Oral β-1,3/1,6-glucans as immunmodulators in pigs

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The cell wall glucans of yeasts and fungi consist of a linear backbone of β-1,3-linked glucosylunits with β-1,6-linked side chains (1). Although a lot is already known about the mechanism of action of β-1,3/1,6-glucans on the innate immune system (2), there is still a lot to be learned about their effects on the adaptive immune system in mammals. We aimed to determine if oral supplementation could modulate a systemic immune response. The latter was examined in pigs using a model antigen. In three experiments using newly weaned pigs, Macrogard, a β-1,3/1,6-glucan from *Saccharomyces cerevisiae*, was administered in the feed during three different time periods (one, two and three weeks) and the adjuvant effect of this β-glucan was determined on a systemic immunisation with thyroglobulin. A first immunisation occurred during β-glucan supplementation, while the second one occurred after ceasing the administration. Macrogard exerted significantly higher thyroglobulin-specific primary immunoglobulin (Ig) M and secondary IgA antibody responses in serum. However, Macrogard suppressed the thyroglobulin-specific proliferation of peripheral blood mononuclear cells. A higher dose of Macrogard significantly increased thyroglobulin-specific IgM but not IgA responses, and the animals itself showed hyperaemia. Suppression of the T-lymphocyte proliferation might account for the absence of the switch from IgM to IgA. Weight gain and feed conversion were also determined, without significant differences between groups.
In conclusion, oral β-glucans are able to modulate the humoral as well as the cellular immunity against a systemically administered antigen.

1. Zekovic et al. 2005. Natural and modified (1-->3)-beta-D-glucans in health promotion and disease alleviation. Crit Rev Biotechnol 25, 205-230.
2. Kataoka et al. 2002. Activation of macrophages by linear (1 -> 3)-beta-D-glucans - Implications for the recognition of fungi by innate immunity. Journal of Biological Chemistry 277, 36825-36831