR Cardiac Surgical Procedures [MeSH] OR Pleurectomy [tiab] OR Pleurectomies [tiab] OR Sternotomy [tiab] OR Sternotomies [tiab] OR Thoracostomy [tiab] OR Thoracostomies [tiab] OR Thoracotomy [tiab] OR Thoracotomies [tiab] OR Pericardiectomy [tiab] OR Pericardiectomies [tiab] OR Dental Care [MeSH] OR Oral Surgical Procedures [MeSH] OR Tooth Extraction [MeSH] OR ***Dental procedure*** [tiab] OR Dental procedures [tiab] OR Tooth extraction [tiab] OR Tooth extractions [tiab] OR ***Laparotomy*** [MeSH] OR Laparoscopy [MeSH] OR Digestive System Surgical Procedures [MeSH] OR Splenectomy [MeSH] OR Nephrectomy [MeSH] OR Gastropexy [MeSH] OR Laparotomy [tiab] OR Laparotomies [tiab] OR Laparoscopy [tiab] OR Laparoscopies [tiab] OR Herniotomy [tiab] OR Cholecystectomy [tiab] OR Cholecystostomies [tiab] OR Enterotomy [tiab] OR Enterotomies [tiab] OR Enterostomy [tiab] OR Enterostomies [tiab] OR Colostomy [tiab] OR Colostomies [tiab] OR Duodenostomy [tiab] OR Duodenostomies [tiab] OR Ileostomy [tiab] OR Ileostomies [tiab] OR Jejunostomy [tiab] OR Jejunostomies [tiab] OR Esophagectomy [tiab] OR Esophagectomies [tiab] OR Esophagostomy [tiab] OR Esophagostomies [tiab] OR Gastrectomy [tiab] OR Gastrectomies [tiab] OR Gastropexy [tiab] OR Gastropexies [tiab] OR Gastrotomy [tiab] OR Gastrotomies [tiab] OR Gastrostomy [tiab] OR Gastrostomies [tiab] OR Hepatectomy [tiab] OR Hepatectomies [tiab] OR Proctectomy [tiab] OR Proctectomies [tiab] OR Splenectomy [tiab] OR Splenectomies [tiab] OR Nephrectomy [tiab] OR Nephrectomies [tiab] OR ***Urogenital Surgical Procedures*** [MeSH] OR Hysterectomy [tiab] OR Hysterectomies [tiab] OR Ovariectomy [tiab] OR Ovariectomies [tiab] OR Salpingectomy [tiab] OR Salpingectomies [tiab] OR Vulvectomy [tiab] OR Vulvectomies [tiab] OR Vulvoplasty [tiab] OR Vasectomy [tiab] OR Vasectomies [tiab] OR Cystectomy [tiab] OR Cystectomies [tiab] OR Cystotomy [tiab] OR Cystotomies [tiab] OR Vesicotomy [tiab] OR Vesicotomies [tiab] OR Prostatectomies [tiab] OR Prostatectomy [tiab]) AND
Concept – Treatment or risk factors	***(Anti-Bacterial Agents*** [MeSH] OR Anti-Bacterial Agent [tiab] OR Anti Bacterial Agents [tiab] OR Anti Bacterial Agent [tiab] OR Antibacterial Agents [tiab] OR Antibacterial Agent [tiab] OR Anti-Bacterial Compounds [tiab] OR Anti-Bacterial Compound [tiab] OR Anti Bacterial Compounds [tiab] OR Anti Bacterial Compound [tiab] OR Bacteriocidal Agents [tiab] OR Bacteriocidal Agent [tiab] OR Bacteriocide [tiab] OR Bacteriocides [tiab] OR Antibiotics [tiab] OR Antibiotic [tiab] OR Anti-Infective Agents [MeSH] OR Anti-Infective Agent [tiab] OR Anti Infective Agents [tiab] OR Anti Infective Agent [tiab] OR Antiinfective Agents [tiab] OR Antiinfective Agent [tiab] OR Anti-Microbial Agent [tiab] OR Anti-Microbial Agents [tiab] OR Anti Microbial Agent [tiab] OR Anti Microbial Agents [tiab] OR Antimicrobial Agents [tiab] OR Antimicrobial Agent [tiab] OR Microbicide [tiab] OR Microbicides [tiab] OR beta-Lactamase Inhibitors [MeSH] OR beta-Lactamase Inhibitor [tiab] OR beta Lactamase Inhibitor [tiab] OR beta Lactamase Inhibitors [tiab] OR beta Lactamase Antagonists [tiab] OR beta Lactamase Antagonist [tiab]

