

Optimising the gut environment is essential for poultry performance

Ensuring that gut microflora are balanced and not threatened by disease-causing pathogens is essential for maintaining health and welfare in all animals. In high-performing production animals such as poultry, managing gut health is essential, as any disease or immune challenge diverts energy and other nutrients away from growth and egg laying.

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As it is difficult to isolate chickens from ubiquitous disease-causing organisms in farm situations, nutritional strategies are required to prevent colonisation of pathogens in the gut, which can lead to digestive disorders, gut wall damage and poor productive performance.

For more than two decades, the benefits of supplementing poultry diets with specific yeast cell wall-

derived oligosaccharides for moderating gut microflora have been researched.

Highly effective product

The most advanced product is the mannan-rich fraction Actigen from Alltech. This highly effective and purified product is the result of decades of research into its mode of action in the gut environment, interactions with the immune system and effect on nutrient uptake as well as poultry growth and laying performance.

This mannan-rich fraction and its predecessor, Bio-Mos (Alltech) has been shown to work on the gut environment and associated functions in a number of ways.

Firstly, Actigen acts as a decoy for the thread-like fimbriae present on pathogenic bacteria that are used to attach to the gut wall to allow growth and colonisation. Fig. 1 demonstrates the binding action of active components in Actigen.

Once bound to Actigen, the

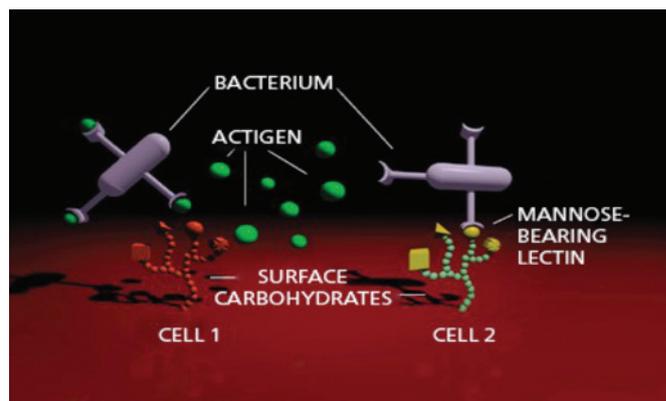


Fig. 1. The binding action of active components in Actigen.

second mode of action is that the complex is presented to M cells embedded within the gut, leading to a cascade reaction, which alerts the immune system to the potential presence of pathogenic organisms.

Trial in many animals have shown that this stimulates the immune system, making it ready to react to a threat from such pathogenic species should their numbers increase to a dangerous level in the gastric tract.

In mice immune experiments, Actigen was shown to significantly increase phagocytosis by monocytes from less than three phagocytosed cells per minute in the control group to seven cells per minute in the animals fed Actigen.

In turkey toms fed the active components of Actigen, levels of bile IgA increased by 27% and plasma IgG by 22%.

Novel nutrigenomics research has shown that supplementing feed with Actigen acts at a genetic level, increasing enzyme production and improving gut barrier defences, such

as mucous production. Feeding trials in poultry have shown that Actigen equals or increases performance when compared to antibiotic growth promoters (AGPs), making it an ideal alternative in countries where AGPs are being restricted or banned.

Improvement in broilers

From recent experiments (run since 2009 in European, North and South American and Asian sites), an average improvement of more than 4% in weight gain and 2% in feed conversion ratio (FCR) was seen in broilers (Table 1).

In a broiler trial conducted by Drs Greg Mathis and Steve Collett at the University of Georgia, USA, Actigen was compared against the AGP bacitracin. At 42 days of age, when chickens were slaughtered, the birds fed Actigen had significantly better weight gains and FCR

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Table 1. Average responses from global trials in broilers fed diets containing Actigen.

Trial site	Weight gain (%)	FCR (%)
Southern Poultry Research, USA	+5.0	-4.7
Scottish Agricultural College, UK	+5.4	-2.0
Leading broiler company, USA	+5.1	-0.1
University of Novi Sad, Serbia	+8.1	-3.5
Leading broiler company, Denmark	+1.3	NA
Broiler company, India	+10	0
Broiler company, Philippines	-1	+0.7
Broiler company, Brazil	0	-1.8
Feedmill, Holland	+1.3	-0.3
Centro Universitário Vila Velha, Brazil	+7.8	-4.6
Leading broiler company, USA	+2.6	-2.6
Feedmill, Poland	+4.3	-6.1
Average response	4.1	2.0

Table 2. Effect of feeding Actigen on duodenal gut wall structures.

Parameter	Control	Actigen
Mucus	3.20 ^a	1.66 ^a
Uniformity of villi	1.87 ^a	1.38 ^b
Height of villi	1.97 ^a	2.69 ^a
Integrity of villi	5.57 ^a	6.83 ^a

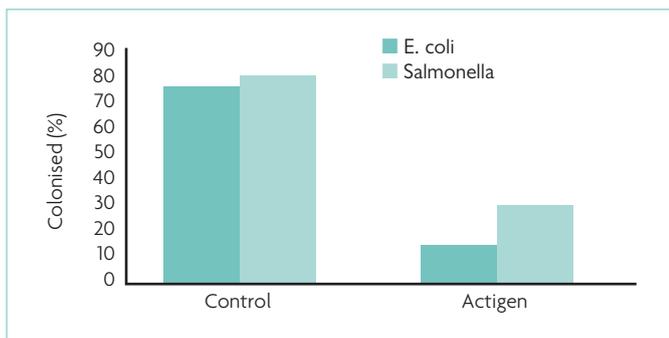


Fig. 2. Colonisation of seven-day-old broiler chicks with E. coli and with salmonella when fed an unsupplemented diet or one containing Actigen.

