Hy-Line®

MG CONTROL IN COMMERCIAL LAYERS

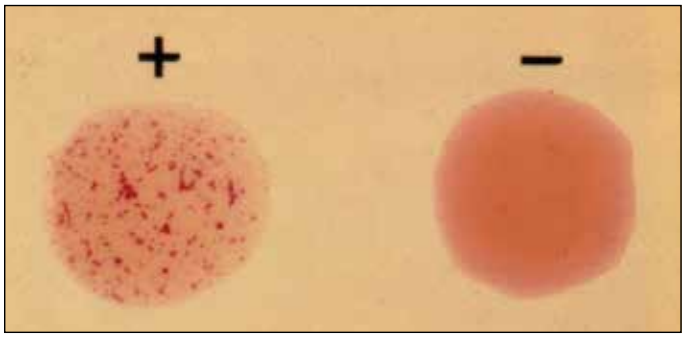
Mycoplasma gallisepticum (MG) is a common respiratory disease in commercial layers around the world. Mycoplasma are a small primitive type of bacteria and various species of Mycoplasma are host-adapted to different animal species. Chickens can also be infected with the generally less pathogenic *Mycoplasma synoviae* (MS) and several other Mycoplasma species that are considered non-pathogenic. Besides infecting chickens, MG causes serious respiratory disease in turkeys and has been found in a number of other avian species. In parts of the U.S., a common wild bird, the house finch, has been found to be infected with MG.

MG can be transmitted vertically from infected breeders through the hatching egg to the chicks, horizontally from bird-to-bird, from contaminated surfaces or through the air for short distances. In the middle of the 20th century, primary breeders recognized the importance of MG and their role in preventing vertical transmission. As a part of the United States Department of Agriculture (USDA) National Poultry Improvement Plan (NPIP), MG was eradicated from primary breeding lines. Since then, breeders have considered it their duty to supply MG- and MS-negative parent flocks to the worldwide layer industry. In most countries, parent flocks are maintained free of MG so that MG-negative commercial chicks can be supplied to the commercial egg producers. In many cases, the MG-negative status is not maintained on commercial layer farms. The typical multi-age rotating population of large layer farms permits flock-to-flock horizontal transmission of MG so that the infection can never be eliminated. Consequently, layer producers have had to learn to live with MG and minimize the effects with vaccination and medication programs.

THE DISEASE

MG is primarily a respiratory disease in chickens, but the most significant effects in layers are a reduction in egg production and a slightly elevated mortality rate, likely due to secondary bacterial infections with the presence of respiratory lesions. Layers can be infected by a number of viral and bacterial respiratory diseases which share many of the same lesions and symptoms, and two or more such diseases can occur simultaneously in a flock. When dealing with respiratory diseases in layers, it is important to get an accurate diagnosis so it is known exactly what diseases are present. Each disease (and combination of diseases) is unique and has its own optimum control measures and vaccination methods.

Diagnosis of MG should involve a combination of observation of typical symptoms and lesions of MG in a flock, along with either a serological change or isolating the organism in correlation with the onset of symptoms. Serology testing utilizing the plate agglutination, hemagglutination-inhibition (HI), or ELISA methods will detect antibodies specific to MG. Depending on prior vaccinations given to the flock, a presence of MG antibodies or an increasing titer may indicate infection with a field stain of MG. Other laboratory methods, such as culture or PCR, are a direct indication of the presence of the MG organism.

