

# Evaluating Effects of Bio-Mos® on Health Status and Growth of Dairy Calves

Results of contract research conducted by: IRTA Institut de Recerca i Tecnologia Agroalimentàries, Unitat de Remugants, Campus Universitari de Bellaterra, Barcelona, Spain

## Material and methods

- 60 female Holstein calves (43.7±4.55 kg; 9.8 ±4.19 d) sourced from different farms in individual pens (1.07 x 1.60 m).
- Two treatments consisted of an enhanced-growth feeding program with or without Bio-Mos® (4 g/d) supplementation.
- Milk replacer (24% CP, 18% fat) at a dilution rate of 18% DM was offered in bottles twice daily in a regime of 4 L/d from 1 to 7 d, 6 L/d from 8 to 14 d, 7 L/d from 15 to 21 d, 6 L/d from 22 to 28 d, and 3 L/d once daily in the afternoon from 29 to 34 d. The study began after 1 wk of adaptation.
- All calves were weaned after 45 d from study beginning.
- Calf starter (19.7% CP) and water were offered *ad libitum*. After weaning, calves were fed the same starter for one more week.
- Animals were vaccinated against *Clostridium perfringens* (type B, C, D), *C. septicum*, *C. novyi*, *C. tetani*, *C. sordellii*, *C. chauvoei* with Miloxan (Merial), and BRSV, PI3, *Pasteurella haemolytica* with Bovipast SRV (Intervet) at 23 d of age and 3 wks later.
- After weaning, all calves were grouped together, and received the same ration and management thereafter.

## Measurements

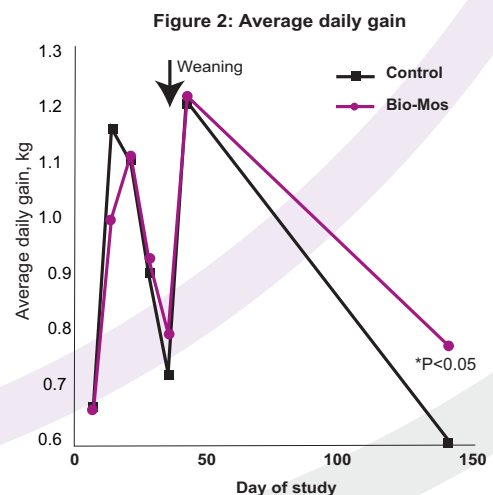
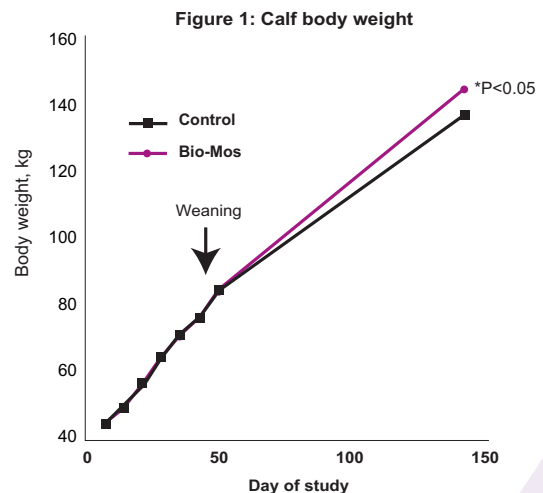
- *Health and performance preweaning*: starter and MR intake, body weight, scour scores and medical treatments needed.
- *Jugular blood samples* drawn between 2 and 4 h after the morning offer of MR were collected from 18 calves/treatment at 1, 3, 5 and 6 wks of study.
- *Counts of E. coli, Salmonella, Clostridium* and presence/absence of *Cryptosporidium* were determined on fecal samples collected at 1, 2 and 3 wks.
- *Blood samples taken the day of the first vaccination and 3 wks later* were used to determination of haptoglobin and antibodies against BRSV (ELISA). To determine whether calves reacted positively to vaccination, a ratio between the optical density (OD) from the ELISA of the sample and OD of the control was calculated.
- Data were subjected to ANOVA with repeated measures using PROC MIXED of SAS (1996). Initial BW and age were used as a covariate. Microbial counts in feces and plasma haptoglobin data were log-transformed before analysis.
- Fecal scores of 1 and 2 were categorized to indicate absence of loose feces, and scores of 3 and 4 categorized to indicate presence of loose feces or diarrhea. Data were analyzed with a mixed-effects logistic model for Bernoulli distributions with the procedure GENMOD of SAS (1999). The same analysis was also

performed for days on medical treatments, as well as the presence of *Cryptosporidia* in feces.

## Results

### Performance

- BW and ADG to weaning were unaffected (Figures 1 and 2), however, BW at the end of the study was numerically ( $P = 0.38$ ) greater for calves given Bio-Mos® (85.1 vs 84.6 kg). However, this difference was much greater ( $P < 0.05$ ) at 140 days of life, (144.7 vs 135.5 kg).
- This increase in ADG following weaning was obtained without additional Bio-Mos® in the ration, and thus the only explanation is a potential carryover effect.



