

Control of *Mycoplasma gallisepticum* in the USA

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Avian mycoplasma infections continue to cause economic losses in the chicken and turkey sectors. Two mycoplasma species are of predominant importance in poultry. *Mycoplasma gallisepticum* (MG) causes respiratory disease and, in mature hens, egg production problems.

In turkeys, MG infections will cause sinusitis and, in severe cases, high mortality and airsacculitis. The other species is *Mycoplasma synoviae* (MS), which may cause respiratory and joint disease in chickens. MG is more virulent than MS and it causes the highest economic losses.

A simple fragile organism

In this article we will deal mainly with MG and the control of MG in the USA. MG is a simple fragile organism. MG will survive in hot dry climates for only a few hours outside the bird.

MG transmission occurs in two ways – horizontal by direct contact with MG carriers, airborne (short distance) and mechanically (contaminated equipment, people) and, secondly, vertically by egg transmission.

MG infection may cause chronic respiratory disease (CRD) in young chickens and particularly in meat type birds or broilers.

The severity of CRD (airsacculitis) is affected by the pathogenicity of the MG, and the presence of other respiratory viral pathogens like infectious bronchitis virus (IBV) and bacteria like *E. coli*.

Healthy carriers

Another important fact of MG infection is that the recovered birds will remain 'healthy' carriers for the rest of their life spreading the mycoplasma horizontally and in the breeding stock vertically. In breeders and layers a negative impact on egg production is observed. In addition, egg transmission occurs in breeding stock.

Depending on the age of infection and the pathogenicity of the MG field strain in laying birds, an egg drop of 10-25 eggs per hen housed may be observed including a negative effect on the feed

conversion and a possible increase in mortality. The rate of egg transmission in breeding stock is low (1% or less) but the egg transmission of an infected bird may occur any time during the production period.

In broilers the disease will, in general, cause an increase in mortality, higher condemnation at processing and an overall poor performance.

Eradication is the only way to prevent vertical (egg transmission) from breeding stock and it can only be achieved by proper testing of the flocks and strict biosecurity.

In the USA through the National Poultry Improvement Plan (NPIP) initially involved in the eradication of *Salmonella pullorum*, all major breeder flocks are now MG clean. Basically broiler chickens/layer chickens are hatched from MG free breeding stock.

To control the disease symptoms two different tools can be used – medication with various antibiotics and vaccination using live and inactivated vaccines.

Limitations of antibiotics

Antibiotics (like tylosin) have been used over many years and have proved to be helpful in controlling the respiratory disease and egg production problems due to MG infections.

It is important to understand, however, that any antibiotic treatment will not eliminate MG from a flock and the birds are capable of transmitting the MG horizontally as well as vertically. Another concern is that antibiotic resistant MG organisms may develop in due course. Breeders in the USA are not permitted to be vaccinated to control MG.

However, there have been a few cases where mild live MG vaccines were allowed to be used in large broiler breeder complexes which 'broke' with MG.

The vaccines were, however, used under controlled conditions for a restricted time. In the US approximately 220 million commercial layers are produced. Most of the commercial layer operations are large multi-age farms of which more than 80% are MG positive.

Commonly, pullets are moved to the large multi-age layer complexes at an

average age of 12-14 weeks from the pullet rearing farms which, in most cases, are MG free. The layer complexes may house several hundred thousand to several million layers. Older infected flocks at these complexes may serve as a reservoir of mycoplasma.

Depopulation not practical

From an economical viewpoint it is not feasible to break the cycle of infection just by depopulating these large infected complexes with many different ages. In the mid 1980s, before vaccination was well established, total losses in the layer industry were estimated approximately U\$150 million per year due to the negative impact on egg production.

In the US live MG vaccines have become the preferred method in controlling MG in commercial layer operations.

MG vaccinations are mainly carried out before the pullets are moved to the actual layer farms.

Of the approximately 220 million layers in the USA, 55% are vaccinated with one of the live MG vaccines. The most common vaccine used is the MG 6/85 vaccine produced by Intervet followed by the F strain vaccine produced by Schering US or as 'home made brew' by some of the commercial egg producers and the Ts11 vaccine produced by Merial in the USA.

A naturally low pathogenic strain

The MG F strain (natural low pathogenic) was the first live vaccine introduced in the late 1970s. This vaccine can be administered by spray or drinking water, however, the most common method is the spray vaccination.

Disadvantages of the F strain vaccine are that vaccinated birds will remain carriers and shedding the F strain for the rest of their lives. MG F strain vaccinated flocks will show more severe reactions after the use of live respiratory type of vaccines like infectious laryngotracheitis (ILT) or infectious bronchitis (IB).

Circumstantial evidence has indicated that flocks vaccinated with the F strain vaccine may produce smaller eggs.

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In susceptible birds in production the F strain will cause egg production drops and the F strain is very pathogenic for turkeys.

Limited use of bacterins

In the early 1980s MG bacterins were introduced, these vaccines will not displace the MG field strains at a farm as observed with live vaccines.

Nowadays, these bacterins are not used to any extent due to the costs of the vaccine, individual application, local vaccination reactions and the availability of

the mild, live, very efficacious and cheaper MG vaccines. The introduction in the early 1990s of the mild safer live vaccines MG 6/85 (modified strain) and MG Ts11 (temperature sensitive mutant) have displaced in many areas the more pathogenic MG F strain vaccine.

Both the MG 6/85 and Ts11 vaccines are very safe even for birds in production. The main differences between those two vaccines are that the 6/85 does not spread and will persist only for short time in the vaccinated birds.

In contrast, the Ts11 may spread in close contact. MG 6/85 and the commercially available F strain vaccine are freeze dried; Ts11 is a frozen vaccine.

The 6/85 vaccine has to be applied by fine spray and the Ts11 has to be applied by eyedrop.

One of the interesting facts of the MG 6/85 vaccine is that it will not induce any humoral antibody response. Serum plate agglutination (SP), haemagglutination inhibition (HI) and ELISA tests are negative.

Fluctuating antibody response

The Ts11 vaccine will induce in a percentage of the vaccinated birds, an antibody response which fluctuates over time and from flock to flock. The F strain vaccine will induce in all birds a rapid antibody response.

The advantage of the negative antibody response after the use of MG 6/85 vaccine is that the flock can be monitored for a field infection. Vaccinations are carried out before birds are sexually mature between 12-14 weeks. If birds are vaccinated properly in general only one vaccination is required.

Vaccines must be applied before a flock becomes infected with a field MG strain, therefore, it is recommended to test a flock in the SP or ELISA for MG antibodies prior to vaccination.

Continuous use of live MG vaccines has shown to displace the field MG strain over time at several multi-age farms.

All vaccines do not completely protect against drops in egg production after a virulent MG field infection, however, vaccinated flocks produce on average 8-10 more eggs per hen housed than the non-vaccinated infected MG infected flocks.

Flocks vaccinated under field conditions housed at multi-age farms with 6/85 vaccine showed a high level of protection. Only a slight drop in egg production that returned to normal in 2-3 weeks was observed. The non-vaccinated flocks showed an egg production drop of approximately 15% and it was prolonged (approximately 20 weeks).

State control

The use of all MG vaccines is restricted and approval to use them is required by the state veterinarian on a state by state basis. The F MG strain vaccine is not permitted to be used in states with large turkey operations.

In summary, controlling MG through the use of live vaccines in commercial layer operations has been used successfully for over 10 years, effectively minimising MG induced egg production losses and displacing field MG strains from multi-age farms. ■