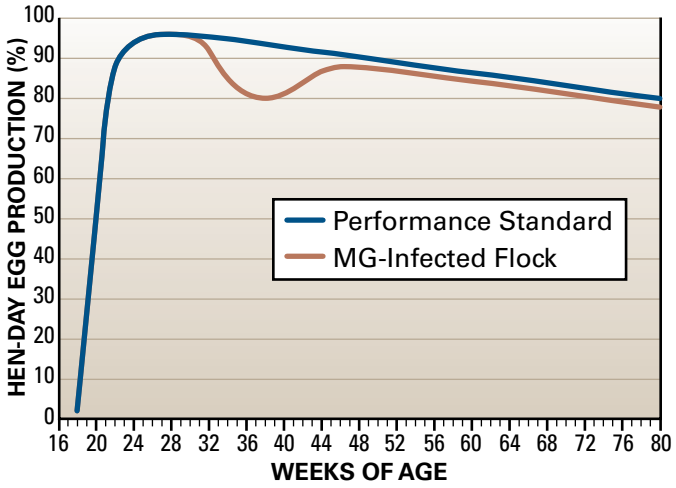


MG plate agglutination test

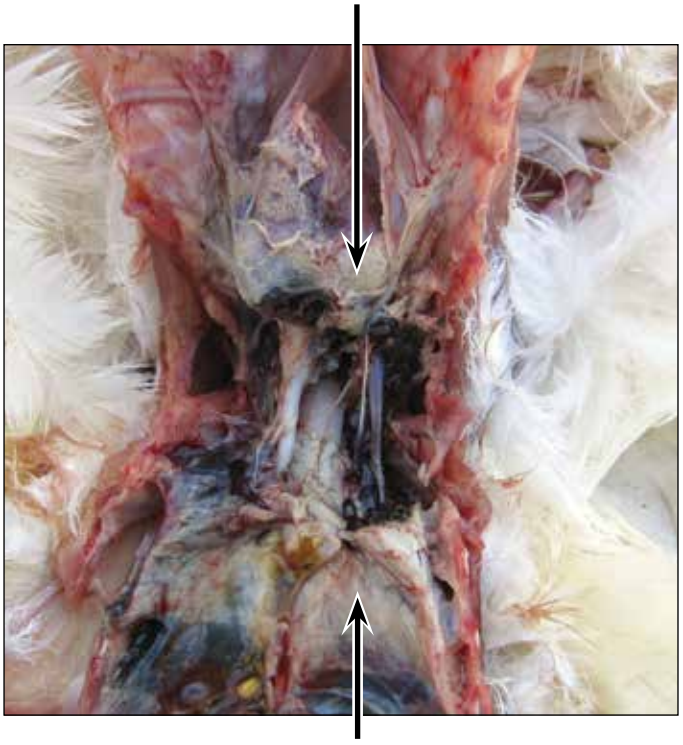
The most noticeable symptom of MG infection in an adult layer flock is an extended drop in production (often 10-15%) occurring over a 4-6 week period. Production is slow to recover and often never does recover to the pre-infection level or a normal production level for the age of the flock. Shell quality may suffer some effects, but this symptom is not as consistent as with other respiratory diseases such as infectious bronchitis or Newcastle.

Mortality may be somewhat elevated with the presence of respiratory lesions. Tracheas can be quite inflamed with some extra mucus and exudate, but do not have the firm trachea plugs typical of laryngotracheitis (ILT) or wet fowl pox. Chronic airsacculitis with cheesy cores can be found, especially in the anterior airsacs.

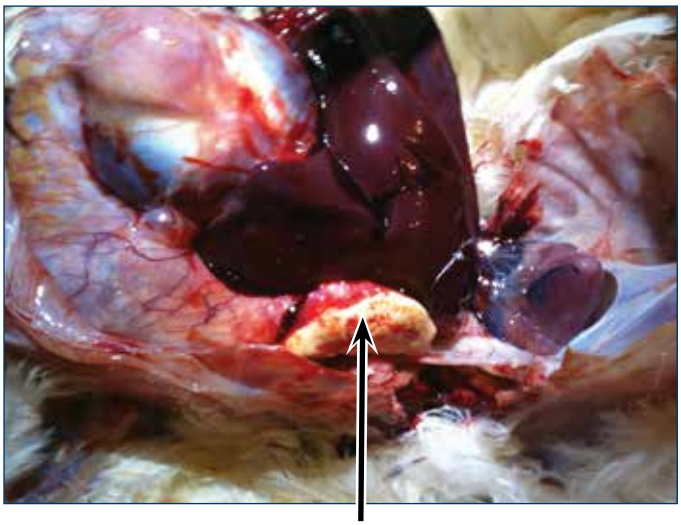
Production Results in MG Infected Flock



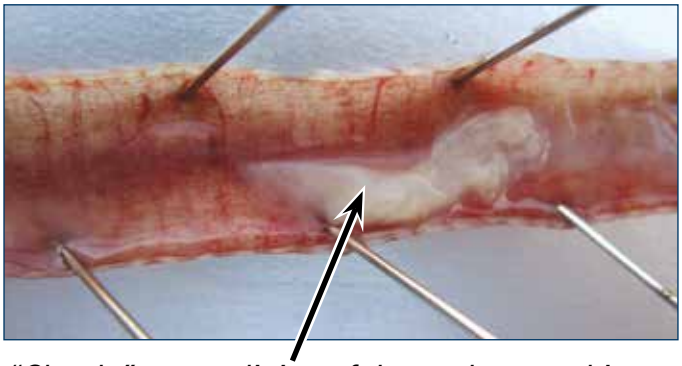
Pericardial sac is cloudy from MG and secondary bacterial infection



Cloudy airsacs (airsacculitis) resulting from MG



"Cheesy" core resulting from MG and secondary bacterial infection



"Cloudy" mucus lining of the trachea resulting from MG and secondary bacterial infections

TREATMENT

Since MG is a bacterium, acutely affected flocks can be treated with antibiotics. Treatment will not totally eliminate MG infection from a flock, but will reduce the clinical effects. Depending on local regulations treatment options include tylosin, tetracyclines, tiamulin, fluoroquinolones and possibly others.

