

## EFFECT OF CELL-RATE™ ON FAECAL MICROBIOTA OF CALVES

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Our understanding of the complex natural communities (microbiota) of calves is still far from complete. While the better studied gastrointestinal pathogens are of obvious importance, the role of commensal bacteria in host nutrition and colonic health is becoming increasingly recognized. Factors such as diet composition or feed additives are of particular interest with respect to their effects on microflora and microbial fermentation products in the gastrointestinal tract of calves. A preliminary study was conducted to evaluate the influence of a nucleic acid-containing feed additive (NA) on faecal microflora and faecal volatile fatty acids (VFAs) of young calves. The present work is the first attempt to identify microbial groups in faeces of calves by culture-independent fluorescent *in situ* hybridization (FISH) technique using 16S rRNA-targeted probes.

**Methods:** Twelve-day old female calves (Holstein-Friesian) were randomly assigned to experimental (+ NA) and control (- NA) groups. NA was supplied via milk replacer per calf in a 35-d study. Additional solid feed was available from d 10. Effects on total faecal *Bacteria* and microbial population groups, e.g. *Bifidobacterium* (Bif), *Lactobacillus* (Lac), *Enterococcus* (Ecoc), *Clostridium coccooides-Eubacterium rectale* (Erec), *Atopobium*, *Coriobacterium* and *Eggerthella lenta* (Ato), *Bacteroides* (Bac), *Fusobacterium prausnitzii* (Fprau), *Enterobacteriaceae* (Entero), *Clostridium histolyticum* (Chis), *C. lituseburensense* (Clit) and *Archea* (Arch) in response to NA administration were investigated by FISH at the end of the study. VFAs were determined by gas chromatography.

**Results:** NA administration resulted in higher numbers of Bif ( $P < 0.05$ ) and Ato in the faeces than control (Table 1) and in a trend to lower counts of Bac and Fprau. The faecal concentration of total VFAs tended to be higher in NA-treated calves than control ( $110.3 \pm 9.6$  vs.  $96.4 \pm 11.0$   $\mu\text{mol/g}$ ), but the mean molar ratios (%) of the faecal VFAs (acetic : propionic : butyric : valeric : iso-acids) did not differ between the groups: (+ NA) 72.4 : 15.2 : 7.9 : 2.9 : 1.3 vs. (- NA) 72.4 : 16.2 : 6.1 : 3.2 : 1.2.

**Table 1: Composition of the faecal microflora of calves [mean, pooled SD]**

	Bacteria	Arch	Bif	Lac	Ecoc	Erec	Ato	Bac	Fprau	Entero	Chis	Clit
Control -NA	9.3	7.3	5.9	6.4	6.4	9.1	7.6	8.5	7.7	7.5	5.9 <sup>b</sup>	5.4 <sup>c</sup>
Treatment +NA	9.3	7.7	7.6	6.8	7.0	9.0	8.3	8.0	7.2	7.7	5.7 <sup>b</sup>	n.d.
Pooled SD	0.2	0.6	0.5	0.4	0.3	0.2	0.4	0.5	0.5	0.5	0.4	

<sup>a</sup> Counts expressed as  $\log_{10}$  cells/gram (6 calves per group) n.d. no bacteria detected

<sup>b</sup> Bacteria only detected in 2 calves.

<sup>c</sup> Bacteria only detected in one calf.

**Conclusion:** FISH with 16S rRNA-targeted probes are well suited for the characterization of flora modulation in calves by additive. An increase in beneficial bacteria, such as Bif and Lac, were noted in this study. A decrease in negative pathogens, such as Fprau and Chis, were also noted in this study. This study demonstrates that small

changes in the feed (NA in milk replacer) can alter the balance of faecal bacteria in calves towards a healthier microflora.

**Definitions of terminology used in above study:**

Bifidobacterium (Bif) – One of the major genera of bacteria that make up the gut flora. Bifidobacteria aid in digestion and are commonly used as probiotics. The primary site of action is the colon and cecum.

Lactobacillus (Lac) – Plays a significant role in the overall health of the intestinal tract. Lactobacillus is a common bacteria used in probiotic products. The primary site of action is the stomach, cecum and colon.

Enterococcus (Ecoc) – Bacteria strands like Enterococcus faecium are commonly used in probiotic products. The primary site of action for enterococcus is the stomach through the small intestine.

Clostridium histolyticum (Chis) – A bacterium found in wounds, where it induces necrosis of tissue by producing a cytolytic exotoxin. Necrosis is the death of cells and tissues through injury or disease.

Fusobacterium (Fprau) – A Gram-negative non-sporeforming bacterium that is widely known and studied as a human and animal pathogen. Fusobacterium's ability to adhere to both Gram-negative and Gram-positive plaque microorganisms has made it a highly invasive pathogen.