Dietary wood lignans: a positive influence on gut health and wet litter

The genetic growth potential of broilers has increased enormously over the last 100 years. Whereas in 1925 broilers needed 120 days to reach their slaughter weight of 1.5kg, today this is possible in 28 days with our modern broiler breeds. This should be kept in mind to understand the sensitivity of broiler fattening. For such performance gains to be possible, all aspects of animal health must be carefully considered.

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Gut health is, of course, a particularly important factor. The amount of feed as well as the nutrient density has to adapt to the increased performance. This puts a considerable strain on the intestine, which has not changed in its physiology but has to develop much faster nowadays and do much more digestive work.

The small intestinal mucosa as the resorptive surface is still comparable in its dimensions with the original conditions of the old broiler breeds of 100 years ago. The mucosa reacts to the increased pressure to perform with latent inflammation. However, inflammatory processes are energy-consuming and restrict the animal's performance potential. This is the case even if no symptoms are evident yet.

Wet litter is already a clear sign of suboptimal conditions in the intestinal tract. One must assume gut inflammation, which is accompanied by limited absorption, secretion of body fluid into the intestine and increased water intake.

For the bird's organism, this means loss of energy and protein for the work of the immune system, decreased uptake of nutrients from the intestinal lumen, loss of fluid and protein via the intestine, and increased energy consumption for all metabolic processes associated with water intake and excretion.

The result is poor litter quality which leads to further health problems such as foot pad dermatitis. Therefore, it is quite reasonable to use faecal quality as a parameter of gut health.

Antibiotic performance enhancers have been used for decades to stabilise gut health. They slow down the metabolism of intestinal bacteria and thus achieve an energy-saving effect. This occurs because the bacteria of the intestinal flora in the small intestine require nutrients and are therefore in direct competition with the nutrient absorption of the animal.

In addition, antibiotic growth promoters (AGPs) also achieve anti-inflammatory effects and thus protect the stressed intestinal mucosa. As they contribute to the resistance to therapeutically necessary antibiotics, the use of AGPs has been banned in Europe, and there is a worldwide trend to reduce or replace AGPs.

It also appears that the efficacy of many traditional AGPs has slowly deteriorated over the decades. The use of natural substances as alternatives or to combine with AGPs are thus becoming more and more interesting for effective broiler production.

Table 1. Feeding trial, Bangkok Animal Research Centre, Thailand.

Trial design

	Negative control	Positive control	Wood lignans low dosage	Wood lignans high dosage
Zinc Bacitracin	-	20ppm	-	-
agromed ROI	-	-	200ppm	400ppm

Results

	Negative control	Positive control	Wood lignans low dosage	Wood lignans high dosage
Body weight at day 42 (kg)	2.531	2.559	2.590	2.608
Feed intake (kg)	4.172	4.182	4.221	4.219
FCR	1.678	1.664	1.659	1.646
Litter score*	2.25	2.13	2.06	2.00
Litter moisture (%)	22.78	22.38	21.54	21.19

(*) Score 1 = Good (no caking litter, light brown colour and quite dry), 2 = Fair (some caking litter, brown colour and quite wet), 3 = Poor (caking litter, dark brown colour and wet).

Wood lignans as a natural support for gut health

Lignans are natural polyphenols found in many plants. In the plant, they exert protective effects against infections. For the use of wood lignans in animals, anti-inflammatory and antioxidant effects have been scientifically described: they decrease gene expression of various pro-inflammatory cytokines and bind free radicals.

Continued on page 23

Continued from page 21

In broiler feeding, a product based on wood lignans (agromed ROI) shows positive effects on gut health and performance.

Trial in Thailand

In a feeding trial at the Bangkok Animal Research Centre, Thailand, the influence of zinc bacitracin and agromed ROI on litter quality and performance data was evaluated under heat stress (see Table 1). Heat stress causes the release of radicals in the intestinal mucosa and in various organ tissues which leads to an increase in inflammatory processes. Heat stress is a noteworthy problem for animal production in many countries and makes economic production difficult. In experiments, heat stress is often used as a provocation to underline effects on inflammation.

● **Animals, materials and methods:**
384 male Ross 308 broilers were allocated to four trial groups with 96 birds per treatment (eight pens per treatment; 12 birds per pen). Trial duration was a full fattening period of 42 days. The maximum house temperature was set at 32°C from day eight to 42 to induce heat stress. 12 birds/m^2 instead of the normal 10/m^2 were kept to induce additional mild stocking density stress. Diets were based on corn and soybean meal.

Trial in Brazil

Another experiment at the University of Sao Paulo (Brazil) confirms these results (Table 2).

● **Animals, materials and methods:**
416 male Cobb 500 broilers were divided into four groups of 104 birds each (eight replicates of 13 birds). Diets were based on corn and soybean meal.

As the industry looks for AGP alternatives or complements to AGPs, wood lignans are suitable candidates. The trials presented show that by relieving intestinal stress, performance data (daily gain and feed conversion) can be improved, in some cases highly significantly. This is shown both in comparison to the zero control and in comparison to AGPs. Positive effects can also be achieved in combination with AGPs.

We can assume that the genetic performance potential is still not at its maximum and will be further expanded in the future. For this, all factors influencing the health of the animals must be very carefully considered. ■

Table 2. Feeding trial at the University of Sao Paulo, Brazil.

Trial design

	Negative control	Positive control	Wood lignans low dosage	Wood lignans high dosage
Virginiamycin	-	16.5ppm	-	16.5ppm
agromed ROI	-	-	400ppm	400ppm

Results

	Negative control	Positive control	Wood lignans low dosage	Wood lignans high dosage
Body weight at day 42 (kg)	2,584^{a}	2,585^{a}	3,090^{b}	3,034^{c}
Feed intake (kg)	4,348^{A}	4,328^{B}	4,511^{C}	4,621^{D}
FCR	1.71^{a}	1.68^{b}	1.46^{c}	1.52^{d}
Litter moisture (%)	25.9	25.4	24.6	25.3

$^{a, b, c}$ values with different superscripts differ significantly ($p<0.001$),
$^{A, B, C}$ values with different superscripts differ significantly ($p<0.05$)