COMBINED EFFECT OF T-2 TOXIN AND A GRAIN EXTRACT FEED ADDITIVE ON THE IMMUNE RESPONSE IN PIGS

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Abstract: The immunomodulating effect of a wheat extract (Immunovet-HBM) feed supplement in pigs suffering from immunosuppression caused by 1.5 and 3.0 ppm T-2 toxin was examined. Immune response was measured after vaccination (day 1 and 5) of the animals against Aujeszky's disease. Specific and non specific *in vitro* cellular immune response was measured by the lymphocyte stimulation test (LST) induced by PHA-P, ConA, PWM and inactivated suspension of the Aujeszky virus. Humoral immune response, e.g. specific antibody titre was measured by virus neutralisation test. All the measured parameters were significantly and dose dependently lower in pigs fed T-2 containing diet than in the controls. The wheat extract supplementation induced a better immune response compared to pigs exposed to T-2.

Keywords: T-2, immune response, wheat extract supplementation, weaned pigs

Introduction

Most *Fusarium* toxins (T-2, HT-2, deoxynivalenol [DON], nivalenol, etc.) have negative effect on the function of the immune system. Rafai et al. (1995) found that T-2 toxin had negative effect on the proliferation and differentiation of the immune competent cells and the antibody production even in a low concentration (0.5 ppm). In prevention of harmful effects of mycotoxins – e.g. immunosuppression – one possible way is to increase resistance of the host animal. The aim of the experiment was to determine the immunomodulating effect of a wheat extract (Immunovet-HBM) feed supplement in pigs suffering from immunosuppression caused by T-2 toxin in the diet. The main active ingredients of the grain extract were benzoquinones (methoxy-p-benzoquinone and 2,6-dimethoxy-p-benzoquinone) produced during the fermentation of wheat germ with yeast, as well as other, hitherto precisely not identified biologically active substances that have antioxidant, immune stimulatory, roborant properties and affect/stimulate the formation of certain growth factors (e.g. IGF-1 and IGF-2) and cytokines (Szende et al. 1998).

Materials and Methods

Weaned castrated pigs of identical genotype, and of approximately 12-14 kg body weight were divided into 9 groups (n=6 in each group): Control (C) group received a toxin free diet. Diet of groups T1.5 and T3.0 was contaminated with 1.5 and 3.0 ppm T-2 toxin. To the toxin containing diet of groups TI1.5 and TI3.0 Immunovet-HBM was added in 1 g/kg concentration.

T-2 toxin was produced under laboratory conditions using the strain *Fusarium sporotrichioides* NRRL 3299 according to the method of Fodor et al. (2006).

Blood samples were taken before vaccination (day 0), and thereafter on days 7, 14 and 21.

Immune response was measured after vaccination (day 1 and 5) of the animals against Aujeszky's disease. Specific and non specific *in vitro* cellular immune response was measured by the lymphocyte stimulation test (LST) induced by inactivated suspension of the Aujeszky virus, and phytohaemagglutinine (PHA-P), concanavalin-A (ConA), pokeweed mitogen (PWM), respectively. Humoral immune response, e.g. specific antibody titre was measured by virus neutralisation test.

Results and Discussion

The most expressed humoral immune response was observed on day 21, although the difference between groups could be seen already on day 14 (Fig.1.). Antibody levels were significantly higher in group C than in the treated animals on day14 and 21. Immunoglobulin production in T1.5 and T3.0 was 46 and 27 %, respectively, compared to controls (taken as 100 %). This decrease was slightly compensated to 65 and 60 %, respectively, using the feed additive (TI1.5 and TI3.0 groups).

Changes in the cellular response due to treatments measured by LST could be observed also on days 14 and 21, on day 21 most expressed (Fig. 2., 3., 4. and 5.). The tendency was similar in case of specific (Aujeszky virus) and not specific (ConA, PHA, PWM) mitogens: 1.5 and 3.0 ppm T-2 toxin significantly decreased the rate of proliferation of the lymphocytes, the decrease was dose dependent and moderated by adding Immunovet to the diet. Cellular immune response of treated animals measured on day 21 compared to the response of the controls' is summarized in Table 1.

