

# Aromabiotic: the ultimate hurdle against *Salmonella*

***Salmonella* is one of the most important foodborne pathogens, causing illness in many people every year. About 14,000 cases of salmonellosis are officially diagnosed per year in Belgium. The most common isolated serotypes are *S. enteritidis* (58%) and *S. ser. typhimurium* (24%). The first can best be associated with poultry consumption, the latter with pork consumption.**

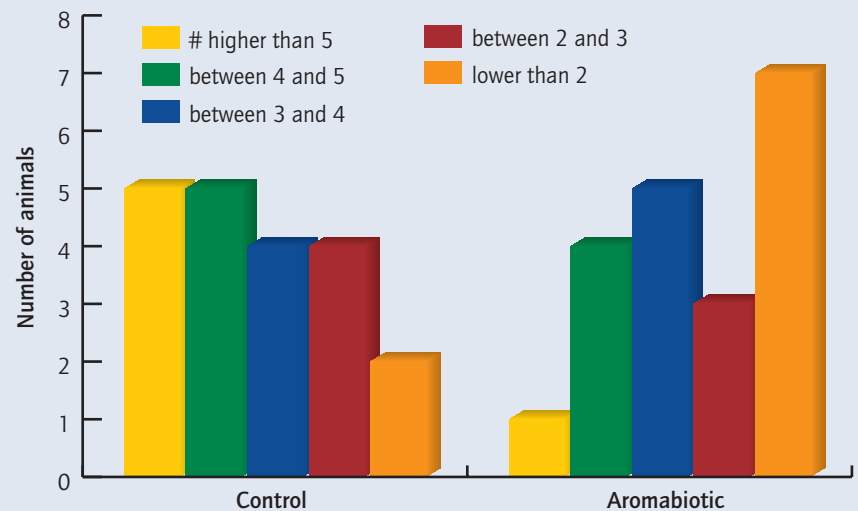
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For many years, various antimicrobials were used in feed to treat and prevent infections in poultry. However, a lot of bacteria (including *Salmonella*) become resistant to one, and in many cases to multiple antimicrobials. This resistance is proving fatal for thousands of people every year and results in high medical and economic costs. In addition, from the consumers' point of view meat should be free from both pathogens and antimicrobial residues.

Therefore, research on possible alternatives for traditional antimicrobials is necessary to control *Salmonella* infections at feed level. In this context, Vitamex has developed an alternative based on medium chain fatty acids (MCFA's). MCFA's are commercialised as Aromabiotic.

Medium chain triglycerides have been shown to be good alternatives for nutri-

**Figure 1. Number of chicks with log cfu of *Salmonella*/g spleen as mentioned in the legend 3 days post infection with *S. enteritidis* 76Sa88**



tional antibiotics in piglets, due to the high antibacterial activity of the medium chain fatty acids. Research with poultry has proven that MCFA's are a good alternative for antibiotic growth promoters.

To establish whether Aromabiotic has an effect on *Salmonella*, *in vivo* challenge studies were performed with pigs and poultry. For pigs, *Salmonella typhimurium* was used to infect the animals. From this trial, it was concluded that Aromabiotic was very effective for controlling *Salmonella* infection in pigs.

## ***Salmonella* control in poultry**

Short chain fatty acids (formic, acetic, propionic and butyric acid) are commonly used in the poultry industry to control *Salmonella*. Although faecal shedding of *Salmonella* can be decreased, short chain fatty acids have undesirable effects. The

acid resistance of *Salmonella typhimurium* was enhanced upon exposure to short chain fatty acids. On the other hand,

feed supplementation with acetic and formic acid results in an increased colonisation by *Salmonella enteritidis* of caeca and internal organs compared to birds receiving non-supplemented feed. This means that care should be taken when short chain fatty acids are used to control *Salmonella* in poultry. After short chain fatty acid exposure, it seems that *Salmonella* bacteria are driven to intracellular compartments of the intestine. In this case bacteriological examination of the cloacal swabs and litter samples could be negative while the animals are carrying the bacteria inside their organs. It is known that carrier animals can excrete the bacteria intermittently under certain stress conditions and can unexpectedly contaminate the other birds in the flock.

