A new way to boost the vaccination strategy in your flock

Because of their antibacterial effects, alpha-monoglycerides of medium chain fatty acids (MCFAs) are added worldwide to broiler and piglet diets to promote health and to reduce the use of medication. However, nowadays they are increasingly being recognised as strong antiviral agents.

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Alpha-monolaurin, in particular, is known to have antiviral properties, which is probably not only due to the disturbing effect on the viral envelope. New research reveals its boosting effect on different vaccination programs via an improved immune response.

Most viruses can easily spread through animal production systems, like modern broiler farms. Once invaded, huge economic losses can occur.

Viral diseases like Newcastle disease (ND) and avian infectious bronchitis (IB) are both known to be harmful and highly contagious.

ND is caused by an avian Paramyxovirus (PMV). Paramyxoviridae is a group of viruses with a single-stranded RNA genome and a fat envelope. ND can lead to acute mortality and problems with the digestive and respiratory tract. Dissemination of the virus within a flock takes place via horizontal transmission by inhalation or uptake of contaminated faeces.

IB is an acute respiratory disease with signs like serious coughing, sneezing and nasal discharge. It is caused by avian infectious bronchitis virus (IBV), which belongs to the group of coronaviruses. Like PMV, this virus is a fat enveloped virus.

Antiviral effects of alpha-monolaurin

Alpha-monoglycerides of MCFAs are known for their antibacterial effects against Gram-positive bacteria and antiviral effects against fat enveloped viruses. This is especially true for alpha-monolaurin, which is lauric acid bound to the first position of a glycerol molecule.

The effect of alpha-monoglycerides, like alpha-monolaurin, is much stronger compared to the corresponding free fatty acids (lauric acid). Alpha-monolaurin is found to affect the viral envelope, causing leakage and, at higher concentrations, a complete disintegration of the envelope and the viral particles (Fig. 1).

FRA C12 Liquid from Framelco, which contains mainly alpha-monolaurin, has shown positive effects on broiler performance and health. Recent research at the University of Agriculture in Faisalabad, Pakistan, revealed that, in contrast to the negative control, adding FRA C12 Liquid to the drinking water improved weight gain and FCR of broilers to at least the level of the positive control (120mg Lincomycin/kg), measured at 35 days. Moreover, a remarkable effect on the immune response was observed.

Vaccination strategy

By vaccination, the immune system is activated to develop adaptive immunity to the specific virus. Birds could thereby be protected against, for example ND or IB. The immunological reaction of birds towards vaccination can be measured by means of laboratory tests.

The efficacy of the vaccination against ND can be checked by the so-called haemagglutination inhibition (HI) reaction test. The efficacy of the IB vaccination is tested with the enzyme-linked immuno-sorbent assay (ELISA).

In the above mentioned Pakistani trial, the effect of FRA C12 Liquid on the immune response to ND and IB vaccination was also examined. The broilers were divided over four treatment groups. Broilers in treatment group A received a commercial diet with Lincomycin (120g per ton of feed), which served as the positive control. For the other groups (B, C and D) an antibiotic free starter and grower/finisher diet was used.

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Fig. 1. Example of the destruction of a fat enveloped virus induced by a fatty acid. The alpha-monoglycerides tested were antiviral in concentrations 5-10 times lower than those of the corresponding fatty acids. a: control with normal intact particles; b: low concentration, viral envelope no longer intact, c: high concentration, virus particles in various stages of disintegration (Thormar et al, 1987).

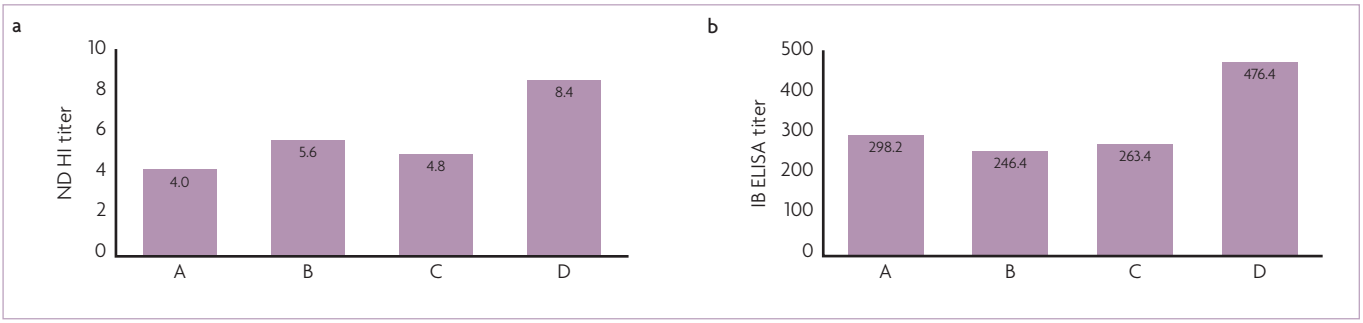

Fig. 2. Haemagglutination inhibition titer against Newcastle disease (a) and ELISA titer level against infectious bronchitis (b) of broilers of group A (positive control), B (negative control), C (FRA C12 Liquid 1kg/1000L) and D (FRA C12 Liquid 2kg/1000L).

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Group B served as the negative control group as the broilers were fed a diet without antibiotics and additives. Group C and D received FRA C12 Liquid via the drinking water, at a dose level of 1 and 2kg/1000L respectively. All broilers were vaccinated against ND and IB according to the schedule in Table 1.

Fig. 2 shows that the HI titer in all groups was higher than three, indicating that the animals created protection against ND. Birds also responded well to the IB vaccinations, since IB antibodies were found.

Interestingly, the highest HI titer against ND was found in group D, which is the group with the highest dose level of FRA C12 Liquid. Fig. 2b shows a similar kind of graph as in Fig. 2a with again no differences in antibody titer values between group A, B and C, but with an obviously higher antibody titer in group D.

These results indicate a stronger immune reaction to vaccination in broilers receiving 2kg FRA C12 Liquid per 1000L drinking water. This might implicate an improved efficacy of the vaccination programme and a better protection against the virus. Moreover, this also indicates that in this trial there was no negative effect of FRA C12 Liquid on vaccination when given simultaneously via the drinking water.

Table 1. Vaccination schedule.

Day	Vaccine against	Administration
5	Newcastle disease	Intraocular
15	Infectious bronchitis	Intraocular
22	Infectious bronchitis	Drinking water
28	Newcastle disease	Drinking water

Conclusions

For several years, alpha-monolaurin has been known for its antiviral properties. FRA C12 Liquid is therefore often used on modern poultry farms to overcome problems with fat enveloped viruses.

In addition, from the current experiment it can be concluded that the HI titer against Newcastle disease and antibody titer against infectious bronchitis were increased in broilers receiving FRA C12 Liquid at a dose level of 2kg/1000L drinking water. This suggests an improved immune response following vaccination. More research will be conducted to confirm these results. ■

References are available from the author on request

Paramyxoviridae (causing Newcastle disease) are fat enveloped viruses which contain an envelope protein called haemagglutinin. Haemagglutinin can bind to red blood cells of the host which cause the cells to agglutinate. This is called haemagglutination.

The principle of the HI assay is that antibodies bind to the virus which prevent attachment of the virus to the host red blood cells. Therefore, haemagglutination is inhibited when antibodies are present. The highest dilution of serum that prevents haemagglutination is called the HI titer of the serum.