University of Prince Edward Island

Faculty of Veterinary Medicine
Summary of Dissertation

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of the Requirements for the

DEGREE OF DOCTOR OF PHILOSOPHY

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Application of systematic review and meta-analysis methods in dairy science

Animal health reviews often address complex clinical research questions where multiple measurements of one underlying construct need to be assessed to fully understand the clinical picture and/or multiple interventions are administered to assess their comparative efficacy. Moreover, studies conducted in animal health often vary in the ways of reporting the outcome measured (assessment unit, time, and methods) and interventions administered (dose, route, and frequency of administration). Such complexities required more adaptations and extensions of the conventional SR and MA methods.

A set of practical steps for data extraction for complex reviews was described. Further, Cochrane risk of bias ROB2 and ROBINS-I were contrasted and assessed to determine whether they fit the unique clinical settings. Multivariate meta-analysis was used to simultaneously synthesise multiple effect sizes coming from multiple outcomes and/or interventions.

We emphasised the importance of determining the organisational data structure and highlighted its role in the subsequent steps of database building. The uniform application of the ROBINS-I tools in randomised and non-randomised studies conducted in animal health reviews seems feasible. However, some domains and questions might need to be reinterpreted before applying the ROBINS-I tools. Our summary estimates from multivariate MA models were generally more precise than their univariate counterparts.

From the clinical perspective, the efficacy of adding a teat sealant to antimicrobial treatment at dry-off depends on the pathogen group causing intra-mmmary infection; overall, teat sealants tend to be associated with reducing the incidence of new infections. The evaluation of the comparative efficacy of different antimicrobials showed that penicillin-based treatment regimens generally seem less effective in curing S. aureus intra-mammary infections except when combined with Novobiocin in high concentrations. Locally infused treatment regimens showed significantly higher odds of cure than systemically injected ones. Treatment regimens formed of combinations of antimicrobials were more effective than those composed of individual antimicrobials.

Publications

Thesis-driven publications arranged in chronological order:

Afifi, M., Kabera, F., Stryhn, H., Roy, J.-P., Heider, L. C., Godden, S., Montelpare, W., Sanchez, J., and Dufour, S. (2018). Antimicrobial-based dry cow therapy approaches for cure and prevention of intramammary infections: a protocol for a systematic review and meta-analysis. Animal Health Research Reviews, 19(1); 74-78.

Afifi, M., Stryhn, H., Sanchez, J., Heider, L. C., Kabera, , Roy, J-P., Godden, S., and Dufour, S. (2023). To seal or not to seal following an antimicrobial infusion at dry-off? A systematic review and multivariate meta-analysis of the incidence and prevalence of intramammary infections post-calving in dairy cows. Preventive Veterinary Medicine, 213, 105864.

Afifi, M., Stryhn, H., and Sanchez, J. (2023). Data extraction and comparison for complex systematic reviews: a step-by-step guideline and an implementation example using open-source software. Systematic Reviews, 12(1), 226.

Afifi, M., Stryhn, H., and Sanchez, J. (2024). Cochrane ROB 2 or ROBINS-I tool for risk of bias assessments in animal research reviews. In preparation for submission to the JBI Evidence Synthesis.

Afifi, M., Stryhn, H., Sanchez, J. and other coauthors (2024). Best antimicrobial for curing Staphylococcus aureus intra-mammary infections in dairy cows during the dry period: A systematic review and network meta-analysis. [in preparation].

Thesis-related Collaborations:

Kabera, F., Roy, J-P., Afifi, M, Godden, S., Stryhn, H., Sanchez, J., and Dufour, S. Comparing Blanket vs. Selective Dry Cow Treatment Approaches for Elimination and Prevention of Intramammary Infections During the Dry Period: A Systematic Review and Meta-Analysis. Frontiers in Veterinary Science, 8,688450.
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Presentations

Afifi, M., Stryhn, H., and Sanchez, J. (2022). Comparison of the univariate and bivariate meta-analyses for evaluating the teat sealant efficacy on the incidence and prevalence of intramammary infections. 16th International Symposium of Veterinary Epidemiology and Economics. Halifax, Canada.

Afifi, M., Stryhn, H. and Sanchez, J. (2022). To seal or not to seal after an antimicrobial infusion at dry-off? A systematic review and meta-analysis. UPEI Graduate Studies and Research Conference.

Afifi, M., Stryhn, H., Sanchez, J. and Dufour, S. (2019). Does the addition of teat sealant to antimicrobial treatment at dry-off matter: A systematic review and meta-analysis Annual Conference of the Canadian Association of Veterinary Epidemiology and Preventive Medicine, Montreal, Canada.

Afifi, M., Stryhn, H. and Sanchez, J. (2019). Antimicrobial-based dry cow therapy approaches for prevention and cure of intramammary infections: a systematic review and meta-analysis. UPEI Graduate Studies and Research Conference.

Awards

2022 – Dr. Ian Dohoo Travel Award
2019 – Student Research travel funding
2018 – Dr. Regis Duffy Graduate Scholarships in Science
2017 – NSERC: CREATE in Milk Quality Program Scholarship
2017 – Competition of Cultural Affairs and Missions Sector – Ministry of Higher Education – Egypt

Biographical Data

Born in Egypt