	OR Amoxicillin [MeSH] OR Amoxicillins OR Penicillin OR Penicillins [MeSH] OR Amoxicillin-Potassium Clavulanate Combination [MeSH] OR Clavulanic Acids [MeSH] OR Cephalosporins [MeSH] OR Cefazolin [MeSH] OR Doxycycline [MeSH] OR ***Risk factors*** [MeSH] OR Risk factor [tiab] OR Risk [tiab] OR Causality [MeSH] OR Causalities [tiab] OR Reinforcing Factors [tiab] OR Reinforcing Factor [tiab] OR Causation [tiab] OR Causations [tiab] OR Enabling Factors [tiab] OR Enabling Factor [tiab] OR Predisposing Factors [tiab] OR Predisposing Factor [tiab] OR Epidemiologic Studies [MeSH] OR Epidemiologic Study [tiab] OR Epidemiological Studies [tiab] OR Epidemiological Study [tiab] OR Epidemiology [tiab] OR Demography [MeSH] OR Demographics [tiab] OR Demographic [tiab])

The search sensitivity will be checked at the end of the initial search process. The author group will provide a minimum of 10 example publications that should appear in the search results. If any of these are not included in the initial search result, the search strategy will be revised and the searches repeated until all test publications are included.

Study records

Data management

Individual database search results will be imported to Endnote™ 20 software (PDFNet SDK © PDFTron™ Systems Inc.) and duplicates will be removed. The final reference list will be imported to Rayyan software tool (www.rayyan.ai), an Internet based software program that facilitates collaboration among reviewers during the study
selection process. Records will be kept on a secure server, and extraction of data will be entered in an Excel sheet. Once data is extracted the Excel will be locked to avoid mistake alterations during the analysis phase.

Selection process

Two independent reviewers (FA and TMS) will perform the screening, eligibility and inclusion of studies blindly through the Rayyan software tool. If disagreement between those reviewers, a third reviewer (LRJ) will evaluate the records and a collective agreement will be achieved on those individual references.

The title and abstract will initially be screened for eligibility and exclusion based on the criteria described above. Full text documents will be retrieved for those records where uncertainty exists on eligibility based on the title and abstract alone.

In Rayyan software labels will be appointed on all decision criteria for each record in order to fill in the PRIMSA flow-chart.

Data collection process

Data will be extracted in pre-formatted excel tables by two reviewers (FA & TMS) individually. A piloting form will be developed and a trial extraction of five records will be evaluated initially before full data collection begins. If disagreement between the reviewers, a collective agreement and inclusion of a third reviewer (LRJ) will be pursued when necessary. If any reported data is incomplete regarding the item needed for this scoping review, corresponding authors will be contacted to obtain missing data.

Data items

Data items extracted for the scoping review will be

- Study characteristics: Design, setting and demographic information, methodology, intervention details, follow-up interval, method of follow-up (prospective vs retrospective, e-mail, telephone, physical control or other), funding sources.
- Population characteristics: total population size, group size, species, breed and summary age and weight parameters, all reported surgical procedures performed, dichotomous (yes/no) registration if reporting on comorbidities, contamination class, ASA scores or procedure and anaesthesia duration.
- Context variables: Antimicrobial or other prophylactic treatment, pharmaceutical product, dose, route of administration, peri-operative timing (including intra- and post-operative), dosing interval, duration of treatment.
- Outcome variables: All reported patient- and surgery related outcomes (e.g. temperature, surgical site infections (SSI) or inflammation, re-surgery, re-treatments, mortality) as well as the reported definitions thereof.

Outcomes and prioritization

The explorative nature of this scoping review make it unnecessary to do a priori prioritization of outcome variables, but all reported outcomes will be extracted as stated above.

Endpoints important for decision making are of primary interest. If reported on, these will be analysed and graded. If a clinical endpoint is not reported on, we will analyse and grade their relevant surrogate outcome(s):

- Endpoints important for decision making:
    - SSI
    - Other clinical complications (e.g. dehiscence, non-union of fractures, peritonitis)
    - Adverse antimicrobial events
    - Mortality
- Surrogate outcomes:
    - Re-surgery
    - Re-treatment
    - Commencement of antimicrobial therapy

All composite and individual outcomes will be extracted as reported in the studies. Due to possible variation in outcome definitions over time, the definitions of outcomes as reported in individual studies will be adhered to.

Included references will be summarized and grouped based upon type of surgery or contamination class.

References

Bramer, W.M., de Jonge, G.B., Rethlefsen, M.L., Mast, F., Kleijnen, J., 2018. A systematic approach to searching: an efficient and complete method to develop literature searches. J Med Libr Assoc vol. 106, pp. 531-541.

Grindlay, D.J., Brennan, M.L., Dean, R.S., 2012. Searching the veterinary literature: a comparison of the coverage of veterinary journals by nine bibliographic databases. J Vet Med Educ vol. 39, pp. 404-412.