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## MYCOPLASMA INFECTIONS IN POULTRY

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*This article, like most of our major articles, was developed in response to requests from our readers.*

**Background:**

Mycoplasmas are the smallest free-living organisms known. It is helpful to think about them as very small bacteria that lack a cell wall. As a result they require close association with their host to provide nutrients and are relatively susceptible to environmental inactivation when outside the host. Due to the lack of a cell wall they are resistant to penicillins and all antibacterials that act by inhibiting cell wall synthesis.

There are several hundred known species with a very broad host range, including animals, insects, and plants, but each species tends to be host specific – for example, humans are not susceptible to mycoplasmas that infect birds. Although most mycoplasma species are not thought to be pathogenic, there are important mycoplasmal diseases of many host species, including man, bovine, porcine, avian, other animal species as well as many diseases of plants.

There are more than 20 species of mycoplasma that infect chickens and turkeys, but only 4 are considered to be pathogenic: *Mycoplasma gallisepticum, M. synoviae, M. meleagridis,* and *M. Iowae;* all four of these pathogens are egg-transmitted. Other avian species have their own unique mycoplasmas, some of which may be minor pathogens. These include *M. anatis* in ducks, *M. anseris* in geese, and *M. columbinum*, *M. columborale*, and *M. columbinasale* in pigeons. *M. imitans*, an organism closely related to *M. gallisepticum*, has also been shown to have pathogenic potential in several avian species. *M. lipofaciens* may have pathogenic potential for raptors. Mycoplasma infections are chronic and infection remains for the lifetime of the host, even in the face of a strong immune response and intensive antibiotic medication.

***Mycoplasma gallisepticum***

*M. gallisepticum* (MG) is clearly the most important mycoplasmal pathogen of chickens and turkeys. Although many avian species have been shown to be susceptible, the gallinaceous species are most susceptible. MG is the etiologic agent of infectious sinusitis in turkeys and is an important factor in chronic respiratory disease in chickens.

*Occurrence*:

MG is worldwide in distribution. However, it has been the subject of intense control programs in developed countries. Major poultry breeds are now MG-free, as is most of the broiler and turkey production in North America, Western Europe, and many other devel-



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oped countries. However, in many underdeveloped parts of the world MG continues to be endemic. However, MG is commonly found in large multi-age commercial egg production flocks, even in developed countries.

*Clinical manifestations:*
Infectious sinusitis in turkeys manifests itself as a severe, debilitating upper and lower respiratory disease, but with only somewhat increased mortality. Signs include sinusitis, conjunctivitis, nasal discharge, and sneezing and coughing. Birds are depressed, feed consumption is decreased, and the growth rate is poor. Lesions include sinusitis, conjunctivitis, tracheitis, and airsacculitis The course of the disease is chronic.

In chickens MG as an uncomplicated infection may be quite mild; in many cases there are no apparent clinical signs, especially in older birds. However, MG infection is frequently complicated by other respiratory infections such as infectious bronchitis, Newcastle disease, pneumovirus infection, avian influenza, *E. coli*, and *Hemophilus paragallinarum*, and others. In such cases the disease is characterized by severe respiratory signs, and when complicated with *E. coli*, mortality may be significant. Signs and lesions in such cases are similar to those seen in turkeys, but sinusitis may be less prominent. When MG infection is complicated with *E. coli*, lesions often include pericarditis and perihepatitis.

In adults MG infection is accompanied by decreased egg production and vertical transmission to the progeny. In large multi-age egg production facilities, pullets are reared as MG-free. When pullets are placed on the production facility they become infected at about the time of peak egg production, resulting in egg production losses estimated at from 5 to 30 eggs per hen over the life of the flock.

Because of the debilitating, chronic nature of the disease, MG infection is not compatible with efficient industrial-scale poultry production. However, in small scale back yard or village poultry production the disease impact, although clearly present, may be less obvious.

*Transmission:*
MG is transmitted vertically through the fertile egg to the progeny chicks and poults. Therefore, breeding flocks that become infected are often destroyed. All of the major poultry breeds are now free of infection, thus eliminating most vertical transmission in commercial poultry production.

