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Effects of heat stress conditions and dietary organic acid and pure botanical supplementation on milk production and gastrointestinal permeability in Holstein dairy cows

INTRODUCTION

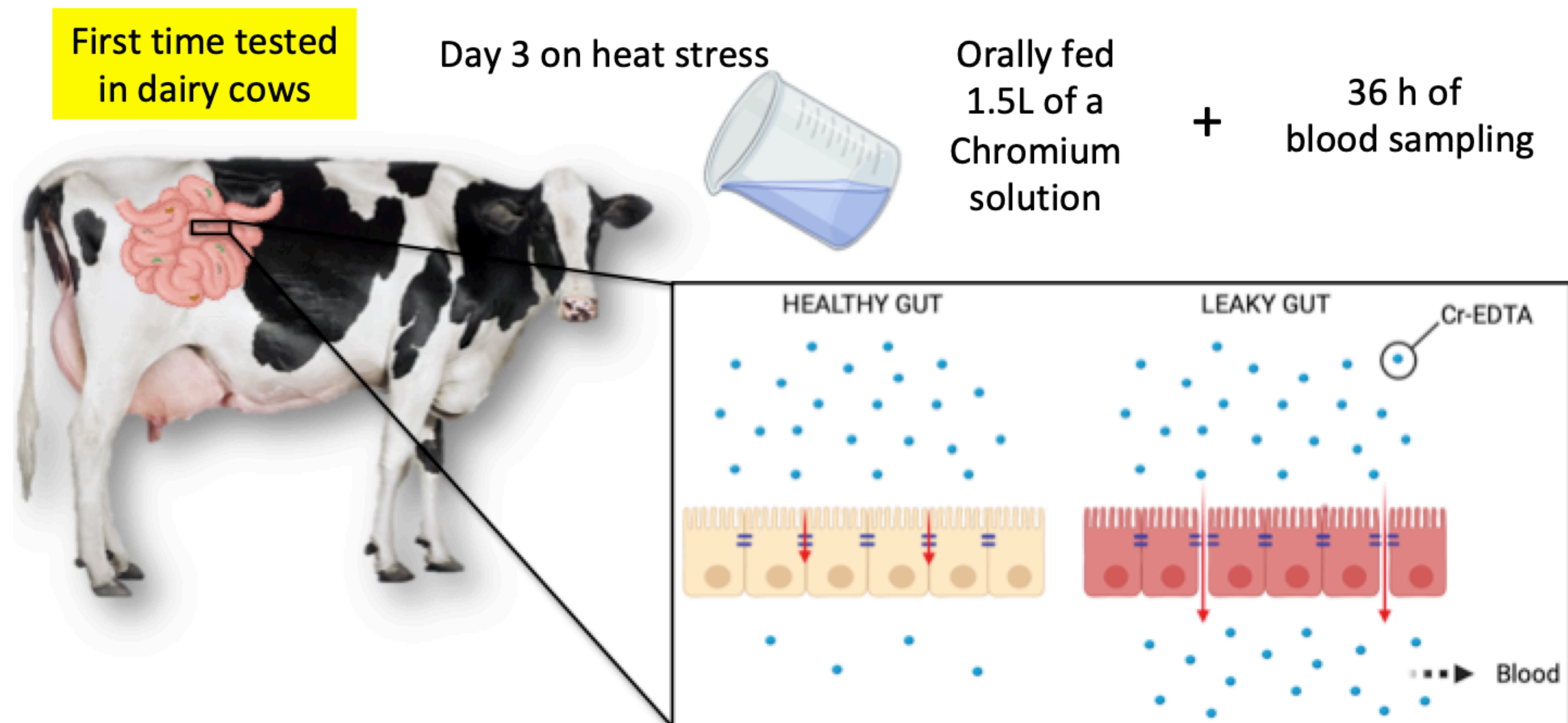
Heat exposure compromises gastrointestinal barrier and leads to inflammation in non-ruminants. However, it is unclear whether extreme heat enhances gut permeability with compromised milk production in cattle.

Dietary organic acid and pure botanical (OA/PB) feeding may prevent these outcomes.

Following a 7-d acclimation in thermoneutral conditions (temperature-humidity index [THI] 68), 48 cows were randomly enrolled to 1 of 4 groups (n = 12/group): thermoneutral conditions (**TN-Con**), HS conditions (**HS-Con**; diurnal THI 74 to 82), thermoneutral conditions pair-fed to match HS-Con (**TN-PF**), or HS fed OA/PB (**HS-OAPB**; 75 mg/kg of body weight; 25% citric acid, 16.7% sorbic acid, 1.7% thymol, 1.0% vanillin, and 55.6% triglyceride; AviPlus® R, Vetagro Spa, Italy) for 14 d.