In pigs ConA and PHA induce primarily T-, while PWM stimulates (T cell dependently) rather B-lymphocytes. The homologue virus antigen provokes B cells directly (Gray et al. 1991). Taking our results into consideration it seems that T-2 exerts its effect both on the B and T cell mediated immune response.

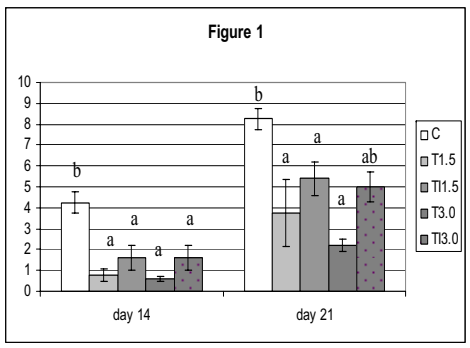

Figure 1. Results of virus neutralization test expressed in binary logarithmic value (^{a,b,c} significant difference between groups, $P<0.05$)

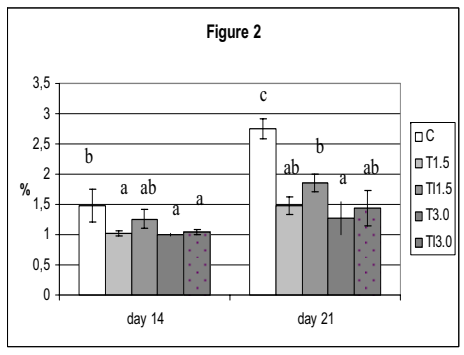

Figure 2. Cellular immune response induced by inactivated suspension of the Aujeszky virus measured by LST

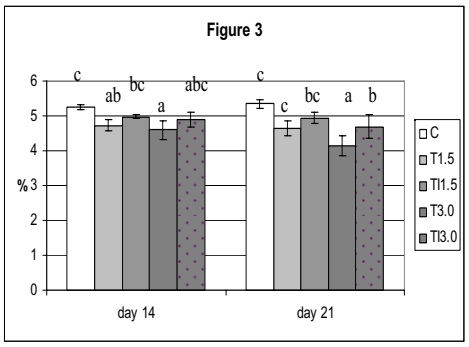

Figure 3. Cellular immune response induced by ConA measured by LST

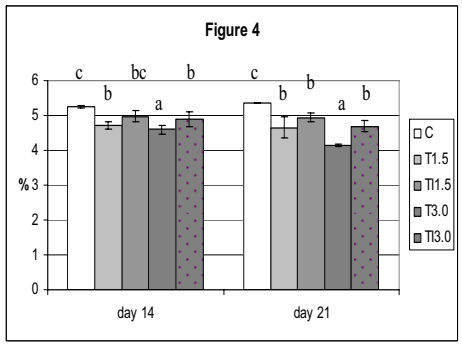

Figure 4. Cellular immune response induced by PHA measured by LST

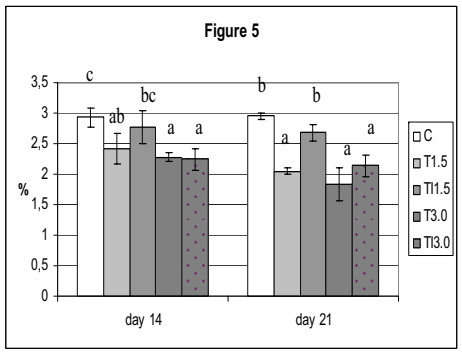

Figure 5. Cellular immune response induced by PWM measured by LST

Table 1. Cellular immune response measured on day 21 by LST compared to the response of control pigs' (results are expressed as percentage of control taken as 100 %)

Group	LST AUJ (%)	LST ConA (%)	LST PHA (%)	LST PWM (%)
T1.5	53	87	82	69
TI1.5	68	92	86	91
T3.0	46	77	61	62
TI3.0	52	87	78	72

Conclusion

It could be established, that all the measured parameters were significantly and dose dependently lower in pigs fed T-2 containing diet than in the controls. The wheat extract supplementation induced a better immune response compared to pigs exposed to T-2.

References

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