

Essential oils may reduce the use of antibiotics

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A survey conducted by the Agricultural Ministry of Lower Saxony showed that 83% of the examined broiler farms and 92% of the turkey breeding and finishing farms apply antibiotics for treatment of various diseases.

Until 2005 antibiotics were used as growth promoting agents, because they had a positive impact on flock health.

Antibiotics combat pathogens in the gut and, by improving overall health in this way, improve performance.

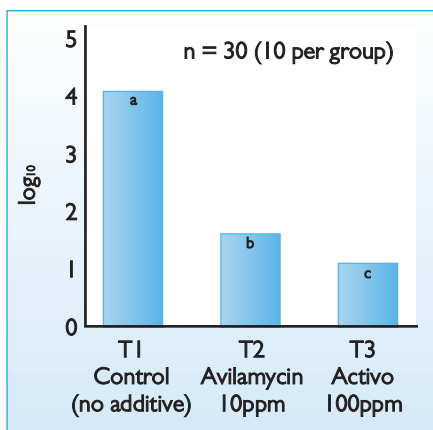
However, on the other side of the coin:

- Prophylactic application of antibiotics covers up problems on the farm, for example bad management or lack of hygiene.
- Antibiotics also affect the positive gut microflora.
- Prophylactic use may also induce bacterial resistance.
- The use of antibiotics in animal nutrition is not well accepted by the consumer other than for treatment.

In 2006 sub therapeutic use of antibiotics was prohibited in the European Community and a void appeared where previously such ingredients had been used.

Beside organic acids, immunoglobulins, probiotics and prebiotics, essential oils have

Fig. 1. Colony count 72 hours after the inoculation with 10^5 CFU of *Salmonella enteritidis* (LabMor/UFPR).



been used to fill the void (herbs and spices and their extracts/essential oils).

Herbs and spices have a long tradition as part of the human diet and as therapeutic agents. That is why they are well accepted by the consumer and generally considered to be a safe alternative to antibiotics.

They do not induce bacterial resistance, nor do they create residues in meat, milk and eggs.

Essential oils

Essential oils are vegetal products, which do not show any nutrient, mineral or vitamin character, but influence the performance of animals in a positive manner. They are derived from the group of spices and herbs.

Their effects are attributed to the secondary plant ingredients, which are not relevant for the primary metabolism of the plant, but are of vital importance for the defence against viruses, bacteria, fungi and insects and, in some cases, act as attractants for reproduction.

The different active ingredients interact and only this special combination defines the intensity of the effectiveness.

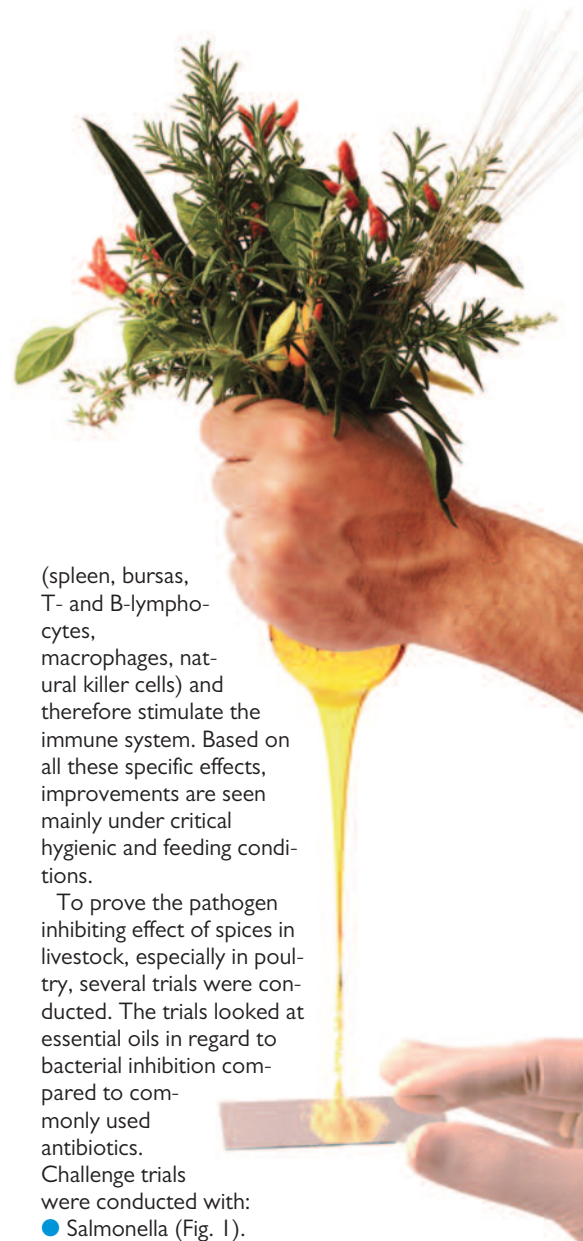
Trials with essential oils point to the fact that the effect is not only caused by the key substance but significantly by the quantitatively less important ingredients.

