

Association of breed with health and growth performance of pre-weaned Holstein and Beef on Dairy Calves

C. Rocha*, D. M. Morais, R. E. Aguirre, S. Gill, M. Baugher, M. A. Ballou, V. S. Machado
 Department of Veterinary Science- Animal Health & Industry
 carrocha@ttu.edu



TEXAS TECH UNIVERSITY
 Davis College
 Veterinary Sciences™

Introduction

As beef-on-dairy (BxD) calves become more widespread in calf raising facilities, understanding health and growth performance differences between Holstein and BxD calves is essential for optimizing and tailoring management strategies for each breed.

Objective

The objective of this study was to evaluate the association of breed with key growth performance indicators, mortality, and morbidity of common health disorders such as diarrhea, bovine respiratory disease (BRD), and abomasal bloat.

Materials and Methods

- 120 one-day-old calves were housed individually in outdoor hutches and fed (Figure 1).
- Calves were bottle fed 6 L of a 24% crude protein, and 20% fat all-milk milk replacer divided into 2 feedings.
- Calves were visually inspected daily using a Fecal Scoring System (Table 1) and BRD Scoring System (Table 2).
- Calves were offered water and texturized calf starter ad libitum for the duration of the study
- Starter intake was measured daily- The amount offered each day was weighed and subtracted from the leftovers that were also weighed the following day.



Figure 1. Texas Tech University New Deal- Calf Research Facility located 20 miles NE of Lubbock, TX. Photo: Oscar Benitez

Experimental Design:

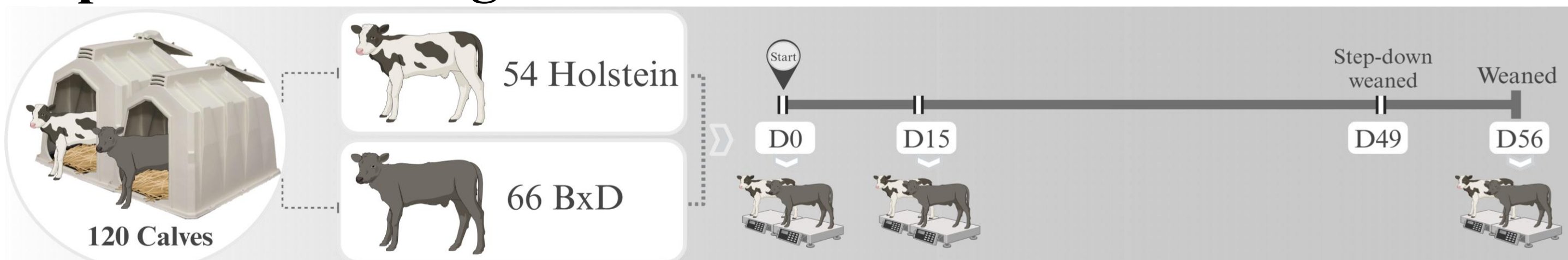


Table 1: Scoring system on feces consistency (McGuirk and Peek, 2014). Calves were treated when: Fecal Score > 3 + severe dehydration.

	Fecal Score			
Fecal consistency	0	1	2	3
	Formed; Normal	Semi- formed; Pasty	Loose	Watery

Table 2: Systematic scoring system developed to assess BRD in pre-weaned dairy calves (Love et al., 2014). Calves were treated when the BRD score > 5.

Clinical Sign	Score if normal	Score if abnormal (Any severity)
Eye discharge	0 Points	2 Points
Nasal discharge	0 Points	4 Points
Ear droop or Head tilt	0 Points	5 Points
Cough	0 Points	2 Points
Breathing	0 Points	2 Points
Temperature	0 < 102.5° F	2 ≥ 102.5° F

Results

Table 3: Cox's proportional hazard models evaluating the association of breed with the incidences of bovine respiratory disease (BRD; Model 1), severe diarrhea (Model 2), abomasal bloat (Model 3), and mortality (Model 4), and time to consume at least 100 g of calf starter for two consecutive days (Model 5).

