Hydrolysed brewery yeast – the benefits

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At weaning, piglets have to adapt rapidly to major changes in their nutrition and environment. It is a stressful situation at a time when the immune status of a piglet is at its lowest.

Feed intake remains low for several days after weaning and the weaning transition is also accompanied by adverse changes in intestinal morphology.

Therefore, piglets are susceptible to post-weaning diarrhoea which is usually linked to E. coli infections. In addition to satisfying the nutritional requirements of a weaned piglet, the feed industry has the challenge to formulate diets that would prevent the growth of E. coli, stabilise gut microbiota, improve the function of immunity and enhance disease resistance in young piglets.

Antibiotic growth promoters (AGPs) have been used to overcome this problem. The European ban on the use of AGPs which came into force at the beginning of this year as well as increasing pressure to decrease or discontinue their use elsewhere has lead to the increase in demand for alternative methods.

Several new products have been investigated and proposed as alternatives to AGPs.

The addition of both live and inactivated yeast products have gained growing interest during the last few years. There are, however, major differences in the strains, composition and structure of the yeast products and, as a consequence, their effect on animal health and productivity.

Method of processing

The yeast cell wall consists of long polysaccharide chains and is considerably resistant to digestion.

Hydrolysis is needed to break down the cell wall structures and to activate some of the yeast functions. The methods and conditions of the processing affect the degree of hydrolysis and the efficiency of the end product.

Therefore, the capability of a yeast product to prevent the attachment of E. coli or the stimulation of immunity is closely related to the hydrolysis process.

The combination of yeast extract and cell wall appears to be more efficient than cell wall alone.

In a trial conducted at Justus-Liebig University, Giessen, the capability of several yeast products in binding enterotoxic E. coli strains with different fimbria types was studied.

Various yeast products were co-incubated with E. coli bacteria at 37°C and after one hour the suspension was centrifuged and the number of unbound bacteria in the supernatant was determined.

The E. coli count with hydrolysed brewery yeast (Progut) was in every case the lowest, showing that all the E. coli strains that were studied attached most significantly to it.

In most cases, the difference to other yeast products was also significant (<0.029).

It was suggested that the special characteristics of hydrolysed brewery yeast (Progut) were related to its patented production process.

The results from the study with F4-ETEC E. coli are presented as an example in Fig. 1. It should be noted that, compared with the control cultures, most of the yeasts reduced the germ counts with F4-ETEC and F4/F6 ETEC strains but not with any of the other strains.

	Progut for sow and piglets	Progut for piglets only	No Progut	Statistical analysis
Daily weight gain (g per day per piglet)	323 ± 45	327 ± 45	329 ± 44	NS
Feed conversion (kg feed per kg gain)	1.74 ± 0.17^{a}	1.64 ± 0.16^{ab}	1.93 ± 0.18^{b}	P<0.1

^{a,b}means with different subscripts within row differ significantly P< 0.02

Table 1. The effect of treatment groups on performance of group housed unchallenged piglets presented as means for the first five weeks after weaning.

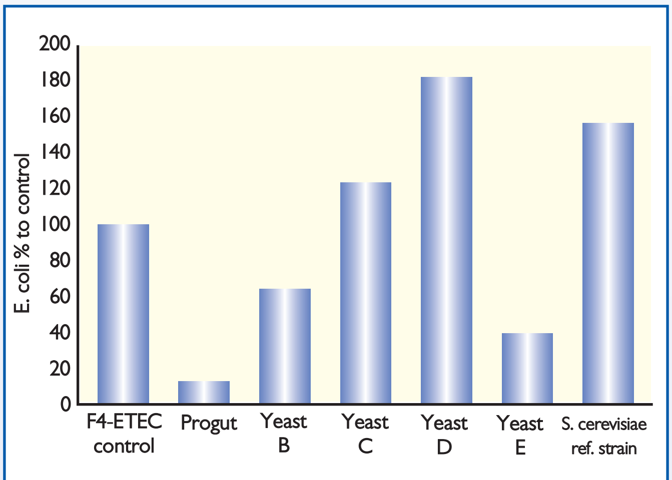

Fig. 1. Unattached bacteria content in the supernatant after one hour co-incubation of F4-ETEC E. coli and different yeast products (mean from triple replicates, as % of relevant control). Justus-Liebig University Giessen 2004.

Protects gut from E. coli

An in vitro trial using the Ussing chamber system at Hannover Veterinary High School indicated that the hydrolysed brewery yeast (Progut) was capable of protecting gut tissue from an E. coli infection, while a competitive yeast cell wall product had no effect at all.