Even though mycoplasmas do not survive well in the environment outside the host, the organism can survive for several days on feathers and materials such as cotton clothing. Therefore, horizontal transmission continues to be an important factor in commercial poultry production. The organism is commonly introduced by human traffic with contaminated boots and clothing. Free-flying birds and rodents are generally not infected with MG, but can be important in horizontal transmission because of contamination of their feathers or hair. Airborne transmission may be a minor factor, but generally occurs irregularly, and only up to a distance of about 1-2 kilometers.

In situations where parent flocks are MG-free, **the most important risk factor for infection is close proximity to contaminated birds or flocks**.

*Diagnosis:*
MG infection should be considered in the differential diagnosis whenever there are respiratory signs and lesions or egg production drops. However, such signs are similar to a wide range of poultry pathogens, a diagnosis cannot be made on the basis of clinical signs or lesions. Laboratory confirmation is needed to confirm a diagnosis of MG infection. It should also be remembered that MG infection is often accompanied by other pathogens.

The most commonly used diagnostic tests are serological procedures. Initial efforts should include the testing of 10-30 serum samples by the serum plate agglutination or ELISA tests. The serum plate agglutination test is the simplest and most common. Antigen is produced by Schering Plough Intervet in the U. S. and in Holland. ELISA test kits are available in the U. S. from Synbiotics or IDEXX. Other ELISA kits are available in other parts of the world.

Although agglutination and ELISA tests are quite sensitive, both procedures are known to give false positive results, especially within 4-6 weeks after administration of oil emulsion vaccines against other diseases. Hemagglutination inhibition (HI) tests are highly specific and reliable when properly conducted, but HI may not be available in many parts of the world because of difficulties in obtaining good antigen. However, when a high percentage of strong positive results are obtained by agglutination or ELISA, especially on a repeat test after 2-4 weeks, there is strong presumptive evidence of infection.

The gold standard for MG diagnosis is isolation and identification of the organism. Unfortunately, few labs in the world have such capability, and import restrictions in many companies make it difficult to ship specimens internationally. Polymerase chain reaction (PCR) procedures often substitute for culture methods, and many laboratories now have such capability. Fortunately, there are few restrictions on international shipment of DNA. For example, specimens placed on Whitman® FTA cards inactivate all known pathogens while preserving DNA and can be easily shipped by post to most laboratories in the world.

*Control:*
The preferred control method is to use replacements only from MG-free breeder sources, use all-in, all-out management methods, and to use strict methods of biosecurity to maintain flocks free of infection. Unfortunately, this method is not feasible for multi-age commercial layers or in areas of the world where MG is endemic and wide-

spread. It has little application for production systems in which multi-age flocks are maintained or for back yard or village poultry production methods.

In situations where maintaining flocks free of MG is not feasible, medication and vaccination are the only other methods available.

MG is susceptible to a variety of antibiotics including tetracyclines, ethromycin, chloramphenicol and related products, fluroquinolones, tylosin and its derivatives, tiamulin, or other products that do not act by inhibiting cell wall synthesis (not all of these products are licensed in all countries, especially in North American and Western Europe). Penicillin and its derivatives are not effective. Medication is most effective when used prophylactically. For example, young birds may be medicated during the first 3-5 days of life and/or during times when they are having vaccination reactions against Newcastle disease or infectious bronchitis. Continuous medication or medication for 3-5 days each month may be useful for layer and breeding flocks. Unfortunately, no known medication program is capable of eliminating MG from a flock, and mycoplasmas may become resistant to antibiotics when used over long periods of time. Rotating products may be useful in delaying the onset of resistance.

Several types of vaccines are available, but none is completely suitable for all circumstances. There is no effective vaccine for use in broiler or turkey production. All vaccines should be administered prior to field challenge.

Inactivated, oil emulsion vaccines are perhaps safest, because no live organisms are introduced. They are generally administered subcutaneously or intramuscularly for layers or breeders shortly before the onset of egg production and are useful in preventing egg production losses or reducing egg transmission. There may be of some limited value in vaccination of younger birds that may suffer from respiratory disease.