Variable	Level	Coefficient (SE)	Hazard ratio (95%CI)	P-value
<i>Model 1: BRD</i>				
Breed	Holstein	Reference	Reference	0.28
	BxD	-0.53 (0.49)	0.59 (0.22 – 1.54)	
Failure of Passive Transfer	Yes	Reference	Reference	0.12
	No	1.66 (1.08)	5.29 (0.64 – 43.9)	
<i>Model 2: severe diarrhea</i>				
Breed	Holstein	Reference	Reference	0.45
	BxD	-0.28 (0.38)	0.75 (0.35 – 1.60)	
<i>Model 3: abomasal bloat</i>				
Breed	Holstein	Reference	Reference	0.09
	BxD	-0.79 (0.47)	0.45 (0.18 – 1.15)	
<i>Model 4: mortality</i>				
Breed	Holstein	Reference	Reference	0.20
	BxD	-0.81 (0.63)	0.45 (0.13 – 1.52)	
<i>Model 5: time to consume at least 100 g of calf starter for two consecutive days</i>				
Breed	Holstein	Reference	Reference	<0.01
	BxD	0.58 (0.20)	1.79 (1.20 – 2.67)	

Table 4: Association between breed and average daily gain (ADG; kg/d) within the first 15 (Model 1) and 56 (Model 2) days of life.

Variable	Level	Coefficient (SE)	LSM (95% CI)	P
<i>Model 1: ADG within the first 14 days of life</i>				
Breed	Holstein	Referent	0.39 (0.33 – 0.46)	0.16
	BxD ⁷	-0.05 (0.04)	0.34 (0.30 – 0.38)	
FPT ⁷	No	Referent	0.32 (0.28 – 0.35)	0.02
	Yes	0.10 (0.04)	0.42 (0.34 – 0.49)	
BW at enrollment				
Model 1: ADG within the first 56 days of life				
Breed	Holstein	Referent	0.50 (0.46 – 0.54)	<0.01
	BxD ⁷	0.09 (0.02)	0.59 (0.55 – 0.63)	

Table 5: The association between breed and weekly starter intake (kg/d) throughout the study period.

Variable	Level	Coefficient (SE)	LSM (95% CI)	P	
Breed	Holstein	Referent	0.31 (0.23 – 0.39)	<0.01	
	BxD	0.34 (0.05)	0.43 (0.36 – 0.50)		
BW at arrival					
Week	1	-1.00 (0.05)	0.01 (-0.06 – 0.07)	<0.01	
	2	-0.98 (0.04)	0.03 (-0.04 – 0.09)		
	3	-0.93 (0.04)	0.08 (0.01 – 0.14)		
	4	-0.88 (0.04)	0.16 (0.10 – 0.23)		
	5	-0.72 (0.03)	0.33 (0.26 – 0.39)		
	6	-0.61 (0.03)	0.47 (0.41 – 0.54)		
	7	-0.38 (0.02)	0.73 (0.66 – 0.80)		
	8	Referent	1.17 (1.10 – 1.24)		
Breed x week					
				Figure 3	0.01

Figure 2: The association of breed effect of treatment on weekly fecal (A) and respiratory (B) scores of during the pre-weaning period. Error bars represent SEM.