That means that an isolated or even synthesised single substance can never be as effective as the combination of all components of the plant.

That is why in newer products the extracts of the whole plant are often used. If different plants/plant extracts are combined, as commonly practised in animal nutrition, interactions between the key and minor substances also occur. Therefore, direct comparison of feeds containing combinations of different essential oils is difficult.

Essential oils combine the effects of antibiotics (antimicrobial activities of certain plant ingredients like thymol and carvacrol) with the effects of prebiotics (well balanced gut flora and its stabilisation).

According to this, application of plant extracts can reduce the incidence of diarrhoea. The polysaccharides contained play a major role in the growth of immune organs



(spleen, bursas, T- and B-lymphocytes, macrophages, natural killer cells) and therefore stimulate the immune system. Based on all these specific effects, improvements are seen mainly under critical hygienic and feeding conditions.

To prove the pathogen inhibiting effect of spices in livestock, especially in poultry, several trials were conducted. The trials looked at essential oils in regard to bacterial inhibition compared to commonly used antibiotics.

Challenge trials were conducted with:

- *Salmonella* (Fig. 1).
- *Eimeria* (Figs. 2 and 3).

Challenge trials

Broilers were confronted with *Salmonella enteritidis* (10^5 CFU directly into the oesophagus). In Fig. 1 it can be seen that Activo showed similar bacteria reducing effects as avilamycin after 72 hours.

Essential oils also have an ameliorating effect in case of infection with eimeridae (eimeria and cryptosporidia).

To prove this statement 36 one-day-old broiler chickens were divided into three treatment groups of 12 birds each:

- T1 (control, without feed additive).
- T2 (Avilamycin 10ppm).
- T3 (Essential oils, Activo 100ppm).

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At 15 days old, the birds were inoculated orally with 1.8ml of inoculums with sporulated oocysts of *Eimeria acervulina* (200×10^3), *E. maxima* (50×10^3) and *E. tenella* (10×10^3).

At 31 and 38 days old, 15 birds (five per treatment) were euthanised and necropsied for evaluation of coccidiosis lesions. The coccidiosis lesions were measured using a score system (Level 0 – no lesion; Level 1 – slight lesion; Level 2 – moderate lesion; Level 3 – severe lesion; Level 4 – very severe lesion).

The values of scores were submitted to ANOVA and to the Fischer test with significant p (standard deviation) values smaller

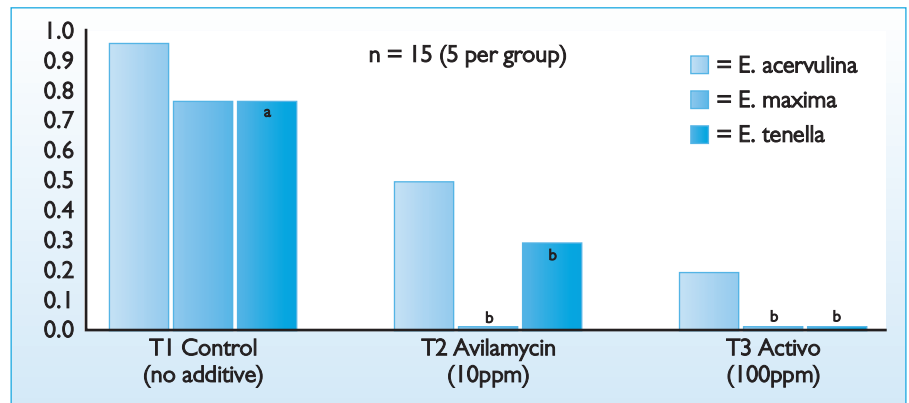


Fig. 2. Score of *Eimeria* spp lesions (specific enteritis) in GIT 23 days after inoculation (necropsy on day 38) (LabMOr/UFPR).

than 0.05. Additionally, caecal samples were collected from the birds necropsied at 31 days old for counting *Clostridium* sp. colonies.

Results from the count were transformed into Log 10, for statistical analysis, which was then submitted to the Tukey's test at 5% of probability.

Conclusion

The results show that essential oils have a very similar effect compared to antibiotic growth promoters with regard to the reduction of bacterial growth. Essential oils reduce salmonella, eimeria but also clostridia.

Against this background, essential oils could be used preventively to boost the beneficial intestinal bacteria by reducing the harmful ones.

Essential oils are not associated with any of the negative side effects that come with the use of antibiotic growth promoters like residues and bacterial resistance.

In times of growing problems with the use of antibiotics, they represent a viable, effective alternative! ■

References are available from the author on request

Fig. 3. Counting of *Clostridium perfringens* colonies 16 days after inoculation with *Eimeria* spp (LabMOr/UFPR).