There are three commercially available live vaccines. The original strain, F strain, is a naturally occurring strain of moderate virulence, and is the most effective in preventing colonization from wild-type challenge strains. It is available from Schering Plough Intervet internationally, and from Fort Dodge in the United States. It is a lyophilized product and can be administered by spray, eye drop, intranasally, or in the drinking water. F strain is virulent for turkeys and is too virulent for use in broilers.

The 6/85 strain is apathogenic for chickens and turkeys, comes as a lyophilized product, and must be given by spray. It does not induce an antibody response, but offers a degree of protection. It is available from Schering Plough Intervet. Development of an antibody response is indicative of a field challenge.

Another apathogenic strain, ts-11, is available as a frozen product and must be stored at -70 C or in liquid nitrogen. It is administered by eye drop. A slow, moderately high antibody response is expected. The ts-11 strain is produced by Bioproperties, Ltd. Internationally and Merial in the United States.

Although live vaccines may be useful, none of them is completely capable of preventing infection against field challenge, but the F strain is perhaps the most effective.

Although there is no research to confirm its effectiveness, there have been suggestions that using a program with a combination of live vaccine along with inactivated bacterin may be of value. Others have reported some value in revaccination of layer or breeder flocks with 6/85 or ts-11 mid-way in the egg production cycle.

***Mycoplasma synoviae***

*M. synoviae* (MS) infection is another important egg-transmitted pathogen of chickens and turkeys. It is usually manifested as a relative mild respiratory infection and/or infectious synovitis. Synovitis is often present as a swelling of the joints (most commonly the hock joint) along with lameness and poor growth. The virulence of MS strains varies significantly, and many strains appear to be apathogenic and cause little or no disease problem; a few strains appear to be quite virulent. The severity of the resultant disease may vary according to the virulence of the MS strain that is present. MG infections often appear to spread slowly, but MS appears to spread quite rapidly. Diagnosis is the same as for MG infection, and control methods are similar. Differentiation from viral tenosynovitis (reovirus) and Staphylococcus synovitis may be difficult.

There is only one vaccine strain available. The MS-H strain is similar to the ts-11 strain for MG and is produced by Bioproperties, Ltd.

***Mycoplasma meleagridis***

*M. meleagridis* (MM) is disease of turkeys only. It is egg transmitted and results in a mild upper respiratory disease in young poults. More importantly, MM strains can sometimes be associated with feathering problems, skeletal deformities, and poor growth in young poults that are progeny of MM positive breeders. The only feasible control method is by maintaining breeding flocks in single-age, isolated facilities with good biosecurity. No vaccines are available, and there is little benefit from medication. Dipping preincubated eggs in cold solutions of tylosin/gentamicin or enrofloxacin has been shown to have beneficial results in improving skeletal deformities and growth in turkey poults that are progeny of MM-infected breeders, but egg dipping is usually not feasible as a control measure.

***Mycoplasma iowae***

*M. iowae* (MI) has recently been recognized as a pathogen for turkey embryos or young turkeys. It is an egg-transmitted infection. Some strains of MI have been shown to be the cause of mid-incubation mortality in turkey embryos, and more recently, as synovitis, skeletal deformities, and poor growth in a small percentage of poults that hatch from infected breeder flocks. Other MI strains appear to be non-pathogenic. The only effective control in affected flocks appears to be culling of the affected poults; the majority of the poults in the flock appear to be normal. There is no serological test for MI – diagnosis is primarily culture or PCR of the genital tracts of breeders, dead embryos, or affected young poults.

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## UPDATES

When we have to choose between many subjects that we would like to cover in this publication we often give preference to conditions that affect both animals and humans and often are transmitted between them (Zoonotic conditions). We also give a priority to updates on subjects covered in previous issues. The following news item is in that category and it includes an excellent website.

***Chlamydophila psittaci 2008 Compendium***

The National Association of State Public Health Veterinrians has released the 2008 Compendium of Measures to Control C. psittaci Infection among Humans (Psittacosis) and Pet Birds (Avian Chlamydiosis). This updates the 2006 compendium. Changes include updates on prevention and control measures and an expanded resource list. For details visit http://www.nasphv.org.

