Leucine supplementation alters immune responses and blood metabolites of lambs exposed to endotoxin

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Introduction

- Stress may weaken an animals' immune system and increase susceptibility to foreign viral and bacterial agents (Carroll and Forsberg, 2007; Duff and Galyean, 2007).
- Post ruminal BCAA supplementation improved nitrogen balance and animal performance (Carter et al., 2011; Löest et al., 2018).
- Cattle challenged with an endotoxin had lower plasma BCAA which implies increased metabolic demand for BCAA during stress (Waggoner et al., 2009; Löest et al., 2018).

Objectives

To evaluate effects of supplemental rumen-protected leucine on immune responses and blood metabolites of lambs exposed to LPS.

Materials and Methods

- **Animals**: 29 wether lambs (43.8 ± 10.7 kg BW)

  Approved by NMSU IACUC

- **Treatments**: 2 x 3 factorial

	NO-LEU	IV-LEU	RP-LEU
-LPS	n = 4 LPS: 0 µg/kg BW LEU: 0 mg/kg BW	n = 5 LPS: 0 µg/kg BW LEU: 15 mg/kg BW	n = 5 LPS: 0 µg/kg BW LEU: 15 mg/kg BW
+LPS	n = 5 LPS: 3 µg/kg BW LEU: 0 mg/kg BW	n = 5 LPS: 3 µg/kg BW LEU: 15 mg/kg BW	n = 5 LPS: 3 µg/kg BW LEU: 15 mg/kg BW

- **Experimental timeline**:

Lambs moved to individual pens	Jugular catheters	Moved to metab crates	LPS injection
d -14	d -7	d -3	d 0
Adaptation to basal diet	Adaptation to Leu treatments		Collections

Results

Figure 1

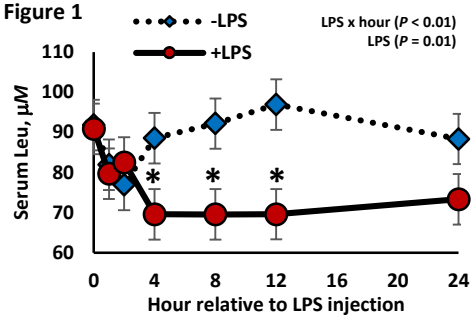


Figure 2

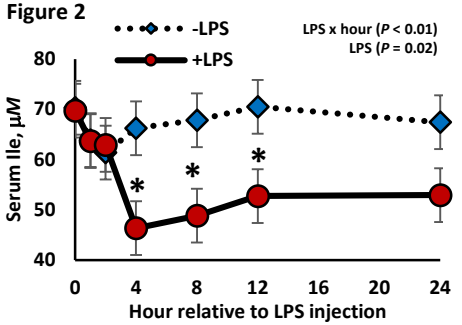


Figure 3

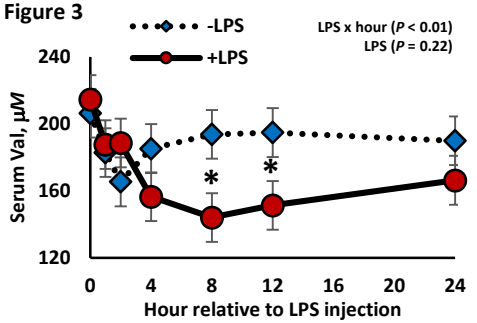


Figure 4

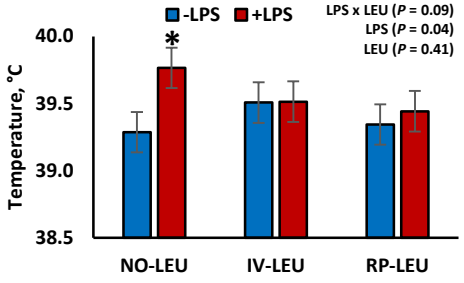


Figure 5

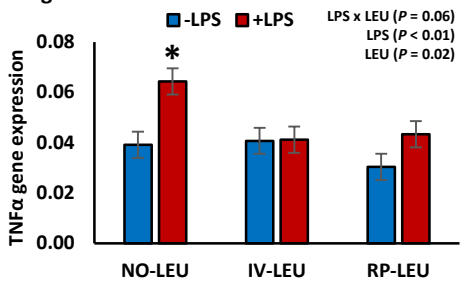
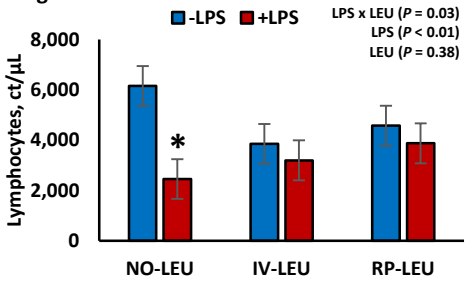


Figure 6



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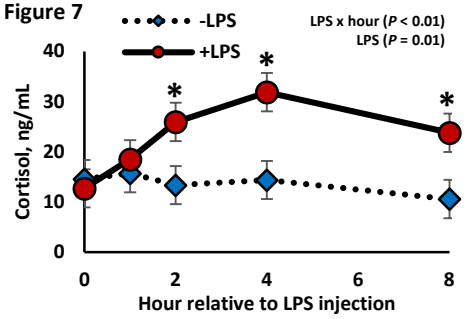
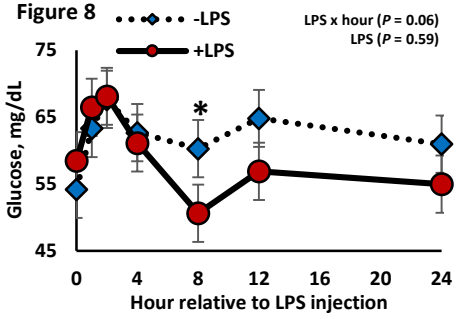


Figure 8



Conclusions

- The effects of LPS on rectal temperatures, serum TNF-α, and blood lymphocytes was reduced by supplementing leucine at 15 mg/kg of BW.
- Leucine alleviated LPS effects regardless of whether leucine was supplemented intravenously or as a rumen-protected dietary supplement.
- These results indicate that rumen-protected leucine supplementation attenuates the inflammatory responses to endotoxin in sheep.