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On the influence of β-glucans from *Saccharomyces cerevisiae* on sow and litter performance during lactation

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Introduction

In search of alternatives for antimicrobial growth promoters various feed additives are used in farm animal feeding to improve animal health and performance. Among these are 1,3/1,6-β-D-glucans extracted from yeast cell walls. They are supposed to stimulate the immune system thus enhancing animal performance as it was shown in previous studies with various types of animals (Engstad and Raa 1999).

Material and Methods

To prove this, a trial was conducted feeding yeast cell wall extracts to 15 sows from a commercial herd between d112 of gestation and weaning (d21). The animals were divided into 3 groups of 5 sows each in the experiment and housed into individual farrowing crates. Diets consisted of a standard barley-soybean meal (13.0 MJ ME/kg, 17.5 % XP) and were supplemented with 0 g (control), 4 g (group 1) or 2.2 g (group 2) β-glucan per sow and day, respectively. From d112 of gestation until farrowing sows were fed restrictively with 1.5 kg of the lactation diet which was then increased daily by 700 g until *ad libitum* intake from d6 of lactation on. Creep feed was offered to suckling piglets starting on d10 after birth. Sows and piglets had free access to tap water.

Results and discussion

Significant treatment effects on litter performance were not observed (table 1). The number of piglets born alive varied insignificantly between 10.2 (control group) and 12.2 (group 2). However, these differences were not due to β-glucan-supplementation so that cross-fostering occurred within 24 h *post partum*, irrespective of treatment. Cross-fostering is an usual method to compensate for unequal litter weight resp. size at birth and was carried out by Fleischer et. al. (2001) and Auerbach and Ranft (2001) during their experiments as well (table 2). Nonetheless, there was a positive tendency towards higher litter weight at weaning for group 1 amounting to 11.9 kg compared to the control group (p = 5,6 %). Moreover, litter weight gain was 8.5 kg higher than in the control group ($p > 0.05$).

Table 1: Effects of β-glucans added to a lactation diet on litter performance

β-glucan content per kg feed Litters (n)	**Control** **-** 5		**Group 1** **4 g** 5		**Group 2** **2.2 g** 5	
	0	s	0	s	0	s
Number of						
Piglets born alive	**10.2**	± 1.3	**11.2**	± 2.3	**12.2**	± 3.4
Piglets born dead	**1.6**	± 0.9	**0.6**	± 1.3	**0.8**	± 1.1
Weaned piglets	**8.2**	± 0.8	**9.4**	± 1.1	**9.8**	± 1.6
in kg:						
Piglet weight gain	**4.3**	± 0.5	**4.7**	± 0.7	**4.0**	± 0.3
Litter weight at birth	**14.4**	± 2.2	**17.8**	± 1.8	**16.7**	± 5.5
Litter weight at weaning	**47.3**	± 10.1	**59.2**	± 6.3	**53.0**	± 9.9
Litter weight gain	**32.9**	± 10.0	**41.4**	± 7.3	**36.2**	± 9.8

$p > 0.05$

As it is shown in the review presented in table 2, Auerbach and Ranft (2001) recorded significantly higher litter weight at weaning in the β-glucan groups compared to an unsupplemented control group. This result was confirmed by the experiments of Fleischer et al. (2001). In our own experiments we received the same results at least in tendency.

As to the mechanisms lying beyond increased performance in β-glucan supplemented animals ADEREM and ULEVITCH (2000) showed that β-glucans attach to specific receptors on macrophages thus stimulating antibody-producing B-lymphocytes and other cells of the immune system. This thesis is supported by DECUYPERE et al. (1998). The authors observed a higher amount of antibodies in sows‘ milk which were fed β-glucans compared to an unsupplemented control group when both groups were vaccinated against *E. coli* 3 weeks *ante partum (a.p.)*.

Moreover it may be possible that feeding β-glucans to sows had an immune-stimulating effect which lead to an improved well-being of the animals. Followingly, feed intake may have increased thus leading to a higher milk yield in sows. This may be an explanation for increased piglet weight at weaning in β-glucan supplemented groups. However, as our trial was carried out under practical farming conditions it was impossible to determine sows‘ feed intake or milk yield.

Table 2: Influence of β-glucans on sow performance (review)

		Decuypere et al. (1998)	Auerbach and Ranft (2001)	Auerbach and Ranft (2001)	Fleischer et al. (2001)
Product		MacroGard®	Not specified	Not specified	Leucogard®
yeast		*S. cerevisiae*	*S. cerevisiae*	*S. cerevisiae*	*S. cerevisiae*
Dosage per sow and day (g)		2.5	8	8.75	7.5
administration		orally	orally	orally	orally
No. of animals (n)		34	274	79	20
Trial start (day of gestation)		108th	107th-109th	108th-110th	108th
Trial duration (d)		21	28	24	24
Further treatments		*E. coli* vacc 3 weeks a.p.	Cross-fostering	Cross-fostering	Cross-fostering
Performance: trial group vs. control group					
Number of					
Piglets born alive	K	10.1	10.3	11.4	11.1
	V	**±0**	**+0.1**	**±0**	**-0.3**
Piglets born dead	K	0.2	0.6	1.0	n.d.
	V	**+0.2**	**+0.05**	**+0.05**	**n.d**
Weaned piglets	K	n.d.	9.0	8.2	8.1
	V	**n.d**	**+0.6** p<0.02	**+0.7** p<0.05	**+1.1**
Litter weight at weaning (kg)	K	n.d.	54.5	37.8	25.8
	V	**n.d**	**+5.2** p<0.02	**+8.2** p<0.01	**+5.6** p<0.01
Piglet weight at weaning (kg)	K	4.5	6.0	4.7	4.8
	V	**-0.6** p<0,01	**+0.2**	**+0.5** p<0.05	**+0.4**

K: control group; V: trial group; n.d.: not determined

Summary

In a commercial herd fifteen sows were divided into three groups of five animals each from day 112 of gestation on. All animals received the same lactation feeding which was supplemented with 0 g (control), 4 g (group 1) or 2.2 g (group 2) β-glucan per sow and day until weaning (d21). There was a positive influence on litter weight at weaning and litter weight gain in the β-glucan supplemented groups. Further research is necessary concerning the use of 1,3/1,6-β-D-glucans to understand the

immunological mechanisms forming the basis of this amelioration e.g. in view of antibody contents in sows' milk.

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