An oral Cr-EDTA challenge was performed to measure gastrointestinal permeability on d 3.

MATERIALS AND METHODS: The Cr-EDTA challenge

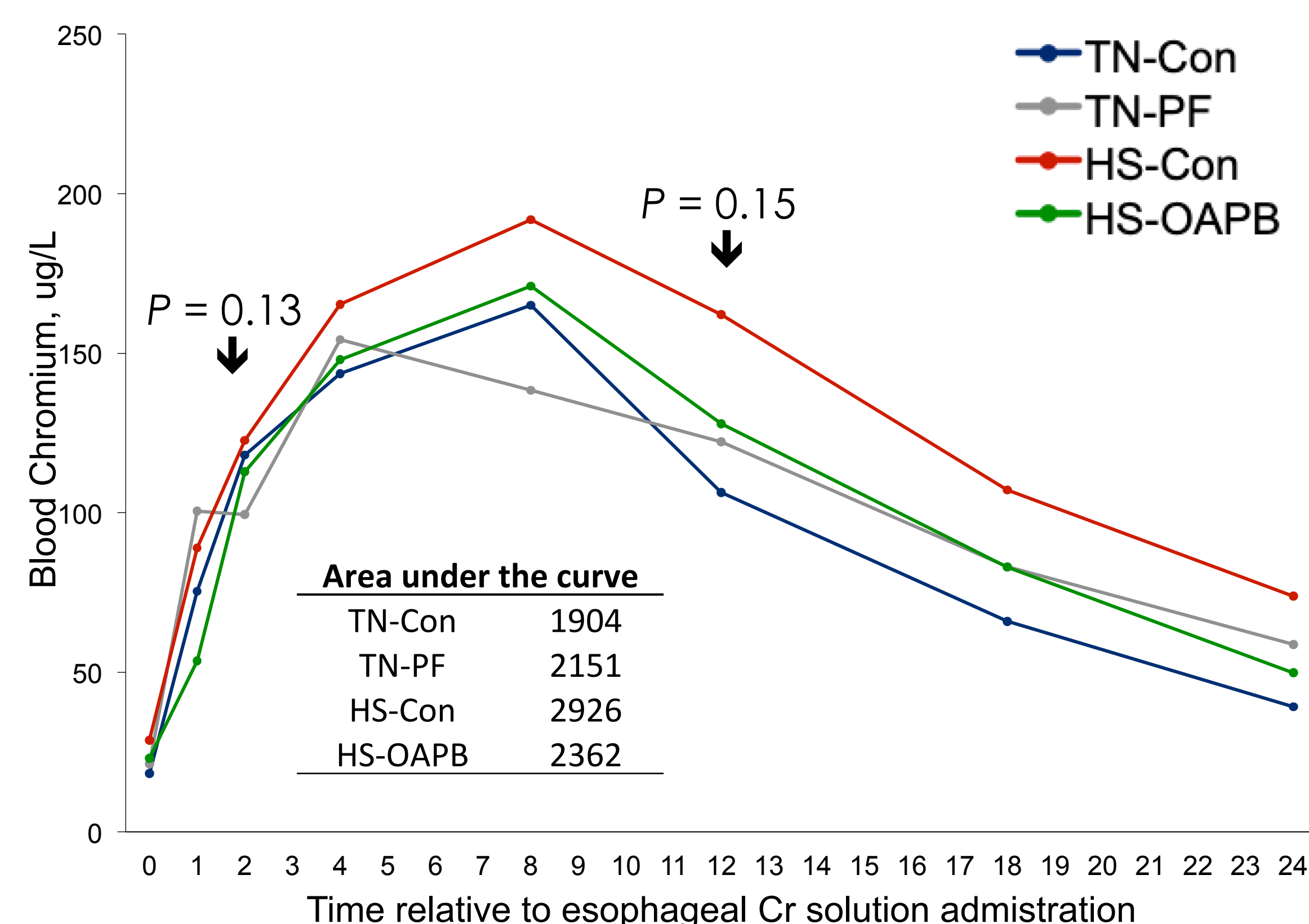


AIM OF THE STUDY

We evaluated whether heat stress develops with gastrointestinal permeability and tested whether dietary OA/PB supplementation ameliorates the effects of heat stress on milk production in cows.

