

## **Mycoplasma: How to Deal with a Persistent and Ubiquitous Pathogen**

Poultry just like all animals can get sick from various bacterial, viral and parasitic pathogens. Fortunately most poultry can recover from an infection and return to normal health via their immune systems and if necessary the judicious use of antibiotics if treating a bacterial infection. Unfortunately, some disease causing organisms persist in these “recovered” poultry and hence the birds can be reservoirs of the pathogenic organisms. Consequently, the remainder of your flock may become infected if exposed to this “recovered” bird. Unfortunately this is often the case when dealing with the pathogenic bacteria Mycoplasma. Understanding these types of subtleties is essential toward keeping a healthy flock and reducing the risk of Mycoplasma infection.

Mycoplasma is a very challenging disease for backyard poultry owners and especially people who have breeding flocks because the only way to eliminate it with 100% certainty is via 1. culling or 2. testing and culling of breeding hens. There are other approaches which can also be considered which do not provide 100% certainty but may be appropriate depending on the circumstances. Many responsible breeders and non-breeders get a diagnosis and then are confused on what they “should do.” This article attempts to provide a relevant background of Mycoplasma in poultry and then provides several options that a poultry owner may want to consider when dealing with a positive flock.

### **Know your enemy: What are the clinical signs of a Mycoplasma Infection?**

In general, infections from Mycoplasma cause significant acute and chronic respiratory disease (i.e. coughing, sneezing, sinus infections, ocular and nasal discharge) and “secondary” problems including swollen and infected joints in the hock and foot pad, skeletal deformities, weakness, poor laying and embryo mortalities (Figure 1). With respect to domesticated poultry there are four major species of Mycoplasma that cause disease; *Mycoplasma gallisepticum* (MG), *Mycoplasma synoviae* (MS), *Mycoplasma meleagridis* (MM) and *Mycoplasma iowae* (MI). While each of these four species of Mycoplasma have slightly different domestic poultry they affect (e.g. chickens, turkeys, quail, pheasants) and also have slightly different clinical signs, for the purposes of this article we will group all Mycoplasma together because in general there are more similarities than differences with respect to clinical signs, diagnosis, prevention and control. However, it should be noted that MG is considered the most pathogenic and economically significant Mycoplasma by the commercial poultry industry due to reduced feed consumption, significant condemnations at the processing plant and reduced egg production. In addition, it should also be noted that MM is specific to turkeys while the other three Mycoplasma can infect turkeys, chickens, pheasants and quail.

While the clinical signs listed above are often seen in Mycoplasma positive poultry you can't assume that if you see those signs that your birds have a Mycoplasma infection. This is because other infectious diseases have similar clinical signs in poultry include Infectious coryza, fowl

cholera, Newcastle Disease, and Infectious Bronchitis. In fact the only way to know for sure what disease your birds may or may not have is via diagnostic testing. Diagnostic testing for Mycoplasma can be done while the birds are alive (i.e. ante-mortem testing) or once they are dead (i.e. post-mortem testing) (Figure 1). It is important to work with a veterinarian and/or a diagnostic lab in order to test appropriately.

### **Mycoplasma trivia:**

Mycoplasma are very unique bacteria in the following three ways:

1. Mycoplasma are the smallest living organisms on the planet. In fact they are approximately 5 times smaller than *E. coli* which have a width of approximately 1-2 micrometers. Note: a micrometer is one millionth of a meter!. This is important because unlike most bacteria Mycoplasma often infect the inside of cells as opposed to the outside of cells like most bacteria. Consequently, the intracellular Mycoplasma are more protected from the chickens immune system. The intracellular Mycoplasma can also “hide” from antibiotics and can take advantage of nutrients within the cell.
2. Unlike any other bacteria, Mycoplasma lack a bacterial cell wall which is important in protecting bacteria from the environment. Therefore, Mycoplasma are extremely sensitive to the outside environment and do not survive outside of their respective animal hosts for very long. Therefore, the presence of susceptible birds is integral for Mycoplasmas persistence.
3. Many antibiotics work by inhibiting cell wall growth. Because Mycoplasma do not have a cell wall they are naturally resistant to antibiotics that inhibit cell-wall synthesis.

### **Transmission: How did my birds get Mycoplasma?**

Mycoplasma can be contracted either vertically or horizontally. Horizontal transmission means that Mycoplasma can be transmitted from one bird to another bird through some type of contact such as infected respiratory droplets. Vertical transmission means that Mycoplasma can be transmitted from an infected hen to its developing embryo before the egg has been laid. Once a bird in a flock is infected, intra-flock transmission occurs readily. Therefore the intra-flock prevalence of Mycoplasmosis is high. Consequently, if one bird in a flock tests positive, it is relatively safe to assume a high percentage of the remaining flock is positive. This is one reason why Mycoplasma is considered ubiquitous in backyard poultry. In addition, in older flocks mortality is typically low therefore thinking that an infection will naturally cull birds is not accurate.