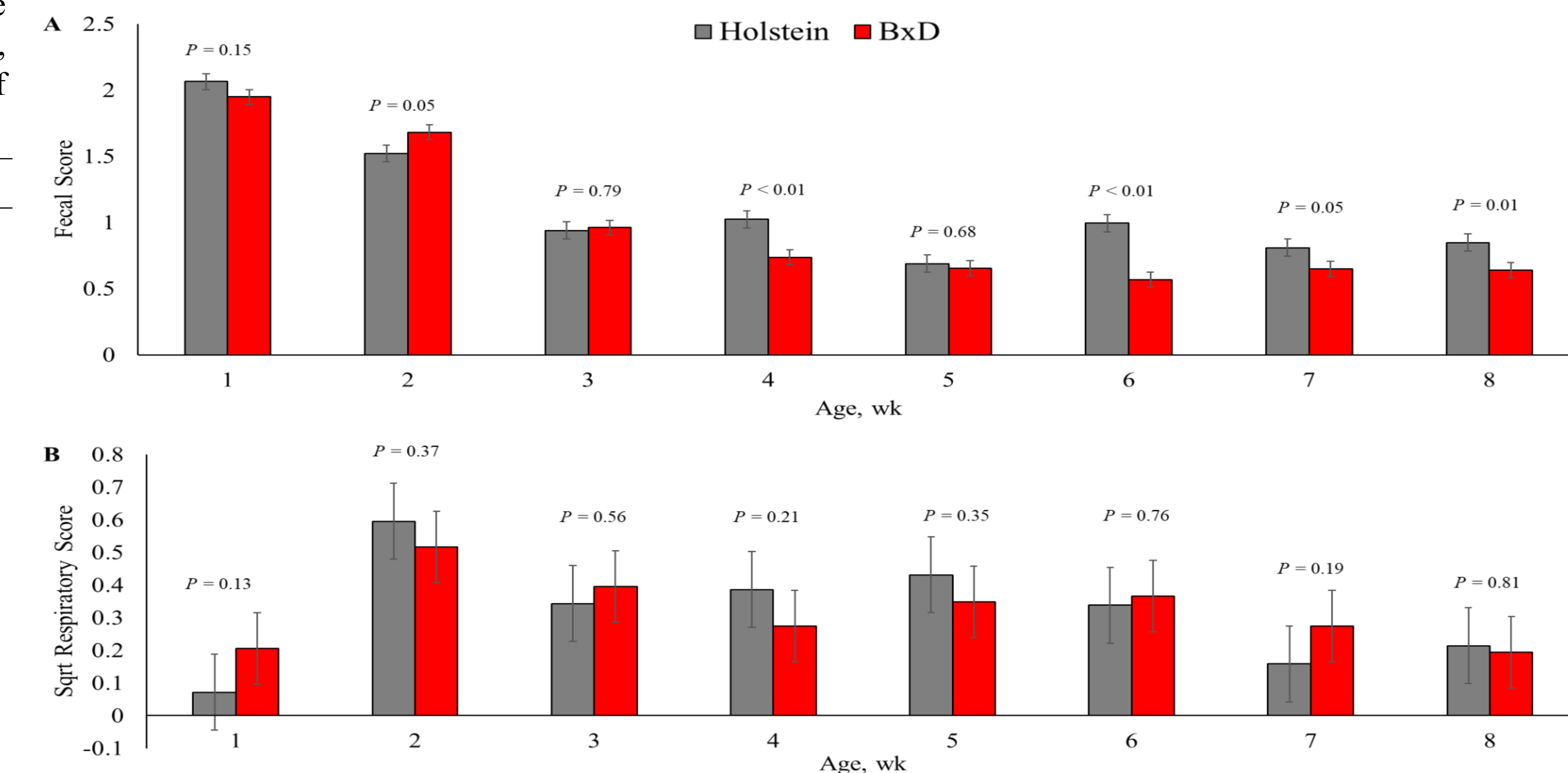


Figure 3: The association between breed and weekly average starter intake throughout the pre-weaning period of calves. Error bars represent SEM.