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***Occurrence of Anoplocephala Perfoliata (Tapeworm) Infection in Horses in Ontario, Canada and Its Association with Colic and Management Practices***

Infection with the tapeworm Anoplocephala perfoliata has been found to be associated with equine colic in horses in the United Kingdom. In the Candian study cases were horses in southern Ontario diagnosed with colic by local veterinarians and control (non-colic cases) horses were from the same stables as colic cases and were matched by age, breed and gender where possible.

Infection status was defined on the basis of positive results on coprological (fecal) examination and/ or seropositivity to a secretory protein of the tapeworm. Horses dependent on pasture for a large part of their diet were significantly more likely to be positive compared to other horses. *Adapted from Veterinary Parasitology, 2008; 153:1/2:73-84.*

**Editor's Note:** I spent many years in rural community practice, much of it spent treating colic in the many horses and mules that were used for farm power. Many of the cases were never identified as to actual cause. However many were related to chronic constipation in some form from 'sand colic' (ingesting excessive amounts of sand or dirt while trying to ingest a little of the sparse vegetation available. While I do not remember tapeworms being considered as a cause it probably should have been considered with the close grazing and the possibility of ingesting tapeworm ova from the soil. When a number of colic cases are occurring in equine grazing on pasture, tapeworms should be considered as a possible cause and if found there would be good reason for treatment and pasture management control programs. *D.E.Goodman, DVM*

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### TIPS FROM AROUND THE WORLD

***Preventing the Spread of Disease***

One of the major ways to prevent the spread of a recently noticed disease problem in animals, especially rabbits and poultry is to immediately remove the sick animal, destroy and bury or burn the carcass and clean and disinfect, if possible, the pen or area where the sick animal was found. Dogs, wild animals and carrion-eating birds can spread the disease organisms if the carcass is not destroyed by burning. It is usually best to not treat the sick animal because that gives the causative organism time to spread to the other animals. And very often, even if the treated animal recovers, it is unthrifty, not good for breeding, may be a carrier of the disease organism, and can continue to be a source of infection for others. A better idea is to remove the healthy animals some distance away from the pens or sheds where the sick animal was found and not use that area again for animals for at least a month or so after it is cleaned and disinfected. If the animals were on the ground it is good to not raise any more animals in that immediate area for at least six months. This is one of the best, more effective and least costly ways of preventing the spread of sickness.

*From Disease and Parasite Prevention in Farm Animals:Ten major Steps, a publication of Christian Veterinary Mission. This is a short book that covers the most important ways to prevent and control diseases and parasites on small farms. You may purchase it from CVM for $5.00 US by sending an e-mail to vetbooks@cvmusa.org.*

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***Tippy Tap***

Figure 1: The Tippy Tap

The Tippy Tap (Footsteps 30) is a useful way to improve hygiene. It uses little water or soap. The base of the handle of a plastic container is is heated over a candle and gently pinched with pliers so that it is sealed tight. Using a heated nail, a small hole is made just above the sealed area. The nail is heated again, this time to make two holes in the back of the bottle so that the container can be hung up. Use string to make a handle and attach and empty can upside down to keep the soap dry. Pulling the handle releases a stream of clean water for washing hands. It is becoming more and more accepted that hand-washing, especially in any kind of medical procedure including the most basic examinations, and after bodily functions and always before eating are a big help in preventing the spread of disease and parasite problems.
*from Footsteps, a publication of Tear Fund, Issue 42*

**Editor's Note:** When working or traveling away from a source of water a simple and easy way to wash hands is to carry a jug or two of water with a small amount of liquid soap added or a small amount of shredded bar soap to make a weak solution. This can be especially useful for cleaning after animal health procedures.

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***Comparison of Methods to Detect Gastrointestinal Parasites in Llamas and Alpacas***

<u>OBJECTIVE</u>
To compare relative sensitivity and overall yields of various methods of fecal examination for gastrointestinal parasites in llamas and alpacas.

<u>PROCEDURES</u>
Fecal samples were analyzed by direct smear, a modified McMaster technique with a Sucrose solution or natural saline (approximately 36 Percent NaCl ) solution, and a centrifugation-flotation procedure. McMaster flotation chambers examined 15 and 60 minutes after loading, and Centrifugation-flotation samples were examined after 10 and 60 minutes of flotation. The proportions of samples with positive results and concentrations were compared among methods.