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versus the control (un-supplemented) diet and were numerically better than the AGP-fed group.

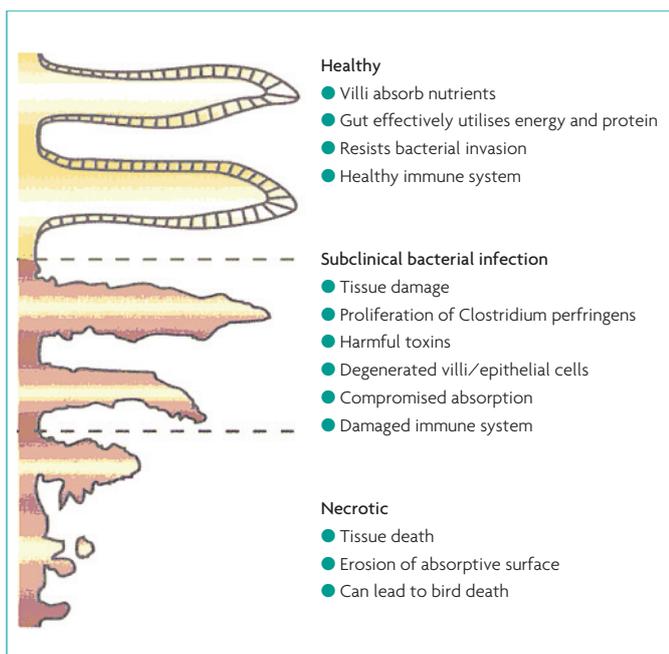
Litter score followed the same pattern, with both the Actigen and AGP groups' pens having drier, more friable litter.

This is in agreement with Danish

studies on footpad lesions, where poor gut health leads to higher levels of wet litter and microbial contamination in the shed, increasing lesion scores. The birds fed Actigen-supplemented diets had 30% less lesion damage.

When birds were dissected in the USA trial, Collett commented, "It is

Fig. 3. Impact of poor gut health and important absorptive structures.



my opinion that the caecal content is a good indicator of the long-term performance expectation. In other words, good caecal content (colour and consistency) indicates a balanced microflora, which will generate a good house flora and hence sustained performance. In contrast, poor caecal content will cause performance to deteriorate with time/repeated grow-outs in the same house."

These researchers therefore made a direct link between gut health and the performance improvements recorded.

Reduce colonising common pathogens

Direct measurements of microbial population in poultry fed the active components within Actigen have shown that it reduces the levels of colonising common pathogens in young birds. Similar effects were seen when Salmonella spp. were evaluated (Fig. 2).

In trials examining the impact of reducing pathogenic organisms in the guts of broilers, the supplementation of Actigen reduced caecal, liver and spleen *S. enteritidis* by over 90%.

Campylobacter is an important human pathogen, and its control in poultry production is therefore of great importance.

In other trials, feeding Actigen increased the levels of beneficial bacteria in the gut, such as Lactobacilli spp., whilst reducing overall bacterial levels.

Control of Clostridium perfringens

In an era where more countries are banning antibiotics, there is a great concern regarding control of Clostridium perfringens, which is directly related to the development of necrotic enteritis, which causes great damage to the gut wall in

poultry. Sims (1998) showed that the active components of Actigen significantly helped to reduce the levels of *C. perfringens* in poultry, with log levels of less than three compared to nearly log 4.5 in the control at six weeks of age.

In addition, trials have shown that the benefits of Actigen, taken in combination, have a protective effect on the gut microbial environment as well as the physical structures in the gut wall, which are responsible for secreting digestive enzymes and mucous as well as absorbing nutrients.

Fig. 3 shows how poor microbial environment and exposure to pathogenic microbes can lead to atrophy of the important gut wall absorptive surface.

Table 2 shows the impact of feeding Actigen on mucous production and villi absorptive structures from poultry.

When these structures were examined microscopically, the impact of Actigen on uniformity of the gut surface was evident (Fig. 4).

Summary

In summary, Actigen has multiple functions that help to build a more balanced, optimised gut environment for the digestion and absorption of nutrients. It influences the development of immunocompetence, building the bird's own immunity to fight potential threats.

This is manifested as improved productive performance as well as better bird health and reduced risk of pathogens being passed on to the rearing shed and the human food chain.

This is of special importance in regions where in-feed antibiotics have been banned and concern regarding major diseases, such as necrotic enteritis, is rising. ■

References are available from the author on request

Fig. 4. Impact of feeding Actigen (right) on gut villi development and organisation in poultry compared to the unsupplemented control (left).

