
TECH bulletin

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How to assess the effectiveness of your mycoplasma vaccination programme in broiler breeders

Review of the development of avian mycoplasma control

With the understanding of the aetiology of CRD and identification of the central involvement of *M. gallisepticum* (MG) [or *M. synoviae* (MS)] in affected chicken flocks, it was suggested in the 1950s that the best way of preventing CRD would be to be free from these mycoplasma infections. Mycoplasma freedom was actively pursued by all parts of the chicken industries, often with infected flocks being culled and it was realised that to be effectively implemented it would have to be from the top down in the breeding pyramid because of vertical transmission. The chronic nature of mycoplasma infections and the inability of antibiotics to reliably cure infections made this very difficult but the rewards for mycoplasma freedom were great. Successful industries were able to produce healthy broilers.

Concurrently anti-mycoplasmal antibiotic intervention in vertically infected broiler flocks (less successful operators needed a workable solution) was op-

timised as a treatment of one to three days around day 21. This could prevent clinical mortality from CRD developing. Presumably at day 21 most birds are infected and susceptible to development of airsacculitis (the first stage of developing CRD) but treatment at this time greatly decreases the populations and allows the bird to remain healthy developing some immunity limiting CRD.

Production of mycoplasma-free day-old chicks should be the overall aim of your mycoplasma control programme

Treatment later is more costly as the birds are bigger and not as successful as the infection has started pathological processes and may be further aggravated by concurrent respiratory infections or immunosuppression. Treatment earlier may be before all the birds become infected and ineffective at stimulating immunity in this fraction of the flock – not preventing CRD from occurring when the mycoplasma infection starts moving again.

Modern broilers at this age are about 900g each and treatment for three days is a considerable expense. This strategy is not sustainable and excessive use of antibiotics for mycoplasma control has

The impact of your programme should be assessed across the whole production process.

seen the emergence of antibiotic resistance strains. In Australia in the 1980s tylosin resistant MG strains become a problem while in Thailand enrofloxacin resistant MG strains emerged rapidly.

When you can reliably get Mycoplasma-free broiler DOCs (Day old chicks) it is possible to raise broilers without this antibiotic intervention. This is an enormous saving in antibiotic expenditure and solution to the problem of evol-

ing antibiotic resistance. In countries that export this can help prevent residue problems. The treatment of DOCs with antibiotics initially started as an intervention, in part, against mycoplasma but also provides protection from other bacteria (from shell contamination especially with decreased use of formaldehyde fumigation on farm, hatchery origin bacteria and from other sources like *E.coli*, perhaps even Salmonella in some situations).

How to get mycoplasma free DOCs

Mycoplasma free DOCs is the true measure of how successful your mycoplasma control programme in your Breeders. How to get mycoplasma free DOCs has varied from country to country and within countries and of course you must generate enough DOCs for your requirements so you don't need to source broiler eggs or stock of unknown status from outside your integration.

Country	MG strategy	MS strategy	Comment
Australia	Vaccination	Vaccination	Routine vaccination has been used for many years
USA	Freedom	Monitoring	Supported by their NPIP. During MG epidemics vaccination of ts-11 breeders has been used ¹ . Similarly MSH has been successfully trialled to control a MS epidemic uncontrolled by antibiotics.
Mexico	Freedom	Vaccination	MSH vaccination has been so successful here that a lot of US integrators with operations in Mexico now want to use this in the US and elsewhere.
Europe	Freedom	Freedom/Uncontrolled	MG vaccines not available everywhere. MSH has just recently been registered.
Israel	Freedom	Monitoring	Price differential in market place with MS positive flocks progeny selling at a lower price
Iran	Freedom	Monitoring but recently vaccination	Typically you can kill one flock with a break but once multiple flocks break then this is reassessed.
UK	Freedom	Monitoring	MS infected DOCs have increased condemnations
Brazil	Freedom (cull infected flocks)	Freedom	Severe movement restrictions are placed on progeny of MS positive stock (for example across state boundaries)

¹ During a recent MG epidemic in Georgia, USA one flock in approximately 80 flocks of breeders vaccinated with ts-11 may have had a problem with vertical transmission of a possible vaccine derived MG (El Gazzar *et al.*, 2011 Avian Dis. **55**:569-74). This is currently being further investigated but the US industry feels that in the face of a similar outbreak they would still use ts-11 in breeders. Protection against the vertical transmission of MG is the usual experience with vaccinating breeders with ts-11 (Barbour *et al.*, 2000 Poult Sci. **79**:1730-5).

Asian experience

Recently export orientated integrators have got interested in decreasing antibiotic usage in broiler flocks in Thailand and Philippines. With mycoplasma free DOCs they have been able to rear broilers without an anti-mycoplasmal antibiotic intervention around 20 days (or any antibiotics after the first week of life). This has been successful even where contract broiler farmers have been near other broiler farmers with infected stock (from other integrations). Horizontal transmission does not seem to be a problem probably due to the kinetics of the infection. The birds are being processed before the infection can get up enough momentum to cause a flock problem and the respiratory damage from vaccination (especially with LaSota vaccines) is repairing before the mycoplasma arrives. Certainly these broiler flocks are still completely MG seronegative at processing.

A lot of this experience has just been using MG ts-11 vaccine but the addition of MSH to the parent stock vaccination programme may make this more robust. This has been the experience in Mexico and in a trial done in the USA.

These results cannot be achieved with MG F strain vaccination because of its regular propensity for vertical transmis-

sion and residual pathogenicity. Killed vaccines also had problems in completely stopping vertical transmission. Antibiotic or heat treatment of fertile eggs could not completely stop vertical transmission.

Combined with a reliable supply of MG and MS negative DOC parent stock, ts-11 and MSH offer Asian poultry producers a final, cost-effective solution for the production of MG and MS free DOCs and decreased dependence of antibiotics.



Airsacculitis (arrow) in pipped embryos can be monitored.

How do you know if your MG and MS vaccinations are working?

- You do not need a routine medication of broilers around 20 days with anti-mycoplasmal antibiotics.
- Seronegative MG & MS broilers at processing and reduction of airsacculitis in pips.
- Serological responses in breeders are not correlated with vaccine efficacy or vaccination failure.
- Problem flocks can be analysed by PCR genotyping and if necessary treated with an antibiotic.

The future

Antibiotic residues and perhaps even antibiotic resistance determinants² are contaminants that are potential trade barriers and export orientated producers are now looking for ways to minimise the chance of this happening. Clearly, a reduction in the dependence on antibiotics will help prevent this and there are benefits for the farmer in reduced cost of production (in Thailand and Philippines the broiler farmer pays for the medication of broilers).

In the face of evolving resistance to antibiotics effective MG and MS vaccination makes a lot of sense especially as newer drugs also tend to be the most expensive. Numerous case studies in Asia have shown that in breeders alone the cost benefits of mycoplasma vaccination outperform antibiotics. Often in Asia this analysis is just done on the part of the production process where the vaccine is applied. If the cost benefit analysis is expanded to the broiler generation then it really becomes compelling. Vaccinate with MG ts-11 and MS MSH for these benefits. Having the same strategy for both mycoplasmas is the best strategy.

² The USDA has considered declaring broiler meat containing multi-resistant *Salmonella typhimurium* as adulterated. There is no antibiotic residue in this case. Whether Europe or Japan would consider banning broiler meat from flocks that had been treated with antibiotics irrespective of their residue status is unknown.



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