The antibacterial activity of MCFA's appears higher compared to short chain fatty acids against both Gram-positive and Gram-negative bacteria, as well as against *Salmonella*. However, it was not known

**Table 1. Zootechnical performances of broilers receiving feed with an antibiotic growth promoters vs. aromabiotic**

	Feed + antibiotic growth promoter	Feed + aromabiotic
N° of broilers	785,000	779,000
Body weight (g)	2058	2118
Age (days)	40.20	39.70
Daily weight gain (g/d/b)	51.10	53.40
FCR 1500 g	1.524	1.459
Mortality (%)	6.50	4.00

**Table 2. Results of aromabiotic field trial in the Netherlands**

Farm	Hygiene	History	Aromabiotic		
			cycle 1	cycle 2	cycle 3
1	++	<i>S. java</i> positive	80 % S-	100 % S-	100% S-
2	++	<i>S. java</i> positive	50 % S-	100 % S-	100% S-
3	++	<i>S. typhimurium</i> positive	100 % S-	100 % S-	
4	-	<i>S. java</i> positive	33 % S-	33 % S-	67% S-

whether MCFA's have any effect on the invasiveness of *Salmonella*. Therefore, in a *Salmonella* challenge test, Aromabiotic was used to evaluate its efficacy for reducing the abundance of *Salmonella enteritidis* in the intestinal tract and in some internal organs in young chickens. The trial was performed by Dr. ir. Filip Van Immerseel of the University of Ghent, Faculty of Veterinary Medicine.

Specific pathogen free chicks were randomly divided in two groups. From the day of hatch, one group received feed supplemented with Aromabiotic, while the other group received non-supplemented feed. The animals were infected orally with  $3 \cdot 10^9$  CFU of *Salmonella enteritidis* 76Sa88 at day 5. At day 6 cloacal swabs were taken for the detection of *Salmonella*. At day 8, samples of caecum, liver and spleen were taken for bacteriological analysis.

The use of Aromabiotic decreased the excretion of *Salmonella enteritidis* as measured in the cloacal swabs. Even more interesting was the lowered number of *Salmonella enteritidis* in the intestinal organs after supplementation with Aromabiotic (Figure 1). This means that Aromabiotic decreases the invasion. These invasion-decreasing properties are serotype independent.

### Fighting *S. java*

Based on these data, Aromabiotic was

used by the Dutch feed producer De HOOP, to solve the problem of *Salmonella java*. Today, about 50 % of *Salmonella* found in broilers in the Netherlands are of the *Salmonella java* type. This rate is most likely due to the fact that once a broiler house became contaminated, it is very difficult to get rid of this type. *Salmonella java* is not regarded as detrimental to poultry, while in public health both the incidence and the gravity of the symptoms are relatively low. However, the problem is the increasing rate of resistance to antibacterial drugs, more and more isolates appear to be multi-resistant, specifically against drugs used to treat human salmonellosis.

In the autumn of 2003, 4 farms suffering from *Salmonella (java and typhimurium)* during several cycles included Aromabiotic in the broiler feed. The growth promoter avilamycine was replaced by aromabiotic. Three of the four farmers did maximal efforts to clean and disinfect to have as many "hurdles" as possible against *Salmonella*. One farmer made, apart from Aromabiotic, no extra efforts because of his financial situation.

*Salmonella* was determined using the overshoe method and by bacterial counts of caecum content. Besides this, technical data were collected and compared with the technical performances of 2 previous cycles on the same farm, with a growth promoter added to the feed.

The technical performances are summarised in Table 1. It was clearly demonstrated that Aromabiotic has a positive effect on daily weight gain and feed conversion ratio and resulted in lower mortality.

The use of Aromabiotic during 2 cycles resulted in a complete eradication of *Salmonella* in 3 farms (Table 2). In the latter farm, using Aromabiotic as the only "hurdle", 33 % and 66 % of the houses was *Salmonella java* free after the addition of Aromabiotic during 2 and 3 cycles, respectively. Nutritionist ir. André De Ruijter of DE HOOP summarises: "during the first cycle, Aromabiotic lowered the infection pressure. This continued during the second and third cycle, resulting in *Salmonella*-free flocks. One farm was already *Salmonella*-negative after the first cycle."

Meanwhile, Aromabiotic is successfully used on a lot of other farms, with excellent results to eradicate *Salmonella*.

It is clear that the success of *Salmonella* control programmes does not solely depend on the use of a single measure. The more 'hurdles' incorporated to reduce the spread of *Salmonella*, the more success may be expected. Adding Aromabiotic offers poultry farmers an opportunity to build an extra hurdle against *Salmonella*. ■

References available on request.