EFFECT OF FINISHING DIETS ON *ESCHERICHIA COLI* NUMBERS, AND PREVALENCE OF ENTEROHAEMORRHAGIC *E. COLI* VIRULENCE GENES IN THE FAECES OF CATTLE

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Previous investigations have shown that the formulation of finishing diets may affect the shedding of *Escherichia coli* in cattle faeces (McSweeney *et al*. 2002). An animal study was conducted to examine the effect of dietary inclusion of molasses (simple sugars), grain (starch) and roughage (structural carbohydrate) on the shedding in cattle faeces of *E. coli* and enterohaemorrhagic *E. coli* (EHEC) virulence factors [shiga toxin genes, stx_1 and stx_2; accessory virulence factors, intimin (*eaeA*) and plasmid-encoded enterohemolysin (*hlyA*)]. Thirty Brahman-cross steers (329 kg mean weight ± 3.2 kg sem) were initially fed a high grain (80%) diet. The cattle were then allocated to 3 groups and fed *ad libitum* either (1) 50% molasses, 28% Rhodes grass (*Chloris gayana)* hay, 15.0% whole cotton seed, 4.5% cotton seed meal, 1.5% urea and 1% mineral/vitamin premix (M+R), 2) 80% sorghum, 5% peanut shells, 5.5% cotton seed meal (G), or 3) Rhodes grass hay plus 20 g urea/kg DM (R).

Table 1. Mean abundance of *E. coli* and concentration of enterohaemorrhagic *E. coli* virulence factors in faeces of cattle fed either Rhodes grass hay (R), molasses plus Rhodes grass hay (M+R) or grain (G) diets. Faecal samples were taken when animals were preconditioned on grain (baseline grain diet), and again during pre-lairage (PL) feeding on the 3 diets and at lairage (L).

		Diet					
	Baseline grain diet (n=25)	R (n=10)		M+R (n=10)		G (n=9)	
		PL	L	PL	L	PL	L
E. coli (log_{10}/g digesta)	8.1 (0.2)^a	5.6 (0.2)^b	4.9 (0.3)^c	5.5 (0.1)^b	4.9 (0.2)^c	7.9 (0.1)^a	7.5 (0.2)^a
Virulence gene (log_{10}/g digesta) enterohaemolysin (*hlyA*)	4.0 (0.8)^a	1.6 (0.3)^b	1.2 (0.4)^b	1.8 (0.3)^b	1.5 (0.3)^b	2.8 (0.3)^a	2.8 (0.8)^a
Intimin (*eaeA*)	2.3 (0.5)^a	0.9 (0.3)^b	0.9 (0.3)^b	0.2 (0.1)^b	0.2 (0.1)^b	2.1 (0.4)^a	0.6 (0.3)^b
Shiga toxin 1 (stx_1)	1.3 (0.3)^a	0.3 (0.2)^b	0.1 (0.01)^b	1.2 (0.3)^a	0.6 (0.2)^a	2.4 (0.4)^c	1.0 (0.5)^a
Shiga toxin 2 (stx_2)	2.1 (0.4)^a	2.1 (0.3)^a	1.3 (0.4)^a	2.5 (0.3)^a	1.8 (0.3)^a	1.4 (0.4)^a	2.2 (0.5)^a

Values in rows with different superscipts are significantly different (P<0.05). Standard errors of means are in parentheses.

Volatile fatty acid patterns were similar in the R and M+R diets whereas increased *E. coli* numbers, decreased pH and enhanced butyrate and lactate concentrations were associated with the G diet. This would indicate a shift in the microbial population of the hindgut. Prior to lairage, faecal *E. coli* numbers were 2 logs lower in the R and R+M diets compared with G fed animals, and this difference increased to 2.5 logs at lairage (Table 1). Analysis of the concentration of EHEC virulence factors in faeces indicate a marked decrease in *hlyA*, *eaeA* and stx_1 genes in the R and R+M diets, and this trend remained at lairage (Table 1).

This study indicates that the type of dietary carbohydrate has a significant effect on the size of the *E. coli* population and, therefore, may determine the level of pathogenic serotypes. Furthermore, diets such as those based on R or M+R combinations, that have low fermentable carbohydrate reaching the hindgut, may have potential use in reducing EHEC populations.

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