A further in vivo trial with E. coli challenged piglets resulted in a similar kind of findings.

In addition to its effects on E. coli attachment, the hydrolysed brewery yeast product has also shown to support natural immunity in the gut, increase the relation of bifidobacteria to enterobacteria and stabilise

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Table 2. Performance results from 21-70 days. Private research centre in France 2005.

Treatment	Weight (kg)	Weight gain (g/d)	Feed intake (g)	FCR (kg/kg)
Negative control	26.11^{bc}	410.5^{bc}	670	1.65^{b}
Positive control	28.01^{a}	453.9^{a}	716	1.57^{a}
Progut 0.1/0.07%	25.72^{c}	400.1^{c}	658	1.63^{ab}
Progut 0.2/0.1%	27.90^{a}	447.6^{a}	697	1.56^{a}
Progut 0.3/0.1%	27.24^{ab}	432.5^{ab}	710	1.63^{ab}

$^{a\,b\,c}$values with different superscripts within columns differ statistically (p<0.05)

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gut microflora during critical production periods.

Subsequently, these functions have shown to have beneficial effects on piglet post-weaning performance in a large number of research institute trials.

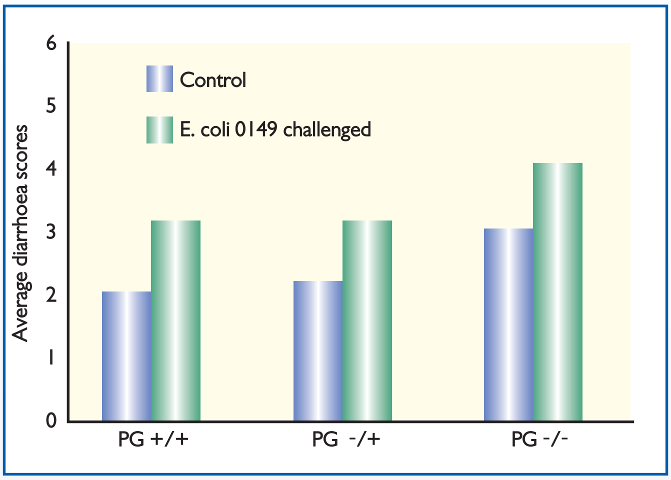
Two of these trials are presented in the following text.

In a Danish Institute trial, feeds containing hydrolysed brewery yeast (Progut) reduced the risk of diarrhoea and improved feed conversion of piglets.

The effect of hydrolysed brewery yeast product (PG) on post-weaning diarrhoea, weight gain and feed conversion with piglets was measured in a trial conducted at The Danish Institute of Agricultural Science (Foulum) 2004.

The study included 10 replications of three individually housed sows and their litters randomly assigned to one of three treatment groups:

Fig. 2. Average diarrhoea scores in a piglet feeding trial at DIAS (Foulum) 2004. Average diarrhoea scores of PG fed piglets differed significantly from the contro,l both with healthy and E. coli challenged piglets.



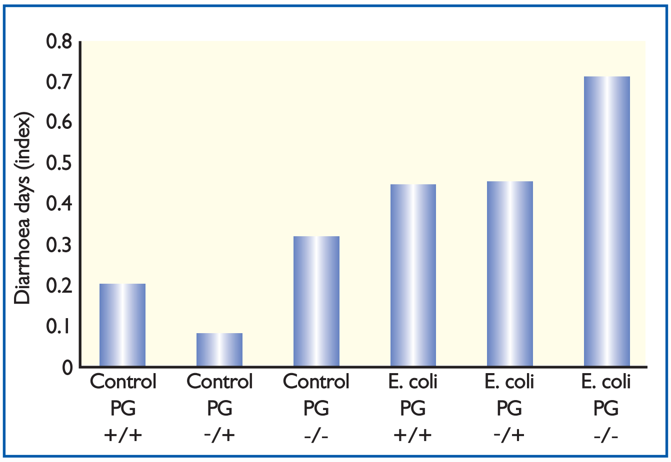


Fig. 3. Average diarrhoea days in a piglet feeding trial at DIAS (Foulum) 2004.

- PG for sows and piglets (PSP).
- PG for piglets only (PP).
- Control (C) without any feed enhancers.

The piglets were weaned at four weeks of age. In the PSP group, 0.15% of PG was added in the sow feed from one week before expected farrowing and during lactation.

In the PSP and PP groups, the piglets were offered a weaning feed containing 0.3% PG from two weeks of age until two weeks post weaning, and a starter feed containing 0.2% PG from two weeks post weaning until five weeks post weaning.

