KEMIN
Technical Literature

Toekomstlaan 42 • 2200 Herentals Belgium • tel. +32 14 28 6200 • www.kemin.com

Aleta, the tool to manage post weaning challenges

Author: Ricardo Neto

Key Conclusions

Supplementation with Aleta post weaning resulted in:

- **Reduced incidence of diarrhea**
- **Improved response of piglets to *E. coli* challenge**
- **Improved intestinal integrity (improved tight junction and mucosal protection), stress and inflammatory responses (reduced IL6, TNF and increased IL10) in the piglet**

INTRODUCTION

Weaning is one of the main challenges in the piglets life. It combines changes in local protection, caused by sudden withdrawal of maternal milk with IgA´s, declining immunity against pathogens to which will be exposed after weaning, changes in the intestinal tract (structural and functional) to adapt to a new different diet, insufficient stomach acidification and inability to fully use the nutrients available in the diet immediately after weaning. All these challenges often lead to post weaning diarrheas.
Improving the resilience of the piglets during the post weaning period to these challenges is desirable and several interventions are often considered to achieve this (diet composition, weaning age, acidification, immunomodulation, etc).

The objective of this study was to investigate the effects of supplementing weaned piglets diets with an algae (*Euglena gracilis*) based beta-1,3-glucan immunomodulator, Aleta™ on the resilience of piglets to the weaning challenge.

KEYWORDS

Aleta™, piglet, weaning, *E. coli*, intestine, diarrhea

MATERIAL AND METHODS

This trial was conducted at the University of California, Davis, USA. A total of 36 weaning pigs (21 days old) with an equal number of gilts and barrows and an average initial body weight (BW) of
7.69 ± 0.77 kg were included in the study. The study had a duration of 17 days (5 days adaptation and 12 days post infection).
The piglets were randomly allotted to one of three treatment groups. A control group, in which piglets were fed a basal diet without spray-dried plasma, antibiotics, and zinc oxide. A second group Aleta low, the Basal diet supplemented with 54 g of Aleta / t of feed and a third group, Aleta, fed basal diet supplemented with 108 g of Aleta / t of feed. A summary of the trial design can be seen on table 1.

	Control	Aleta low	Aleta
treatment	Basal diet	Basal diet+ 54 g Aleta / t feed	Basal diet+ 108 g Aleta / t feed

Table 1. Summary of the trial treatment groups

After 5 days adaptation, all pigs were orally challenged (day 0) with 3 mL (10^{10} CFU) of F18 *E. coli* (U.IL-VDL # 05-27242) for 3 consecutive days.
The diarrhea score of each pig was assessed daily, with the score ranging from 1 (normal feces) to 5 (watery diarrhea). The frequency of diarrhea was calculated as the percentage of the pen days with diarrhea score 3 or greater.
Blood samples were collected before challenge (d 0), and on d 2, 5, 8, and 12 post challenge, the samples were used for measuring total and differential blood cell count, assessment of acute phase proteins, cortisol levels and T cells.
6 piglets from each treatment were randomly selected and euthanized on d 5 post challenge and the remaining piglets were euthanized at day 12 post challenge.
Ileal samples were freshly collected from pigs in the control group and Aleta group for gut permeability analysis.

RESULTS AND DISCUSSION

Piglets included in the group Aleta had a reduced ($P<0.05$) *E. Coli* diarrhea score at day 3 and 5 post challenge and a reduced ($P < 0.05$) frequency of diarrhea (17.28%) for the entire experimental period, compared with pigs in the control (29.01%). A summary of the daily diarrhea score in the different groups can be seen on figure 1.

