Development and validation of a goat kid health scoring system

T. M. Menn, BS; R. Storlie, DVM; E. A. Barrell, MS DVM DACVIM; E. M. Burke, BS; M. M. Thomas, BS; W. A. Knauer, VMD PhD
Department of Veterinary Population Medicine, University of Minnesota, Saint Paul, MN 55108

Introduction

Although dairy goat kids are at risk of morbidity and mortality during the pre–weaning period, a standardized scoring system to screen for and detect disease is lacking. Our objective was to develop and validate a Goat Kid Health Scoring System (GKHSS) as a screening and diagnostic tool in pre–weaned goat kids on a commercial goat dairy.

Materials and methods

The GKHSS was developed using an iterative approach and small ruminant veterinary expert feedback. The final scoring system evaluated has 6 categories, including: mentation (0 = bright, alert; 1 = dull, quiet; 2 = obtunded, non-responsive), body posture (0 = standing, alert; 1 = standing, dull/hunched; 2 = lying, unwilling to rise), respiratory secretions (0 = no nasal/ocular discharge; 1 = minimal clear nasal/ocular discharge; 2 = excessive clear or mucoid nasal/ocular discharge), abdominal fill (0 = full abdomen on palpation; 1 = empty abdomen on palpation; 2 = tense/bloated abdomen on palpation), fecal staining (FS; 0 = tail/perineum free of fecal staining; 1 = tail/perineum scant fecal staining; 2 = tail/perineum/legs fecal staining), and rectal temperature (°F; 0 = 101.5 – 103.5; 1 = ≤ 101.4 or ≥ 103.6; 2 = < 98.6 or > 105). To validate the system, 854 goat kids ranging in age from 7 to 54 d were evaluated by trained study technicians using the scoring system. A kid was considered sick if they received a categorical score of 2, or had a cumulative score of ≥ 4. To evaluate the GKHSS as compared to veterinary diagnosis, a subset of kids (n = 736) was first evaluated by a small ruminant veterinarian and diagnosed as healthy or ill (respiratory/diarrheal/other disease). To evaluate the GKHSS FS as a diagnostic tool for diagnosis of fecal pathogens, matched pairs of kids in each pen with fecal scores of 0 and 2, respectively (n = 233), had a fecal swab taken and submitted to the SDSU veterinary diagnostic lab where they were tested for rotavirus, coronavirus and cryptosporidium. Farm treatment records were retrieved from computer records. Diagnostic test characteristics (Sensitivity [Se], Specificity [Sp], Accuracy [Ac]) were calculated from 2 × 2 tables for the following: ability of the GKHSS to detect a sick kid as compared to veterinary diagnosis; ability of the GKHSS to detect a sick kid compared to farm diagnosis and treatment (± 2 d from farm visit); and ability of a FS = 2 to identify a kid that was shedding fecal pathogens.

Results

A total of 854 kids 26 ± 12 d-old were evaluated over 3 separate farm visits in July and August 2021. Predominant breeds included Saanen and Alpine, with the majority of kids being doelings (97%). The GKHSS diagnosed 59% (502/854) of kids as sick, veterinarians diagnosed 30% (219/736) as sick, and 33% (279/854) were treated by farm personnel for respiratory or diarrheal disease within ± 2 d of technician evaluation. The predominant pathogen recovered from fecal samples was rotavirus, 78% (156/200). The Se, Sp and Ac of the GKHSS to detect a kid diagnosed as sick by a veterinarian was 83.6, 47.4 and 58.2%, respectively. The Se, Sp and Ac of the GKHSS to detect a kid treated by the farm was 57.0, 40.3 and 45.8% respectively. A FS = 2 accurately predicted fecal shedding 49.4% of the time.

Significance

The GKHSS did not provide sufficient sensitivity or specificity to diagnose a sick kid when compared to veterinary diagnosis or farm worker diagnosis and treatment. In addition, a FS of 2 was not able to accurately diagnose a kid actively shedding fecal pathogens. Further analysis will explore the utility of this system when diagnosing diarrheal and respiratory disease compared to veterinary or farm treatments and explore different cutpoints to maximize sensitivity and specificity.