- Although there were no differences in starter DM intake at the beginning of the study, from 32 d to 42 d starter DM intake was greater ( $P<0.05$ ) in calves given Bio-Mos® (1.68 vs 1.47 kg/d, respectively).
- Incidence of loose feces was numerically greater in control calves (28 vs 18%), but did not statistically differ. All loose feces occurred within the first 3 wks, and lasted on average 12.6 and 11.8 d in control and Bio-Mos® calves, respectively.
- The number of medical treatments, but not the number of days on medical treatment, was greater ( $P<0.05$ ) in control calves. For example, the percentage of treated animals during the first 2 wks of study was 33.3% for control and 13.3% for Bio-Mos®.

Table 1. Incidence (n) and length (d) of diarrhea (fecal score  $\geq 2$ )

	Week 1		Week 2		Week 3	
	n	d	n	d	n	d
Control	9	5.2	10	5.3	6	2.1
Bio-Mos	6	6.2	5	3.8	5	1.8

Table 2. Type, incidence (n), and length (d) of medical treatments

		Week 1		Week 2		Week 3	
		n	d	n	d	n	d
Control	Rehydrant	6	16.3	4	2.8	2	2.1
	Antibiotic	-	-	-	-	-	-
Bio-Mos	Rehydrant	3	6.4	1	2	1	3
	Antibiotic	-	-	1	3a	-	-

<sup>a</sup>Antibiotics given due to an arthritic problem.

### Fecal microbiology counts

- *E. coli* counts in calves given Bio-Mos® were slightly lower ( $2.0 \times 10^7$  vs  $2.2 \times 10^7$ , CFU/g) during wks 1, 2 and 3 of study.
- Control calves had higher ( $P<0.05$ ) fecal Clostridia counts than calves given Bio-Mos® week 1, but counts subsequently decreased in controls and were higher for calves given Bio-Mos® wk 3.
- Fecal smears to detect *Cryptosporidium* suggested greater ( $P<0.001$ ) presence in feces of controls than in calves given Bio-Mos® (Figure 4). Generally, Cryptosporidia counts are low the first week of life, and then peaks during wks 2 and 3 and decreases thereafter. Thus, the pattern found in this study coincides with the normal pattern typically described in the literature.

### Serum haptoglobin and immune response to vaccination

- There were no differences in serum haptoglobin concentrations between treatments (0.162 vs 0.164 mg/mL).
- Despite the fact that initial antibody titers against SRV were already high in both treatments (Table 3), no control calves seroconverted positively, but 5 calves given Bio-Mos® seroconverted.

Figure 4. Fecal Clostridia counts

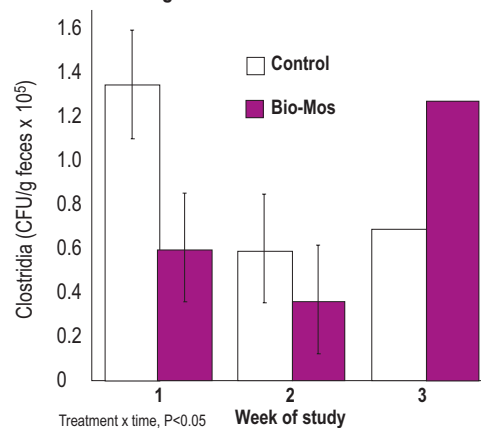


Figure 4. Percent of calves with fecal Cryptosporidia

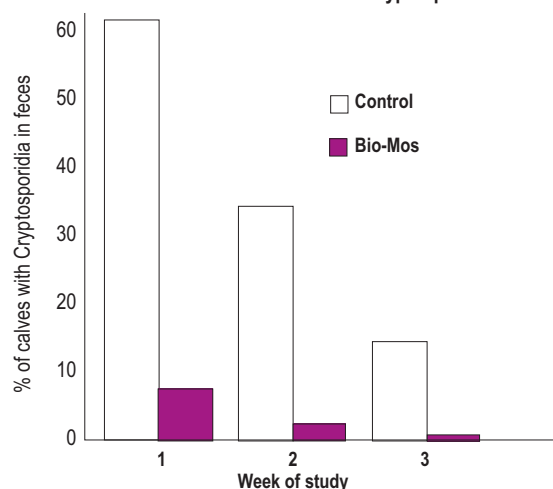


Table 3. Percentage of calves in each of the immune categories determined by the ELISA test.

	Wk	Immune status against SRV <sup>1</sup>					
		0-20% Negative	20-40% Weakly positive	40-60% Moderately positive	60-80% Highly positive	80-100% Strongly positive	>100%
Control	3	10.5	12.5	25.7	17.7	28.8	4.8
Bio-Mos	3	10.6	12.6	25.8	17.7	28.5	4.7
Control	6	10.1	12.1	25.3	17.8	29.6	5.0
Bio-Mos	6	3.66	5.15	14.7	15.5	47.5	13.51

<sup>1</sup>Categories based on the ratio (OD of sample/OD of positive control) x 100

### Conclusions: Calf response to Bio-Mos®

- Higher calf starter intake
- Less diarrhea, fewer treatments needed
- Improved post-weaning performance
- Reduced fecal shedding of Cryptosporidia
- Seroconversion after vaccination tended to increase