

EFFECT OF SHADE ON FECAL SHEDDING OF BACTERIA IN GRAZING CATTLE DURING SUMMER IN TEMPERATE CLIMATES

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Introduction

Climatic conditions and heat stress during summer can predispose fecal shedding of pathogens by infected cattle increasing hide contamination. It is desirable that animals delivered to the slaughterhouse have low levels of fecal bacteria on hide to reduce carcass contamination. Our hypothesis is that the provision of shade to grazing animals will mitigate the effects of hot weather resulting in lower fecal shedding of bacteria which could result in safer meat and lower environmental contamination.

Materials and Methods

The study was carried out in Uruguay (latitude: 33° 14' S., longitude: 54° 15' W.) during the summer of 2007 (60 days). Twenty eight yearling British steers (278 kg $\pm$ 26, mean $\pm$ SD) were divided into two groups (with or without shade) of 14 animals each which were separately kept in 1.8 hectares of Sudangrass (*Sorghum bicolor*). Steers were injected with Rafoxanide and Levamisol hydro-chloride at the beginning of the trial. Artificial shade occluding 80% of the light was provided to one group of animals (3.5 m²/animal). Ambient temperature (T) and relative humidity (RH) were recorded hourly using an automatic sensor. Temperature-Humidity Index (THI) was calculated to determine animal heat stress (<72 normal; 72-78 mild stress; 79-89 severe stress; >89 very severe stress). Pooled fresh fecal samples were collected weekly from 3 randomly selected animals per treatment immediately after defecation in the morning (0700 h) and afternoon (1300h). Samples (N=32) were analyzed (LATU Laboratory) for generic *Escherichia coli* (EC) and EC O157:H7 using Most Probable Number and Polymerase Chain Reaction techniques, respectively. Least square means in bacterial populations were compared by the mixed model procedure of SAS with shade and sampling time as fix effects and sampling day as random effect.

Results and Discussion

Climatic conditions during the study period were generally typical of the area (23.2°C and 74%, average T and RH, respectively). Average THI at 0700 and 1400 h during the sampling days was 59 and 75, respectively, which indicates steers experienced mild heat stress during collection of feces in the afternoon. However, neither the provision of shade (P=0.72) nor the time of sampling (0.34) affected fecal shedding of EC (Table 1). It is possible that the duration or intensity of the heat stress was not sufficient to alter fecal shedding of bacteria. Additionally, lower THI during the night in temperate regions could alleviate much of the stress associated with daytime climatic conditions resulting in no shade or sampling time effect on EC counts. There was no significant evidence (P=0.077) that the effect of shade on EC shedding depends on sampling time (Figure 1). However, the shedding of EC tended (P=0.058) to be higher in the afternoon sampling of the shaded group. Because most of those samples were taken from animals under the shade, overcrowding and social stress under the shaded area during the hottest

hours of the day could increase shedding of bacteria. Although general EC population found in fresh cattle feces (4.76 log CFU/g) was relatively low, it is not the weight of feces but the area over which the contamination is spread that will have the most influence in respect of microbial contamination of carcasses (Bell, 1997). *Escherichia coli* O157:H7 was not found in this study. If generic EC can be used as a general indicator of population dynamics of pathogenic serotypes (Krause et al. 2003), heat stress would not affect fecal shedding of EC O157:H7. Further research is necessary to determine if summer in temperate regions (Uruguay) increases shedding of EC O157:H7 and related cases of human illness as reported in the United States.

Table 1. Least square means (LSM) and standard errors (SE) for effect of shade and sampling time on shedding of generic *E. coli* (log CFU/g)

Item	Shade		Sampling time	
	With	Without	0700 h	1400 h
LSM	4.84 ^a	4.68 ^a	4.55 ^a	4.97 ^a
SE	0.43	0.43	0.43	0.43

^aMeans within row with different superscripts differ ($P < 0.05$)

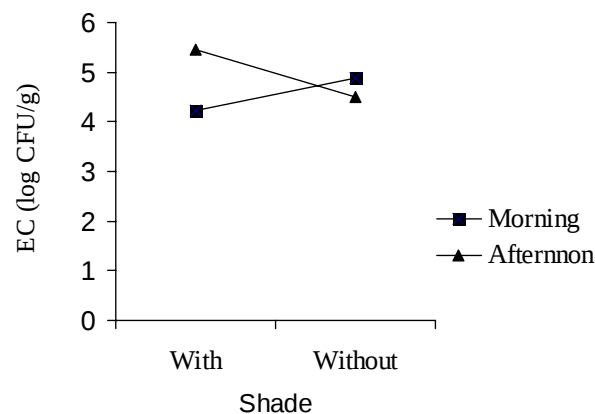


Figure 1. Interaction of shade and time of sampling on shedding of EC in cattle

Conclusions

Heat stress did not result in higher levels of generic *Escherichia coli* and *E. coli* O157:H7 shed in cattle feces in a region of temperate climate. Therefore, the provision of shade to grazing cattle during summer did not reduce fecal shedding of bacteria. Understand the dynamic of pathogenic bacteria in the cattle grazing environment is fundamental to develop management strategies for use in the farm to reduce hide and environmental contamination as well as contamination of beef products at slaughter in a farm to fork approach.

References

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