number of fertilized ova and in the rates of fertilization, transferable embryos and freezable embryos were greater in donor lactating cows compared with donor heifers. In addition, lactating cows generate more body heat and suffer greater hyperthermia when exposed to similar environmental temperatures compared with growing heifers and non-lactating cows, which may be related to the high metabolic energy associated with milk production. Regarding the embryo production technique, studies suggest that IVEP technology can be a viable solution to increase embryo production within a short period of time. The use of OPU-IVEP may be a valuable alternative to produce a large number of embryos and pregnancies within a reduced time period. The IVEP can also be associated with the use of sexed semen to increase the production of calves of a specific sex, which would benefit dairy industries worldwide. In summary, although the embryo transfer technology has been used primarily to reproduce animals with high genetic merit, this technology can be used to resolve reproductive problems such as the reduced fertility found during heat stress.

Pharmacology & Therapeutics

K84

Antimicrobial susceptibility testing and its clinical applications in bovine practice

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Objective: Antibiotic resistance is currently at the forefront of human and animal health and has been for many years. Antimicrobial susceptibility testing is commonly used in modern veterinary practice and so much so that many veterinarians submitting for this type of testing likely do so without thoughtful consideration in regard to the testing procedures or the interpretation of the testing results. However, in order to continue to be judicious with the use of antibiotics, it is essential that the clinician be familiar with the testing procedures and its interpretation in order to increase the chance of treatment success. The objective is threefold; 1) to re-familiarize the bovine practitioner with the most common methods of susceptibility testing performed in laboratories, 2) to educate on what goes into the determination of susceptible “S”, intermediate “I”, and resistant “R”, and 3) to exercise application of susceptibility testing to case management / treatment selection in the clinical setting.

Materials and Methods: The preferred methods of antimicrobial susceptibility testing and interpretive criteria are described in published standards documents to ensure that all laboratories are performing the testing procedures and interpretation in the same “standardized” fashion. The European Committee on Antimicrobial Susceptibility Testing (EUCAST) is the functioning body for such standardization in Europe and the Clinical and Laboratory Standards Institute (CLSI) functions as such in North America. For the purposes of this presentation the CLSI methods and definitions will be used; however, the themes presented will be applicable to all clinicians regardless of geography.

Results: Unfortunately, there is not a perfect correlation between antimicrobial susceptibility testing and clinical case outcome. Testing that yields bacteria that are “susceptible” to the prescribed antibiotic may have a poor outcome and those with “resistant” infections may have a positive outcome. In both cases, the ultimate outcome of the treatment may have been influenced by factors beyond just those of the “bug-drug” relationship, such as immune status, environmental conditions, individual pharmacokinetic differences, etc.

Conclusions: A clinician that thoroughly understands the basic methods of antimicrobial susceptibility testing, its interpretation, and its limitations will make sound clinical decisions and more judiciously select and utilize antimicrobials in their practice.

K85

Defining antimicrobial efficacy through randomized clinical trials with negative controls

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Introduction: Bovine respiratory disease (BRD) is a multi-factorial disease described as a complex or syndrome involving an interaction of stressors, viruses, and bacteria. To this day, BRD remains a major disease in all types of beef and dairy production systems. Administration of an antibiotic is not only the mainstay therapeutic treatment option for acute BRD, but also as means to control the disease in high-risk populations. The judicious use of antibiotics in both human and animal health remains vital to ensure continued antibiotic efficacy.

Objective: The objective is to present a comprehensive review of all published randomized clinical trials investigating the effects of a drug against a negative control in treatment of BRD. The number needed to treat (NNT) statistic will be used to convey the results of this investigation. The NNT is an epidemiological measure used in communicating the effectiveness of an intervention. The NNT statistic is defined as the inverse of the absolute risk reduction and has a major advantage of being more straightforward to readers less versed in thinking of events such as clinical outcome in terms of probabilities (e.g., risk ratio, odds ratio). As such, NNT is much easier to interpret by the practicing clinician as it speaks in terms of number of treatments needed to apply across a population to make a difference in one patient.

Materials and methods: A systematic review of the scientific literature was performed using online resources, with included studies being limited to those published in English and originating from North America. Other criteria for inclusion were that the publications were required to be investigations into the treatment or control of naturally occurring BRD with an antibiotic (only) in a randomized, blinded, negative control field trial study design. Studies on the treatment of naturally occurring BRD must have involved animals that were not mass medicated with an antibiotic prior to or as part of the study. All studies involving positive controls or experimental challenge models were excluded.

Additionally, the Freedom of Information (FOI) New Animal Drug Approvals (NADA) summaries were searched on the United States Food and Drug Administration Center for Veterinary Medicine (US FDA CVM) website at the same time. Inclusions from the FOI summaries included efficacy trials (ET), dose response studies (DRS), dose selection studies (DSS), single location field studies (FS), and multi-location field studies (MLFS). To qualify for inclusion, dose selection studies must have used the current labeled dosages in the study.

As a final step, published literature resulting from online searches were screened to ensure that they were not duplicative of FOI data; any duplicative data was removed from the data set prior to analysis.

Results: The overwhelming majority of trials showed a positive effect on case outcome in the therapy and control of BRD. The median NNT in therapeutic trials involving negative controls was 2 (i.e., for every 2 animals treated for BRD in the overall population of these studies, 1 case was a treatment success). The median NNT for preventing 1 mortality due to BRD in the trials reviewed was 6 (i.e., for every 6 animals therapeutically treated 1 BRD death was prevented). In BRD control studies, the median number of animals that needed to be treated to prevent 1 acute case of BRD was 5.

Conclusions: The objective was to determine the effectiveness, using the NNT statistic, of different antibiotics in the therapy and control of BRD in randomized clinical trials utilizing a negative control. The data from this analysis should not be used to directly compare the NNT of one antibiotic to another due to differences in trial design, sample size discrepancies, risk classification differences of BRD between trials, resultant spontaneous recovery rates, and potential differences in case definition and success/failure outcome between trials. The presentation of the data here does make for a succinct way of defining reasonable expectations of efficacy in the treatment and control of BRD in a field setting for cattle at high risk of BRD. However, the clinician interpreting these findings needs to bear in mind the external validity of these studies when applying it to the type of cattle, environmental setting, and typical BRD pathogens encountered in their practice.