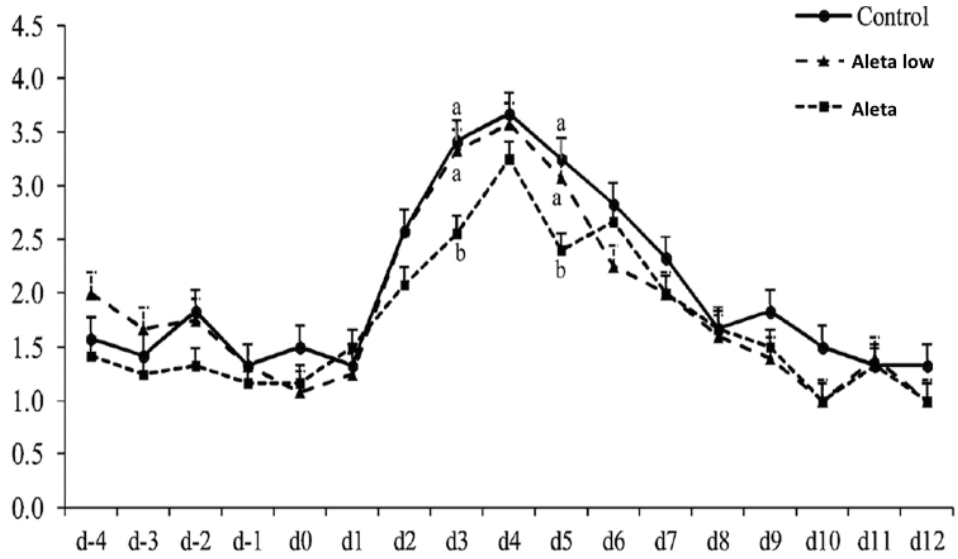

Fig 1 Daily diarrhea score of weaned pigs in the different groups. 1, normal feces, 2, moist feces, 3, mild diarrhea, 4, severe diarrhea, 5, watery diarrhea., means without a common superscript are different (P < 0.05)

Piglets included in the group Aleta (P < 0.05) had an increased percentage of CD8+ T cells (cytotoxic T lymphocytes) at day 5 post challenge and reduced (P < 0.05) percentage at day 12 post challenge compared with the control group, cytotoxic T-lymphocytes respond to antigenic stimulation by proliferating, secreting cytokines (IFN-γ, TNF-α) and killing target cells such as cells infected with a virus. A summary of the % CD8+ can be seen on figure 2.

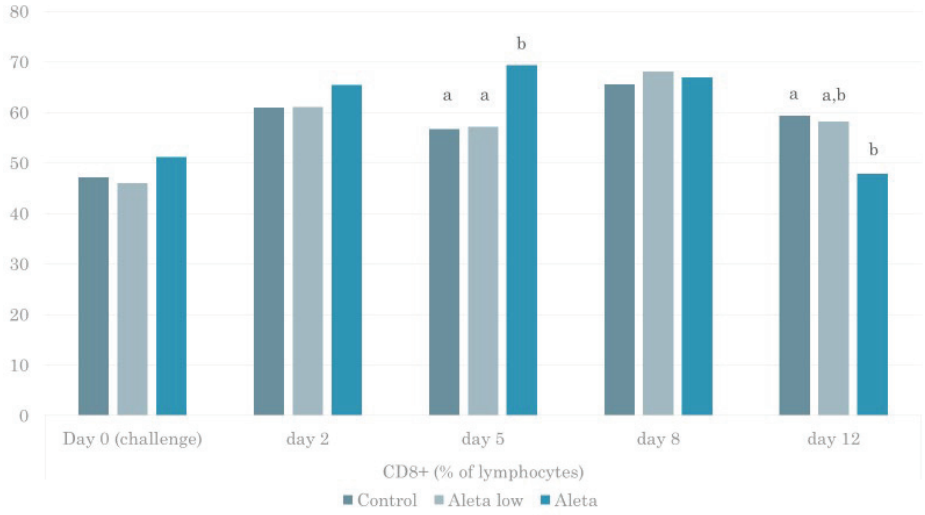

Fig 2. Percentage of CD8+ of lymphocytes, means with a different superscript are significantly different (P < 0.05)

Piglets in the two groups supplemented with Aleta had reduced (P < 0.05) serum haptoglobin (an acute phase protein and marker for inflammation) on day 2 and 5 post challenge and reduced (P < 0.05) serum cortisol (a commonly used marker for physiological stress) on days 5, 8, and 12 post challenge compared with the control diet. Concentration of Haptoglobin and Cortisol in serum of animals in the different groups can be seen in figure 3.

