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Effect of Feeding a Fermented Potato Extract Protein on Piglet Growth and Immunity

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Introduction

Lianol® is a commercial fermented potato extract protein which previous reports have shown that it can stimulate Insulin Like Growth Factor I (IGF-1) production and increase serum IGF-1 in sows (1-2), gilts (1) and piglets (3). IGF-1 is produced mainly in the liver and it is able to stimulate growth, differentiation and maturation of many tissues/organs in the body, the production of IGF-I can be stimulated by growth hormone (GH). IGF-I require IGF-I receptor (IGF-IR) to mediate target cell changes (4).

Many reports showed that a fermented potato extract protein can improve an overall growth development and reproductive performance such as decreasing weaning-to-oestrus-interval (WSI), farrowing to service interval (FSI), but increasing litter size and farrowing rate (1-2, 5-6).

Previous studies in piglets have shown that a fermented potato extract protein can increase serum IGF-1 level in piglet (3, 7) and reduce mortality rate (20 days) (7). The mortality rate is significantly increased particularly on starved piglets (8). Using a fermented potato extract protein also reduce using of antibiotic and anti-inflammatory drugs in piglet (8). Moreover, piglets fed with a fermented potato extract protein have shown higher level of serum Immunoglobulin G (IgG) than control group (9). Sows fed with a fermented potato extract protein give a higher piglet birth weight and body weight at weaning. (10).

The present studies was aims to investigate the effect of fermented potato extracted protein on ADG, IGF-I, IGF-IR and IgG in piglets.

Materials and Methods

Fifty piglets from commercial farms were used and equally divided into 2 groups: an untreated control group and treatment group. Treatment group was fed by fermented potato extract protein (Lianol® Colostro, HuvePharma, Thailand). One millilitre of product was given to piglets immediately after farrowing followed by a repeating 12 hours later. One week after feeding, blood samples were collected. Piglet's weigh were measured daily until 14 day to calculate average daily growth (ADG).

Serum IgG and IGF-I were quantified using Enzyme-linked immunosorbent assay (ELISA) kit (Koma Biotech, Seoul Korea) and protein concentration was measured by microplate reader at 405 nM (BioTek, VT, USA)

The mRNA was extracted using Trizol® reagent (Thermo Fisher Scientific, USA) and converted to cDNA using SuperScript® VILO cDNA Synthesis Kit (Thermo Fisher Scientific, USA). Real-time Polymerase Chain Reaction (PCR) was performed as a previously report (11) using KAPA SYBR®Fast qPCR Master Mix (2x) Universal (KAPA Biosystem, Woburn, MA USA). The PCR platform was Rotor gene 6000 (Qiagen, Hilden, Germany). The PCR results, melt curve analysis and comparative quantification were analysed using Rotor gene software 6.1 (Qiagen, Hilden, Germany). Target genes were IGF-I and IGF-IR. Relative gene expression was normalised with references gene (GAPDH).

Statistic difference were analysed using student's t test by SPSS 15 software.

Results

Our results revealed that feeding piglets with a fermented potato extract protein significantly increased ($p<0.05$) the level of serum IGF-1 in piglets. Conversely, ADG and Serum IgG tend to be higher in control piglets than Lianol® fed piglets but no statistical differences was observed ($p>0.05$) (see Table 1 and 2).

Table 1. Comparison of ADG between piglets fed with Lianol® and control group (Mean±SD).

Group	ADG (mean+SD)
Control piglets	137.93±49.59
Lianol® fed piglets	124.14±51.02

Table 2. Comparison of serum IGF-I and IgG between piglets fed with Lianol® and control group (Mean±SD).

Group	Serum IGF-I (ng/ml)	Serum IgG (mg/ml)
Control	86.60±39.92*	6.76±0.79
Lianol®	155.88±78.52	5.52±0.54

*Significant difference (p<0.05) was found.

In contrast to serum IGF-I level, control piglet revealed a significantly higher expression of IGF-I in peripheral white blood cell than a Lianol® treated group (p<0.05). The expression of IGF-IR tend to be higher in a control group than a Lianol® treated group but no significant difference was found (p>0.05) (see Fig. 1).

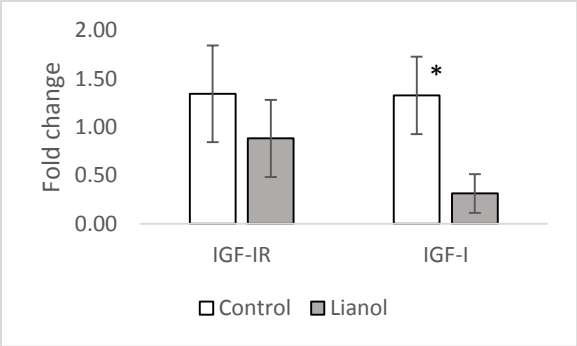

Figure 1 Comparative gene expression of IGF-I and IGF-IR in peripheral white blood cells in control piglets and Lianol® fed piglets.*Significant difference between control and treatment (p<0.05) was found.

Discussion

Our studies revealed that a fermented potato extract protein could increase serum IGF-I level in piglet, but not increase the absorption of IgG and expression of IGF-I and its receptor in white blood cells.

The effect of a fermented potato extract protein on IGF-I was similar to previous studies in piglets (3, 7) confirm the theory that fermented potato extract protein is able to increase serum IGF-I in piglet. Although most studies report the increase of serum IGF-I in pig (1-3, 6-10), but Benjasirwan et al (5) are unable to demonstrate a change of serum IGF-I in gilts.

In contrast to a previous report (9) which reveal that a fermented potato extract protein can increase the serum IgG level by suggesting that it may increase the absorption of colostrum contains maternal IgG. However, our present studies did not observe the increase of serum IgG in piglets. Therefore, the theory of a fermented potato extract protein can increase the absorption of colostrum and maternal IgG is still questionable. So further investigation from independent research group are required.

Additionally, our study showed that IGF-I expression of peripheral white blood cells in a Lianol® fed group was substantially lower than control group which in contrast to the serum IGF-I level. These results suggested that the higher serum IGF-I production might come from the liver which is the main source of IGF-I, rather than secretion of white blood cells.

Acknowledgement

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