Because Mycoplasma can be both horizontally and vertically transmitted, maintaining flocks that are Mycoplasma free requires adequate biosecurity to avoid introduction via horizontal transmission and testing of breeding stock to identify and cull positive breeders.

### **What are my options if I have Mycoplasma in my flock?**

Mycoplasma is believed to be ubiquitous in most backyard poultry. Consequently, if a diagnosis is made by a diagnostic lab that your flock is positive for Mycoplasma owners have a difficult decision. If you have a breeding flock and intend to sell chicks and or hatching eggs your options include:

**Testing and culling of infected flocks:** Culling an entire flock is the only way to be 100% certain that a positive flock is no longer a risk to new birds. However, if the farm has poor biosecurity and consequently there is a high potential for a new Mycoplasma free flock to become positive, the culling may not serve the purpose of maintaining a Mycoplasma free flock. However, if there is good biosecurity this method can be used to rid a farm of Mycoplasma. In the commercial poultry industry this method has been used for eliminating mycoplasma-infected chicken and turkey breeder flocks.

**Test and culling of infected carriers:** In this method carriers of Mycoplasma can be identified in order to eliminate breeders that are Mycoplasma positive.

**Treatment of chicks from infected hens:** Chicks can be treated with high levels of antibiotics by injection and/or in the feed. This approach is not considered reliable in eliminating Mycoplasma but can be a potential option for an owner who does not want to cull infected carriers or flocks.

**Keep flock as a closed flock:** As mentioned earlier Mycoplasma is considered ubiquitous in backyard flocks. Consequently, if you don't have a breeding flock and you "just have some backyard birds" you could decide to do nothing. As long as you practice good biosecurity to prevent horizontal transmission to other flocks you could live with a positive Mycoplasma flock. However, introduction of new birds will result in infection of those birds and hence continue the cycle of infection.

Overall testing is important because no intervention strategies can be utilized without knowing the status of your flock. If you buy poultry from a feedstore or hatchery it is important to ask if the chickens you are buying come from a flock that was tested. Another way to ask this question is to ask if they are part of the National Poultry Improvement Plan (NPIP). Flocks that are part of NPIP are monitored for Mycoplasma among other diseases including Avian Influenza and some Salmonella. In the US most breeders and hatcheries have adopted the various Mycoplasma

control programs of NPIP with great success. If you are a breeder it is highly recommended that you participate in the NPIP program.

### **Prevention:**

As is typically the case in poultry, prevention of disease is much more satisfactory than treating sick birds. Therefore, poultry owners should concentrate resources on acquiring poultry that are not carriers of infectious diseases and once acquired they should practice good biosecurity to prevent their birds from getting exposed to infectious agents. If you sell live birds and chicks, knowing the Mycoplasma status of your flock is important in order to reduce the spread of Mycoplasma. If you buy birds, insist that the hatcheries and feedstores are part of the NPIP.

### **Is there a vaccine against Mycoplasma?**

Yes there is a vaccine against MG. In general there are two vaccine types: killed vaccines and modified live vaccines. The commercially available killed MG vaccine has been shown to reduce but not eliminate colonization of MG following a challenge. Therefore, the long term value in preventing infection is considered minimal. With respect to live vaccines, they are also commercially available however; it is not recommended that people use them without the help of an expert in large part because of concerns about accidental exposure to non-target flocks.

### **Can Mycoplasma positive birds be treated with antibiotics?**

Complete elimination of Mycoplasma from a flock by antibiotic therapy is not considered attainable. However, if the desired goal is to treat sick birds with the understanding that they may be life long carriers then the following antibiotics have been found to be effective against Mycoplasma: tetracycline, erythromycin and tylosin. It is highly recommended that you consult with a veterinarian before using these antibiotics. In addition the Food Animal Avoidance Residue Databank or FARAD should be consulted in order to determine proper withdrawal times for consumption of eggs and meat ([www.farad.org](http://www.farad.org)).

### **Can I get sick from these Mycoplasma?**

While humans can get sick from some species of Mycoplasma, the species of Mycoplasma discussed in this article are not considered human pathogens. However, it is important to recognize that there are multiple other pathogenic bacteria that poultry carry that can make humans ill. Therefore, it is important to always wash your hands after handling poultry.

As you can see dealing with a Mycoplasma positive flock can be extremely challenging. Therefore, the optimal goal should be to prevent Mycoplasma from entering your flock. By following some basic disease preventive practices before and after the arrival of new flocks or birds the poultry owner can reduce the probability of a flock becoming infected as well as the severity and outcome of an infection.



Figure1: Sinusitis (i.e. inflamed and infected sinus(es)) in a turkey infected with *Mycoplasma gallisepticum* (MG). Figure 1a: In order to definitively diagnose *Mycoplasma* in a live bird, a sterile cotton swab is inserted past the mouth into the trachea to recover some of the tracheal exudate. Please work with your veterinarian to obtain proper samples. The swab is then submitted to a diagnostic lab for further analyses. In a dead bird, a full necropsy can be performed which can often provide a more complete diagnoses. Slides courtesy of Dr. Gabriel Sentías-Cué, UC Davis CAHFS laboratory.