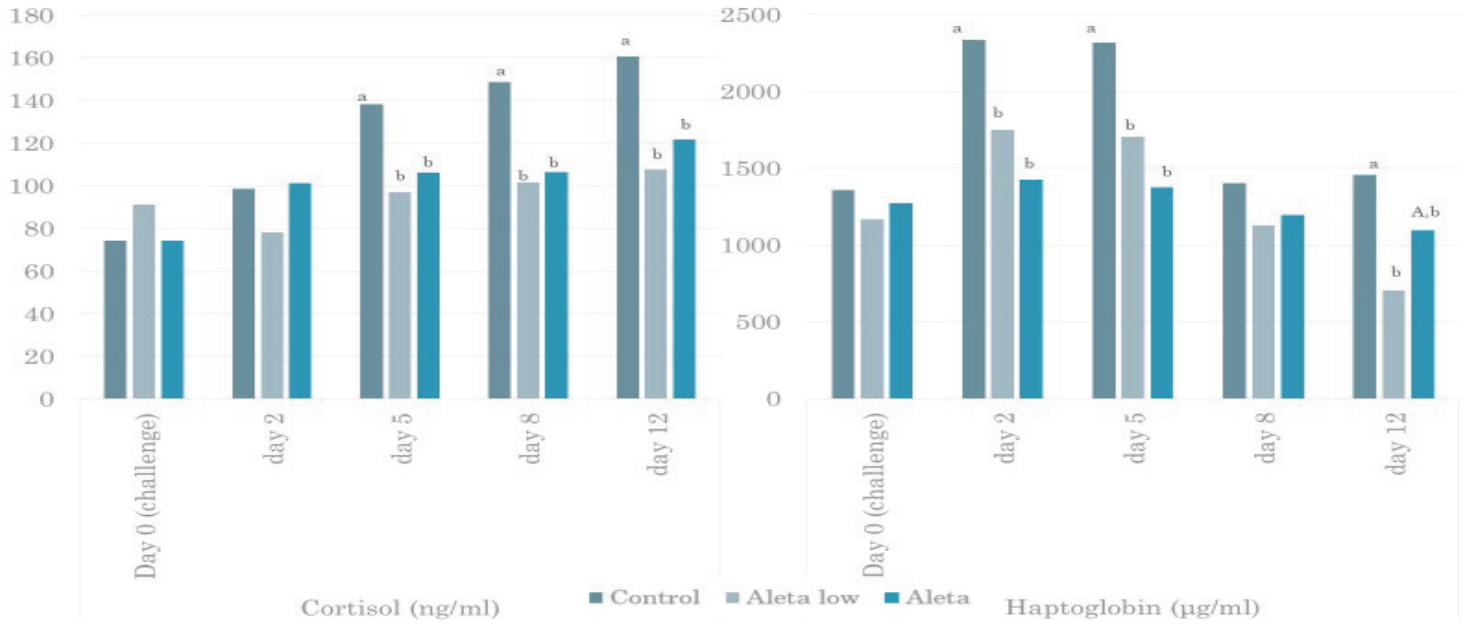

Fig 3. Concentration of Haptoglobin and Cortisol in serum of animals in the different groups, means with a different superscript are statistically significantly different (P < 0.05)

Pigs in the Aleta group had lower (P < 0.05) serum TNF- alfa concentration on day 5 post challenge and higher (P < 0.05) serum IL-10 on day 2 post challenge than pigs fed the control diet, no significant differences were observed between Aleta low and the control group.

