Immunotherapy Efficacy of Mycobacteria Cell Wall Preparation (Immunoboost K™) in New Born Calves Artificialy Infected with Enterotoxigenic *Escherichia Coli*

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Although physiologically developed, the immune system of a new born calf is often unable to cope with the wide array of microbial challenges to which it is exposed in the early stages of life. This vulnerability is primarily due to the prolonged lag phase before antibody syntheses. Passive immunity, in the form of colostral immunoglobulins is the natural defense mechanism to cope with those pathogens. However, colostrum does not always provide protection against a wide spectrum of pathogens. Primarly, this is due to the absence of specific antibodies or a low concentration of passively transported antibodies. It is obvious that new born calves required temporary help until they develop their own specific immune response.

Nonspecific immune stimulation may provide enhanced immunity against common pathogens to which new born calves are exposed. Stimulation of the nonspecific immune system of newborn calves following birth may enhance the protection against certain pathogens until a specific immune response is achieved. The ability of mycobacterial cell wall (MCW) preparation (Immunoboost K™) to elicit a nonspecific immunological response and protect calves experimentally infected with enterotoxigenic *Escherichia coli* (ETEC) has been evaluated. Twenty-two, new-born, colostrum deprived calves were randomly divided into treatment (n=10) and control (n=12) groups. Approximately 7.5 hours after birth, each calf in both groups was experimentally challenged with 3.9×10^9 colony forming units (CFU) of K99 ETEC, administered orally. Each calf was examined three times daily for clinical signs of disease. Clinical scores were ascribed, based on the following: fecal consistency, dehydration, depression, food consumption, weight loss and death. At the onset of clinical sign of disease (approximately 23 hours following infection), MCW (Immunoboost K™, 250 µg) was administered intravenously to each calf in the treatment group while the calves in the control group remained untreated. Clinical scores were recorded three times per day and mean values were calculated for each day of the observation period. Differences between the cumulative mean values for calves in the MCW treated and control groups were analyzed statistically. A statistically significant difference ($p<0.03$) in mortality rate was observed between the MCW treated and control groups (see table 1). Furthermore, analyses of the clinical scores data revealed a statistically significant difference ($p<0.009$) in morbidity between the two groups (see table 2).

Table 1. Mortality of calves challenged with *E. coli*

GROUP	No. Alive/No	% survive Challenged	Average time of death
Controls	5/12	42	69.2 hr
Immunoboost K™	9/10	90	98 hr

Statistical significant difference in the survival rate of Immunoboost K™ treated versus control calves, $p< 0.021$

Table 2. Clinical Scores of calves following challenge with E. coli

Group 1	Calf #	Total score	Survival hour	Group 2	Calf #	Total score	Survival hour
C	156	53.4	99.5	I	219b	9.62	
O	158	56.9	42	M	181	11.7	
N	161	64.1	62.5	M	184	15.9	
T	166	55.6	42.5	U	195	19.2	
R	179	28.4		N	200	1.9	
O	185	62.4	41.5	O	209	22.4	
L	192	10.3		B	213	30.2	
	199	29.5		O	214	13	
	207	62.3	76	O	219	30.7	
	218	21.5		S	224	59.9	98
	221	39	120.5	T			
	225	22.9		K™			
Total	12	M* 42.2	Av. 69.2		10	M*21.5	Av. 98

M* = Mean
Statistical significant difference in total scores between control and Immunoboost K™ $p< 0.009$

A subsequent experiment was conducted to investigate the cellular changes induced by MCW (Immunoboost K™) in this challenge model. Histopathological examination of intestinal walls was conducted 16 hours post treatment (36 hours after challenge) and compared to untreated controls. Three distinct differences were observed in the small intestinal tract sections from the MCW (Immunoboost K™) treated calves:

1. There was a marked reduction in colonization on the microvilli of both the jejunum and ileum.

2. Significantly less of edema fluid was observed in the submucosal epithelium of the lamina propria.

3. Great incidence of degranulated eosinophils in the lamina propria was found.

Despite these histological data, the specific function activities occurring at the subcellular level are not clear. Clinical data of the present study suggest that non-specific immunostimulation of calves with MCW (Immunoboost K™) at the onset of colibacillosis protects the calves against long term morbidity and death.

Abstract

Intussusception in cattle: 336 cases (1964-1993)

A hospital-based, case-control epidemiologic study, using medical records of cattle admitted to 17 veterinary medical teaching hospitals in North America and a retrospective case series involving 57 cattle with intussusception admitted to 3 of these teaching hospitals, were used. The objectives were to evaluate selected risk factors and to describe clinical and laboratory findings, surgical management, and postoperative outcome for cattle with intussusception. Intussusception was detected predominantly in the distal third of the jejunum, although ileocolic, cecocolic, and colocolic intussusception also were reported. Sex and season were risk factors that were not significantly associated with the development of intussusception, whereas calves < 2 months old were at greater risk (P< 0.001) of developing small intestinal intussusception than older cattle. Affected cattle were mildly hyponatremic, hypochloremic, hypocalcemic, azotemic, and hyperglycemic. Various methods were used for surgical correction, with most cattle undergoing right flank laparotomy with the cow in a standing position, followed by intestinal resection and end-to-end anastomosis. Overall survival rate (20/57; 35%) and post-operative survival rate (20/46; 43%) for cattle with intussusception were much lower than previously reported and similar to those for horses undergoing small intestinal resection and anastomosis.

Key words: bovine species; epidemiology; intussusception; surgery.