

Control of *Mycoplasma gallisepticum* in layers

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While the US commercial broiler breeder population generally remains free of *Mycoplasma gallisepticum* (MG) through monitoring and eradication programmes, the commercial egg layer industry continues to experience MG induced economic losses.

Both the major US primary broiler breeder and layer breeder populations are MG clean. However, while commercial pullets may start out MG clean, the multi-age caged layer facilities can not practically eradicate MG like their all-in, all-out broiler breeder counterparts.

Instead, the commercial layer sector depends upon MG vaccination to protect against egg production losses in multi-age facilities.

The US commercial layer sector prefers to use the live vaccines over killed MG bacterins. High labour cost and local reactions at the injection site make the bacterins less acceptable to the US industry compared to the cheaper, mass applied live vaccines.

The original live vaccine was the MG F-strain, a naturally low pathogenic strain best applied by fine spray or individual intraocular drop. The introduction of this strain in a commercial vaccine (F-Vax-MG, Schering-Plough Animal Health) allowed US commercial layer producers to significantly improve egg production peaks compared to unvaccinated flocks.

The flocks vaccinated with F-strain remain carriers of the F-strain MG for the life of the flock. Research has demonstrated that the F-strain produces persistent protection and dramatically reduces the vertical transmission of MG. Studies have also determined that consistent use of F-strain vaccine will displace more virulent endemic MG populations.

The F-strain vaccine was widely embraced by the commercial layer sector after its introduction in the 1980s.

The introduction of temperature sensitive and modified live *Mycoplasma gallisepticum* vaccines to the USA in the early 1990s offered an alternative to the low pathogenic F-strain. MG Ts11 (a temperature sensitive mutant marketed by Merial) and MG 6/85 (a modified MG strain marketed by Intervet Inc) offered advantages in reduced vaccination reaction.

	F strain	6/85	Ts-11
Presentation	Freeze dried	Freeze dried	Frozen
Route	Eye drop, spray or drinking water	Spray	Eye drop
Virulence	Moderate	No	No
Persistency	Excellent	???	Good
Serological response	Moderate	No	Poor
Transmission	Moderate	Poor	Poor
Displacement	Excellent	???	Good

Table 1. Comparison between live MG vaccines. Source: Kleven SH. XVII Congresso LA de Avicultura (2001).

A majority of the 220 million commercial layers in the US are vaccinated with one of the three live MG vaccines.

Both the temperature sensitive and modified MG vaccines have performed well in flocks that had previously been vaccinated for multiple cycles with a live F-strain product.

However, neither of the milder vaccines can effectively block infection and multiplication of the virulent strains of MG.

Over time, producers have begun to experience a re-emergence of more pathogenic strains of MG in flocks vaccinated with the temperature sensitive and modified MG vaccines, particularly in breeds considered more susceptible to MG infection.

Three case studies illustrate the experience of US egg producers that have been challenged by an emergent virulent MG strain despite vaccination with either the Ts11 temperature sensitive MG or the MG 6/85 modified MG vaccine.

Case One

US producer A experienced peak production losses of 8-10% in 750,000 laying hens housed in a six house complex that had been vaccinated with Ts11 vaccine.

Despite an expected MG seroconversion rate of 30% with the Ts11 vaccine, the affected flocks demonstrated 100% seroconversion at 40 weeks of age.

Treatment with tylosin improved production, but the lost performance was economically disastrous.

This producer switched from Ts11 to vaccination with the live F-strain vaccine for the period of one year on all six houses. The goal was to seed the houses

with F-strain, displacing the more virulent wild MG population. The F-strain vaccine sustained the flock performance through peak production without requiring the use of tylosin treatment.

After one year of F-strain use, the producer returned to live Ts11 vaccination and the peak performance of the initial flocks appears to be holding.

Case Two

US producer B maintains six million commercial layers, three million of which are housed in six multi-house complexes. Three of the multi-house complexes were MG negative, and the other three were vaccinated with either Ts11 or MG 6/85 vaccine at 11 weeks of age.

This producer preferred the temperature sensitive and modified vaccine strains due to the proximity of turkey production in their location.

The state regulations dictated that this producer could use Ts11 and MG 6/85 strain vaccine within half a mile of turkey or breeder chicken farms, while F-strain was restricted to a distance of one mile with an added restriction of no movement of birds for four weeks post F-strain vaccination.

Over time, some of Producer B's MG negative complexes became MG positive, and several of the vaccinated complexes demonstrated significant production drops and required treatment with tylosin. Eventually, of the six multi-house complexes, only one remained MG negative. R-strain MG field challenges were documented in the remaining five complexes, including those vaccinated with the Ts11 and MG 6/85 vaccines.

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The producer discontinued use of the Ts11 and MG 6/85 vaccine, choosing to vaccinate with the live F-strain product on all six complexes, despite the necessity of working with regulatory officials to permit the vaccine use.

The economic consequences of the virulent MG on five complexes were so great that the producer elected to vaccinate all of the complexes, including the remaining MG negative complex.

The producer was concerned about the potential for greater vaccination reaction with the F-strain product. As a result, this producer altered the vaccination programme, administering the F-strain at nine weeks of age instead of 11 weeks.

The laryngotracheitis (ILT) vaccine was administered at seven weeks and again at 13 weeks to avoid any interaction between the two vaccines. The producer experienced no adverse reaction to F-strain or the ILT vaccines when a separation was maintained between the two products.

After two years of continuous F-strain use on all complexes, the producer has experienced no further production drops, and no tylosin treatment has been required. The alterations in the timing of the vaccination programme have eliminated vaccination reaction issues.

As of this time, the producer has no plans to return to either the temperature sensitive or modified live vaccines because they do not want to risk the economic losses associated with a potential re-emergence of the virulent strain.

Case Three

US producer C experienced chronic life of flock production drops of 5% in 3.3 million layers divided between three complexes vaccinated with MG 6/85.

MG 6/85 vaccine does not induce a humoral antibody response, allowing serological tests to be used to monitor the flocks for field MG infection.

Serological tests demonstrated MG positive birds in 40-100% of all samples taken from these complexes. As a result, the producer introduced F-strain vaccination of all complexes.

After introducing F-strain vaccination, this producer was surprised to see a reduction in reaction to the ILT vaccination. Although the modified and temperature sensitive vaccines themselves are mild reacting and induce little collateral reaction with ILT vaccine, the emergent virulent MG was apparently interacting with the ILT vaccination to produce reaction problems.

The use of F-strain vaccine reduced the incidence of adverse respiratory vaccination reactions.

The F-strain vaccine has proven to be a useful tool to displace virulent MG on large complexes, and to maintain long-term displacement of these strains.

These experiences may be applied to commercial layers and MG positive broiler breeder populations worldwide.

The ability of the F-strain to displace both endemic and emerging virulent MG challenges in large, multi-age facilities makes it a unique tool for MG control.

The significant reduction in vertical transmission in F-strain vaccinated flocks provides an additional advantage for MG positive broiler breeder flocks, reducing the rate of vertical transmission to the broiler progeny while simultaneously displacing the pathogenic MG endemic to the breeding facilities.

Displacement of the pathogenic MG with F-strain gives the producer the freedom to experiment with the temperature-sensitive, modified and vectored vaccines to attempt to clean up MG positive facilities that are completely seeded with the MG F-strain. F-strain also provides dependable MG control in complexes where frequent re-introduction of pathogenic MG could produce negative economic consequences. ■