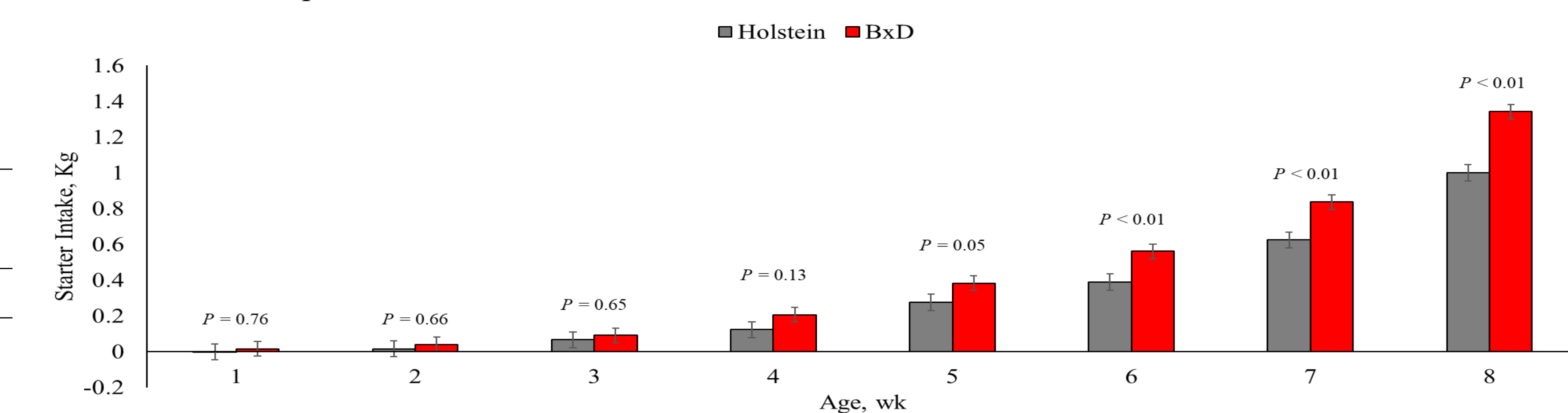
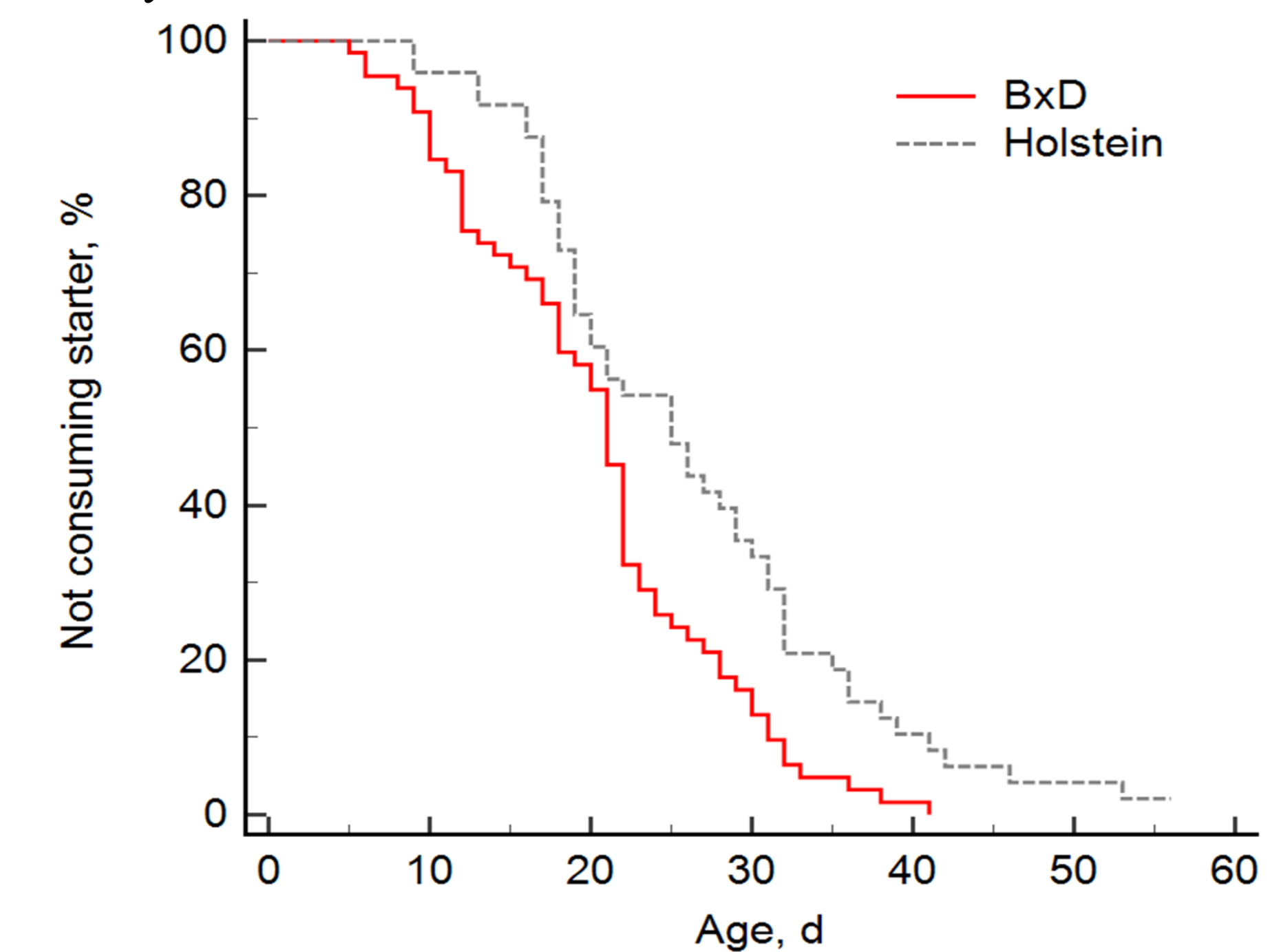


Figure 4: Kaplan-Meier survival curve illustrating the association between breed and time to consume at least 100 g for starter for two consecutive days



Conclusions

These results suggest that morbidity and mortality are similar between BxD and Holsteins. Still, growth performance is greater for BxD calves, likely due to increased calf starter intake during the pre-weaning period.

References

- Love, W. J., Lehenbauer, T. W., Kass, P. H., Van Eenennaam, A. L., & Aly, S. S. (2014). Development of a novel clinical scoring system for on-farm diagnosis of bovine respiratory disease in pre-weaned dairy calves. *Journal of Veterinary Internal Medicine*, 28(2), 442–447. <https://doi.org/10.1111/jvim.12260>
- McGuirk S. M., Peek S. F. (2014). Timely diagnosis of dairy calf respiratory disease using a standardized scoring system. *Anim. Health Res. Rev.* 15, 145–147. <https://pubmed.ncbi.nlm.nih.gov/25410122/>