PREVENTION

Egg operations with multi-age layer farms known to be infected with MG should utilize a vaccination program prior to infection during the pullet growing period. Ideally pullets would be grown on a MG-negative farm to allow immunity to develop before exposure in early production on the multi-age layer farm. There are several vaccine options that have been utilized with varying degrees of success.

INACTIVATED MG BACTERINS

A bacterin is an injectable solution containing inactivated MG organisms in a water-in-oil emulsion. It may be produced as a single antigen MG product, or in a combination with Newcastle and infectious bronchitis. This type of vaccine should produce a strong antibody response and all injected birds should test strongly positive for MG antibody 2-3 weeks after the injection. The protection from bacterins seems to be best in early production as monitoring often shows the antibody response begins to decline in mid-cycle production (positive serology dropping below 100% after 40-50 weeks). This may allow the field strain of MG to spread through flocks in mid-late production as evidenced by a return to 100% positive serology. Hopefully, this transition is slow and mild enough that production is not affected, but in some cases, production can be negatively impacted. Routine monitoring of MG antibody titers and correlating those results with any observed production drops will allow a producer to identify if this is happening.

POX-VECTORED MG

A relatively new type of vaccine is a recombinant or vector vaccine. These are vaccine viruses, such as fowl pox or HVT Marek's disease vaccine, that have been genetically-engineered to contain selected genes for the immunogenic proteins of a second pathogen, like MG. As the vector virus reproduces, it produces the proteins coded by the inserted genes from the second pathogen. These proteins stimulate the immune system and provide immunity against that second pathogen without any risk or stress from reacting to the live virus or bacteria as in traditional vaccines.

A pox-vectored MG vaccine is used like a normal pox vaccine in the growing period. While this concept has proven to work well for some pathogens, sometimes the protection from the vectored pathogen is not as strong as from traditional live or killed products. A comparison of protection from three types of MG vaccines reported in Avian Diseases failed to demonstrate any protection from a recombinant fowl pox-MG product.[1]

LIVE MG VACCINES

Historically, the first attempt to vaccinate for MG utilized a naturally-occurring mild strain known as "F-strain". It had no detrimental effects when inoculated into growing pullets and when given prior to a more pathogenic field challenge, F-strain was able to prevent the negative effects of the disease. Originally, F-strain was grown in large liquid batches by local laboratories and applied as a fresh culture without any packaging step. That original version retained some virulence and could not be used in areas where it could spread to turkeys or susceptible adult layers. In the 1980's the F-strain was commercialized and adapted as a live freeze-dried vaccine. As such, the strain has become less virulent and has been shown to have very little pathogenicity or spreading potential. One product is licensed for spray application and one for drinking water, but field experience has shown better seroconversion when the product is applied by eyedrop, probably due to a higher dose getting in the bird. It has also successfully been applied when mixed with infectious laryngotracheitis vaccine and given by eyedrop. F-strain is strong enough to remain in the bird for its life and provide a permanent competitive exclusion against infection by the field strain.

Two other types of live MG vaccine are also marketed, a 6/85 strain and a TS-11 strain. A summary of the traits of the live vaccines is presented in the table below. In some cases, the protection from these two milder live vaccines appears to decline in mid-production and flocks can experience an outbreak of MG field infection. Diagnosis of such a break is based on a combination of symptoms, lesions, and increasing antibody titers as discussed earlier. When this type of late MG reaction is consistently found in flocks previously vaccinated with one of the milder vaccines, it may indicate the need for a stronger product, like F-strain, or perhaps the need to enhance the protection with additional medications or vaccinations.

MG infection can significantly affect production and profitability of commercial layer flocks. With the aid of some simple diagnostic methods and vaccination techniques, the disease can be relatively easy to diagnose and control. The world's layer industry may not be able to totally eliminate MG anytime soon, but by utilizing these basic methods, we are able to prevent the major negative economic effects of the disease.

MG Vaccines and Bacterins

	Form of vaccine	Application route	Post-vaccination serology on plate test	Longevity of protection expected
Poulvac® Myco F – Zoetis **AviPro® MG F – Lohmann Animal Health**	Live, Lyophilized	Licensed as coarse spray or drinking water. Eyedrop commonly used	100% positive	Lifelong
TS-11 - Merial	Live, Frozen liquid	Eyedrop	About 50% positive	To mid-lay
Nobilis MG 6/85 or Mycovac-L - Merck Animal Health/MSD	Live, Lyophilized	Spray	All negative	To mid-lay
MG-Bac - Zoetis **AviPro®104 MG Bacterin - Lohmann Animal Health**	Inactivated, Water-in-Oil	Intramuscular or Subcutaneous	100% positive initially	To mid-lay
VECTORMUNE®FP MG - CEVA Animal Health	Live, Lyophilized	Wing-web	All negative	Variable

1. Ferguson-Noel, N., et al. "The Efficacy of Three Commercial Mycoplasma gallisepticum Vaccines in Laying Hens." Avian Diseases 56.2 (2012): 272-275.