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Effect of IgY (Globigen®) against *Escherichia coli* K88 in a challenge trial on weaned Pigs

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Egg yolk immunoglobulin (IgY) has been used for prevention of GI problems, for example, *Escherichia coli* (*E. coli*) infections. But IgY is a protein and may be destroyed by enzyme or acid in stomach. Micro-encapsulation is preferred to use for protecting IgY. The objective of this study was to evaluate IgY products, both normal IgY and micro-encapsulated IgY, in pigs challenged with *E. coli* K88.

Materials and Methods

Forty eight weaned pigs (21-22 day-old, average weight 6.25±0.47 kg) were chosen from a commercial pig farm and randomly divided into 3 groups (n=16 each). Group A served as a control, group B was treated with normal IgY (10 g/head/day) twice a day, and group C treated with micro-encapsulated IgY (10 g/head/day) twice a day. All pigs were reared for 21 days in the same house and environment, fed by the same feed (broken rice and soybean meal base, 21% protein and 4% fat). The pigs were put on a fasting and treated with Enrofloxacin (5 mg/kg IM) on the first 2 days to clean bacteria from the gut before challenging. Then all pigs were challenged with 20 ml of $4.7x10^9$ CFU/ml of *E. coli* for 2 days. All groups were monitored everyday during the trial, and fecal score and diarrhea were evaluated. Rectal swabs were examined on day 5, 7, 9, 12, 15, 18, and 21 of trial period. All pigs were weighed on day 1, 7, 12, and 21 and feed were recorded everyday, for calculating ADG and FCR that were analyzed by two-way ANOVA test and compared by Duncan test and p value ≤ 0.05 was considered significant. Non-parametric data, such as fecal score and β-hemolytic *E. coli*, was analyzed by descriptive statistics. SPSS® version 13 (SPSS Inc, USA.) was used for statistical analysis.

Results

All pigs showed clinical sign of colibacillosis such as depress, off feed, diarrhea, palpebral edema. All groups showed diarrhea 1 day after fed *E. coli*. Most of pigs in group B and C recovered from diarrhea 8 days post infection (pi) while group A recovered 15 pi. IgY-treated groups showed higher end body weight and daily gain compared to the A group although the difference was not significant (Table 1). For FCR, group B and C were also lower than group A. For β-hemolytic *E. coli*, numbers of positive in group A were the highest followed by group B and C, 29.46%, 12.5%, and 9.82%, respectively.

Table 1. Start weight, end weight, ADG, and FCR of each group and total.

Group	Start weight	End weight	ADG	FCR
A	6.16±0.40	8.88±1.04	129.46±48.88	4.91±3.15
B	6.23±0.50	9.80±1.53	170.24±68.05	3.98±1.58
C	6.37±0.49	9.47±1.27	147.62±51.70	3.97±1.80
P-Value*	0.428	0.124	0.13	0.415

*Analysed by two-way ANOVA, compared by Duncan test and significant at the nominal 5% level (two-sided).

Discussion and Conclusion

In this study both treatment groups showed reduced level of diarrhea and excretion of hemolytic *E. coli* compared to control group. Other parameters such as daily gain and FCR were also improved in treatment groups. These facts indicate that IgY (Globigen®) can be used for controlling *E. coli* infections and for improving growth performance of piglets.

The results of micro-encapsulated IgY group, however, were not as good as expected. IgY may lose some activity upon exposure to low pH and stomach acid. To protect IgY in stomach microencapsulation technique was used to coat IgY. The IgY in microcapsules has been found to retain full activity after exposure to low pH for a few hours. But the microcapsules have been found not to release all IgY in small intestine after feeding. This may be a reason that the microcapsule group did not show better performance than the normal Globigen-treated group. Microcapsule is an interesting approach to enhance the effect of IgY but more research is needed, such as appropriate thickness of capsule in order to fully release IgY at the target site.