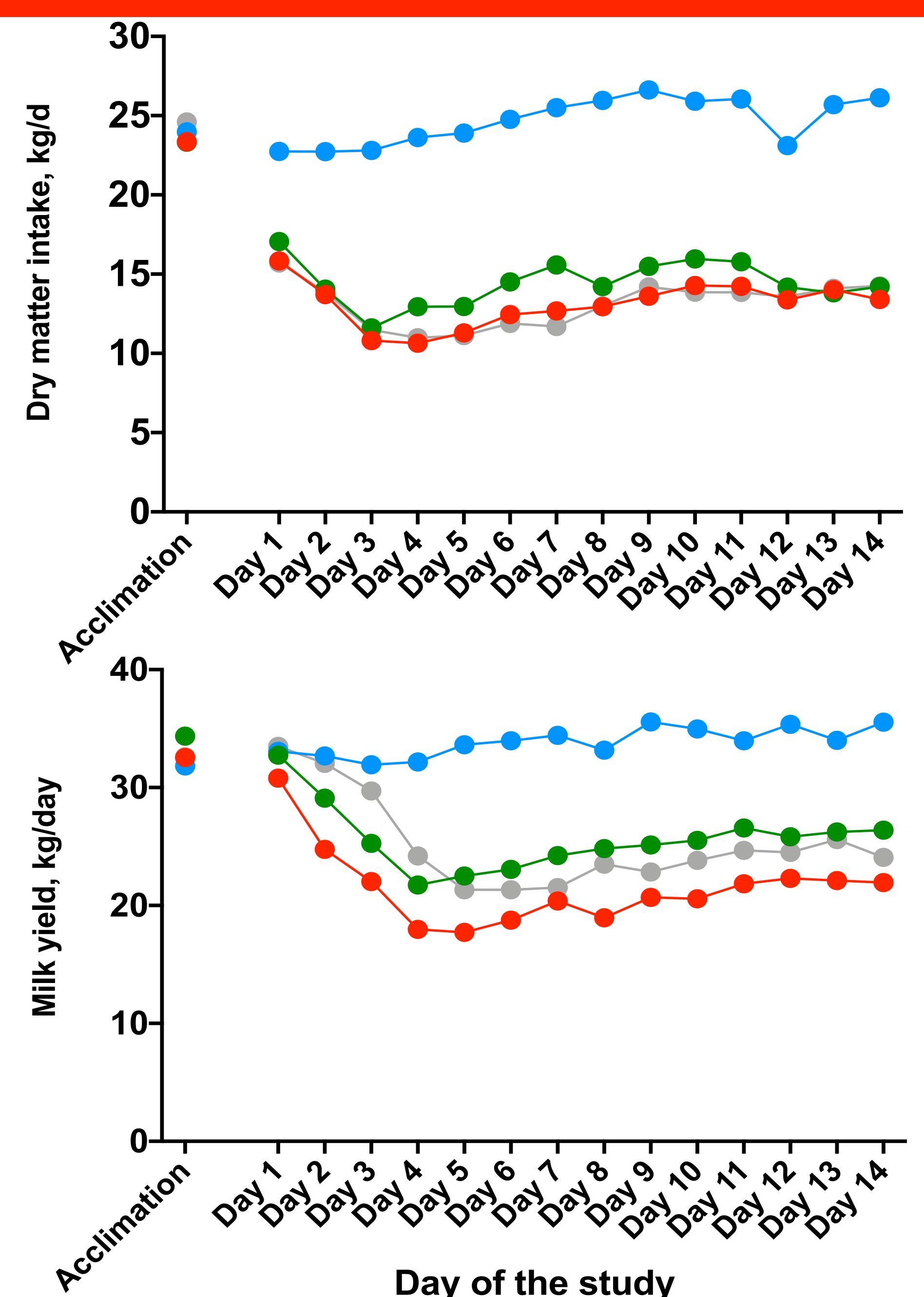
RESULTS

Data were analyzed using a mixed model including fixed effects of parity, pregnancy d, baseline measurements, and treatment, time, and their interaction. Planned contrasts included HS-Con versus (vs.) TN-Con, HS-Con vs. TN-PF, and HS-Con vs. HS-OAPB.



DMI (kg/d)	
TN-Con	24.8
TN-PF	12.8
HS-Con	13.4
HS-OAPB	14.8

Milk yield (kg/d)	
TN-Con	34.3
TN-PF	25.3
HS-Con	22.5
HS-OAPB	25.2



Variable, unit	Treatment	HS-Con vs. TN-Con	HS-Con vs. TN-PF	HS-Con vs. HS-OAPB
Dry matter intake, kg/d	<0.01	<0.01	0.54	0.14
Milk yield, kg/d	<0.01	<0.01	0.09	0.12

DISCUSSION AND CONCLUSION

- HS-Con had reduced dry matter intake and milk yield, relative to TN-Con ($P < 0.01$).
- HS-Con had similar dry matter intake but tended ($P < 0.10$) to have greater milk yield, relative to TN-PF.
- We conclude that heat stress increases gastrointestinal permeability independent of changes in feed intake in lactating cows and that dietary OA/PB supplementation can moderately recover its integrity.
- We conclude that dietary OA/PB supplementation partially restores lactation performance in heat-stressed dairy cows.