Gut permeability and gut integrity associated gene expression

On day 5 post challenge, piglets included in the group Aleta down-regulated the gene expression of IL6 (pro inflammatory cytokine), up-regulated the expression of MUC2 in ileal mucosa (resulting in increased production of Mucin, key for gut protection) and Dectin (a membrane receptor that plays a very important role in activating and modulating the immune response), compared with the control diet. On day 12 post challenge piglets in group Aleta had a reduced (P < 0.05) expression of IL6 and increased the expression of Dectin in the ileal mucosa, compared with the control diet. Piglets in the group Aleta Low had a downregulated IL1B (upregulation of IL1B is associated with autoinflammatory syndromes and TNF alfa but up-regulated MUC2 expression in

ileal mucosa of pigs compared with the control. A summary of the relative abundance of intestinal integrity associated gene expression can be seen on figure 4.

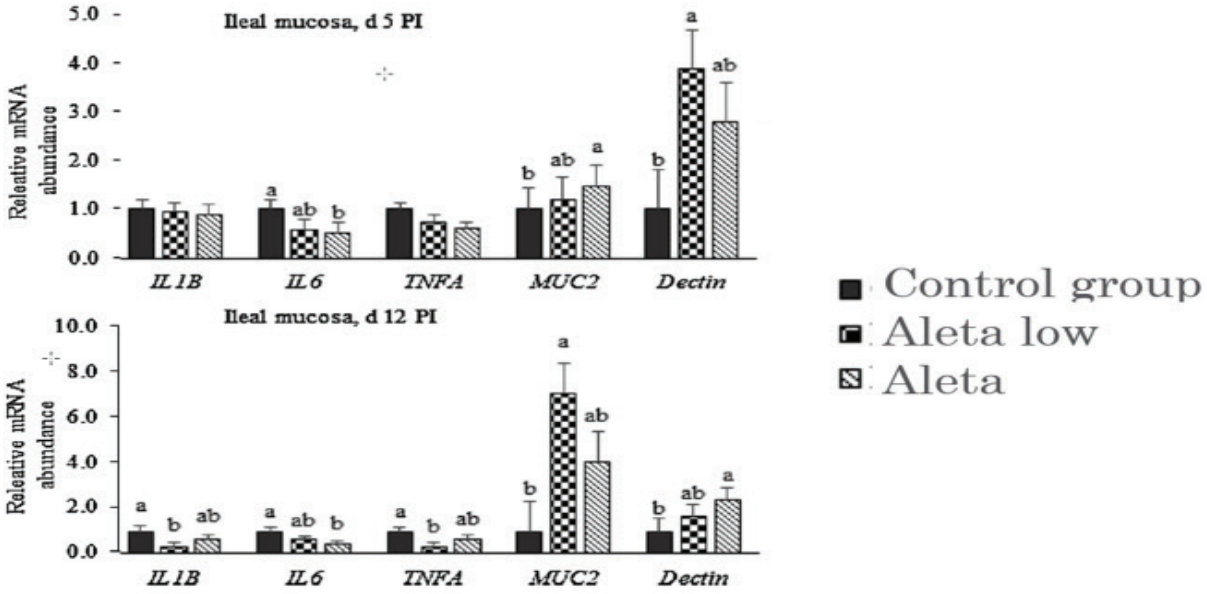

Fig 4. Relative mRNA abundance of IL1B, IL6, TNFA, MUC2, and Dectin in ileal mucosa

CONCLUSION

In the conditions of this trial, supplementation of Aleta at 108 g / t to weaned piglets already reduced the incidence of diarrhea in *E. coli* infected pigs. This reduction was not observed when Aleta was supplemented at a lower dose.

Aleta supplementation alleviated inflammation caused by *E. coli* infection (reduction of TNF and increase in IL-10 (anti-inflammatory cytokine)), enhanced immune responses, reduced cortisol (marker for stress) and haptoglobin (an APP used as a marker for inflammation).

In summary, supplementation of weaned piglet diets with Aleta can reduce post-weaning diarrhea.

REFERENCES

Kim K. et al, (2019). Algae-derived β-glucan enhanced gut health and immune responses of weaned pigs experimentally infected with a pathogenic E. Coli. Animal Feed Science and Technology 248 (2019) 114–125