Animal Health Symposium: Accounting for Diseased Animals in Research Trials (Outliers, Treatments, Interactions)/ Disease Induction by Treatment?

422 Factors influencing onset of disease and subsequent effects on feedlot performance. R. M. Enns*[1], R. L. Weaber[2], H. Van Campen[1], and G. H. Loneragan[3], [1]*Colorado State University*, *Fort Collins*, [2]*University of Missouri*, *Columbia*, [3]*West Texas A&M University*, *Canyon*.

Prevention and treatment of disease in the dairy and beef industries increases production costs for producers. For researchers, disease symptoms often lead to the removal of animals from study outcomes. Removal of these animals from research trials may bias study results if susceptibility to disease is genetically related to outcomes of interest. Failing to correct performance records for factors that induce phenotypic variation can downwardly bias heritability estimates and diminish the power to detect quantitative trait loci. A more complete understanding of factors influencing onset of infectious disease, including genetic contributors, and the resulting influence of these diseases on subsequent animal performance and recovery time lag is warranted. Due to the variable nature of incidence of disease, estimation and quantification of factors contributing to disease susceptibility is often clouded by issues associated with specificity, sensitivity, and exposure to pathogens. Bovine respiratory disease (BRD) represents the largest proportion of disease incidence in feedlot cattle and results from the interactions of stress level, immunological status and response, and the presence of infectious organisms. Stress and immunological response have been reported to have heritable components. Feedlot personnel rely on animals exhibiting clinical signs of BRD for diagnosis and initiation of treatment. Yet, when lung lesion scores are collected at harvest and combined with treatment records a substantial portion of untreated animals have lung lesions while a noteworthy portion of calves treated do not exhibit lung damage. Taken alone, diagnosis and treatment of BRD is related to lower feedlot ADG, carcass weight, and quality. These effects seem to be dependent upon timing of treatment relative to slaughter with effects on recovered animals diminishing with longer periods on feed. A more complete understanding of the environmental and genetic factors contributing to the occurrence of BRD could lead to a reduction in disease frequency and better methodologies for predicting and accounting for impacts on animal performance in research studies.

Key Words: cattle, bovine respiratory disease, health

423 Reporting standards for randomized controlled trials in cattle: Improving the quality of research. I. A. Gardner*[1], A. M. O'Connor[2], J. M. Sargeant[3], J. S. Dickson[4], and M. E. Torrence[5], [1]*University of California, Davis,* [2]*Iowa State University*, *Ames,* [3]*University of Guelph*, *Guelph, Ontario, Canada*, [4]*Iowa State University*, *Ames,* [5]*USDA-ARS*, *Beltsville, MD*.

Design, analysis and reporting of randomized, controlled trials with production, health, and food safety outcomes in livestock presents unique challenges that may not be adequately addressed in published trial reports or in the CONSORT statement (Consolidated Standards of Reporting Trials of 22 items, available www.consort-statement.org). A consensus meeting of 24 experts (biostatisticians, epidemiologists, food safety researchers, and livestock production specialists) resulted in development of an extension of the CONSORT statement. The new statement is called REFLECT (www.reflect-statement.org/statement/). Thirteen items on the CONSORT checklist were modified as well as the inclusion of one additional item: item 1 (title and abstract), item 3 (participants), item 4 (interventions), item 5 (objectives), item 7 (sample size), item 8 (randomization sequence allocation), item 9 (allocation concealment), item 10 (randomization implementation), item 11 (blinding/masking), item 12 (statistical methods), item 13 (participant flow), item 15 (recruitment), and item 20 (interpretation). The additional item proposed was a new sub-item for item 4 (challenge trials). The consensus group also proposed terminology to describe study subjects to make the language more consistent with common usage in livestock production. Implications of these new standards for trials in dairy herd health and production medicine will be discussed with a focus on statistical methods to account for censored and missing observations and cluster designs.

Key Words: randomized controlled trials, statistical methods, censoring

424 Accounting for diseased animals in research trials. G. D. Snowder*, *National Center for Foreign Animal and Zoonotic Disease Defense*, *College Station, TX*.

Unfortunately, livestock on research trials frequently experience pathogenic or metabolic diseases. Sick or deceased research animals often present a dilemma for investigators by influencing the statistical power and/or conclusions of the study. A decision tree approach is recommended for determining appropriate handling of data from such animals. When the treatment effect is associated with the disease, the disease effect should be included in the statistical analyzes. When the disease is not associated with the treatment then it must be determined whether the animal is a statistical outlier which may be adjusted for or an anomaly that could be discarded. There are several different statistical approaches to adjusting data sets to account for outliers, but the interpretation of adjusted data can be difficult to comprehend. The most critical factor in accounting for diseased animals is the number of experimental units (animals) in a treatment or block. In trials with large numbers of experimental units ($n > 30$) per treatment, data from a few sick or deceased animals are frequently deleted. This approach is justified when statistical tests indicate large differences between treatment means and/or measures of variation for the healthy animals. When these statistical differences are small, one may consider inclusion of data from sick or diseased animals that have been properly adjusted or accounted for. When the number of experimental units per treatment is small, the decision to delete sick or deceased animals becomes critical. Depending on the response variable(s) measured, covariate analysis or sub-treatment group analysis may be considered. A decision tree approach with options for statistical methods will be presented for various scenarios to handle data from sick or deceased animals in research trials.

Key Words: statistics, sick, outliers