<u>RESULTS</u>
The centrifugation-flotation technique yielded more positive results than other methods for all parasites except small coccidia. Longer flotation time increased the proportion of positive results and parasite concentrations for all parasites except Nematodirus spp. Longer time in the McMaster chamber made little difference. By use of the modified McMaster technique, sucrose solution yielded more positive results for Trichuris, Eimeria macusaniensis and strongyles whereas saline solution yielded more positive results for small coccidia than did most other methods and the sucrose McMaster technique yielded more positive results for Trichuris spp.

<u>CONCLUSIONS AND CLINICAL RELEVANCE</u>
The centrifugation-flotation technique appeared to offer clear advantages in detecting infection with E.macusaniensis, Trichuris spp, Nematodirus spp and capillarids. The saline McMaster technique
Appeared to offer an advantage in detecting small coccidia.

*Original article by Christopher K. Cebra, Bernadette V. Stang, Oregon State University; from Penn State University Veterinary News April-June 2008 as abstracted from J.Am.Vet.Med.Assoc. Vol.232, No.5 pages 733-741.*

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***Johne's Disease***
From the earliest days of this publication we intended to use part of each issue to bring news of new developments, especially on subjects that we had covered in previous issues.

Some time ago our feature article was on Johne's Disease (Paratuberculosis). One of the points of emphasis at that time was the possible connection between Johne's Disease in cattle and Crohn's Disease in humans. Since that time confusion still remains as to just what connection if any there is between the two diseases.

The following is a brief but to the point discussion of the subject and the best that the editor has seen in quite a period of time. It is by Mike Collins, DVM, PHD, at the University Of Wisconsin, USA and appeared in the Bovine Veterinarian October 2008.

Dr.Collins, a Johne's Disease expert, says that if there is a link between Johne's Disease and Crohn's Disease it has not been proved. He states that what has been scientifically proven about the relationship between these two diseases is:

- Mycobacterium avium subspecies paratuberculosis (MAP) causes Johne's Disease.
- Mycobacterium avium subspecies paratuberculosis (MAP) the causative agent of Johne's Disease contaminates food of animals-origin; primarily milk and meat.
- Johne's Disease of cattle resembles Crohn's Disease in Humans in pathology, epidemiology and clinical signs.
- Mycobacterium avium subspecies paratuberculosis (MAP) the causative agent of Johne's Disease in cattle is consistently found in people with Crohn's Disease.

He states that the only remaining question is whether the MAP organism causes Crohn's Disease or whether Crohn's Disease patients merely become infected with the organism after they have the disease.

A report issued in August by the American Academy for Microbiology highlighted that group's concern that the MAP organism may cause Crohn's Disease. It stated that people with Crohn's Disease are seven fold more likely to have in their gut tissues the bacterium that causes a digestive tract disease in cattle called Johne's Disease. The role that this bacterium may or may not play in causing Crohn's Disease should be a top research priority.

The report *Mycobacterium avium paratuberculosis*; incidental Human Pathogen or Public Health Threat summarizes conclusions from a colloquim convened by the American Academy of Microbiology in June 2007. That conference brought together experts in microbiology, medicine,veterinary pathology, epidemiology, infectious diseases and food safety. A full copy of that report can be found at http://www.asm.org/Academy/index.asp?bid=60057.

Dr.Collins states that this report does not come down with a firm conclusion saying 'yes' or 'no' but it brings a lot of attention to the issue. Since this is an evolving issue, we will from time to time bring further updates.

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**We Want to Hear From YOU!**

With the great increase in prices of oil this year that means a great rise in the cost of purchased fertilizer. There has been much interest in the use of animal manure for fertilizer and requests for information in the past few months on it and on other alternative sources of fertilizer and ingredients. There is much information available but very little that is basic and specific for small farmers in developing areas. We would appreciate any information, especially that based on personal experience or observation which we can pass on to others. We plan to devote a major portion of our next issue to this subject. Please e-mail your suggestions to the editor of this publication at:

cvmvetdrdeg@ftc-i.net

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