Treatment group C was subjected to the same feeding regime but without any feed enhancer. Two piglets from each litter were individually housed after weaning. One of these piglets was challenged on days 1, 2 and 3 after weaning with 10^8 cfu E. coli O149:F4ac,STb, LT, EAST1, while the other piglet was given a placebo treatment.

Three piglets per litter were group housed and performance and diarrhoea were monitored from weaning and until five weeks after weaning.

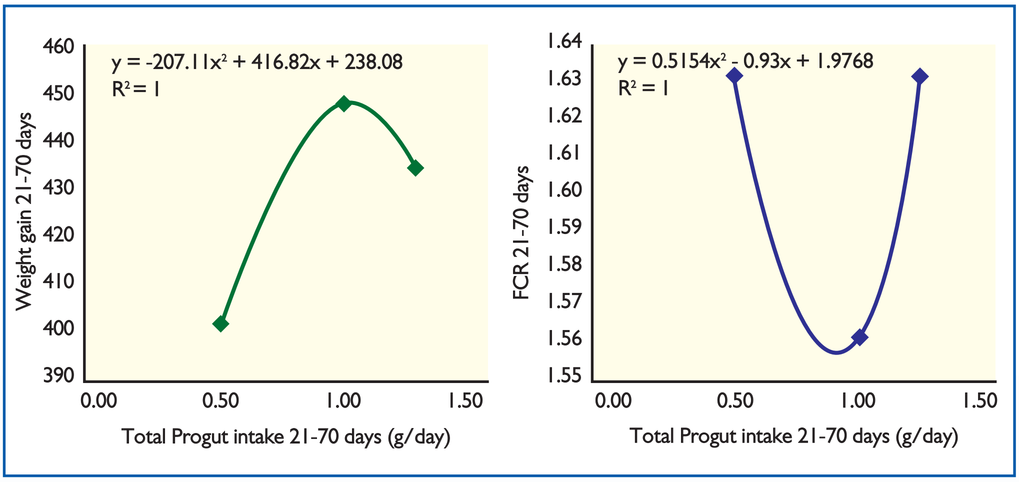


Fig. 4. Optimal dose of hydrolysed brewery yeast (Progut) per piglet and day.

The addition of the hydrolysed brewery yeast product (PG) in the feed significantly lowered diarrhoea scores ($F_{2.17}$=9.16; P<0.01) on days 2-6 after weaning compared to control piglets (Fig. 2). The effect was evident in both the control piglets and in E. coli challenged piglets. The piglets that had diarrhoea scores over three were regarded as having clinical diarrhoea. These piglets were given a daily index 1 and healthy piglets were given an index 0.

When calculating an average for diarrhoea days in different treatments a significant reduction of diarrhoea days can be seen in PG groups compared with control group (Fig. 3).

Piglets in the PSP group had one third the risk of PWD and piglets in the PP group had 25% of the risk of PWD from control piglets.

Feed conversion ratio differed between treatment groups ($F_{2.16}$=2.85, P=0.0874) being significantly lower in PSP group compared to controls (P<0.02 – Table 1).

The addition of hydrolysed brewery yeast in the feed did not influence daily weight gain in group housed healthy piglets not experiencing post-weaning diarrhoea.

At a private research centre in France the efficacy of hydrolysed brewery yeast (PG) was studied in comparison with negative and positive (Avilamycine 40ppm) controls.

In weaning diets from 21 to 42 days 0.3, 0.2 or 0.1% of PG was used followed by 0.1, 0.1 or 0.07% of PG in starter diets from 42 to 70 days, respectively.

At the beginning of the trial 240 piglets were divided into treatments according to sex and initial weight.

One treatment was replicated in six pens and in order to have an environmental challenge, pens and watering systems were neither cleaned nor disinfected after the previous group. During the whole trial period both the growth and feed conversion ratio in the group with 0.2%/0.1% of PG in the feed and positive control were significantly better than in the negative control (Table 2).

Improved performance

Piglets in the group with 0.3/0.1% PG also performed numerically better than the negative control, but the differences were not statistically significant. Based on the PG intake per day and performance results an optimal daily dose of hydrolysed brewery yeast was calculated to be 0.9-1.0g/piglet/day (Fig. 4).

This corresponds to 0.3% of the product from 21 to 42 days and 0.1% from 42 to 70 days of age.

Scientifically proven functions of hydrolysed brewery yeast product (Progut) to prevent E. coli attachment, support natural immunity and stabilise commensal microbiota in the gut have also been found to be beneficial with many other animal species. ■

References are available from the author on request.