The impact of MS and MG on the breeder flock and in the hatchery

Mycoplasmosis is, and probably will remain, one of the most important diseases in poultry production, especially concerning its economic impact. This also emphasises the overarching importance of controlling the vertical transmission rate of Mycoplasma gallisepticum (MG) and Mycoplasma synoviae (MS). To achieve this control of vertical transmission, it is necessary to put a clear focus on mycoplasma control strategies in breeders.

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When MG is transmitted vertically it can cause an increase of pipped embryos due to the formation of lesions in the airs acs of day-old chicks. In consequence, this reduces flock hatchability and has an enormous economic impact, including trade implications. In addition, in many countries MG positive breeder flocks must be culled.

Mycoplasma infection in breeders

Mycoplasma infection, both by MG or MS, causes subclinical or clinical infections in breeders. Both are economically important but do affect breeders differently.

MG

MG is pathogenic and economically significant in breeders as it causes losses from reduced egg production, increased feed consumption per chick, and a drop in hatchability. This makes it a very costly infectious disease confronting poultry breeder production worldwide.

Affected birds show a reduction in feed consumption and, consequently, loss of weight. MG is often found to play an important role in production drops either alone or when combined with other viral or bacterial diseases. Alone or in combination with other infectious diseases MG may cause respiratory infection.

The most characteristic signs of infection in breeders are tracheal rales, nasal discharges and coughing. The major concern with MG infection is the disturbance in production rather than the loss of birds. During infection or outbreak periods, vertical transmission will be high and then transmission rate declines post infection. The real challenge however starts after infection as recovered birds remain carriers for life.

MS

Since the early millennium MS infection causing production disturbances is gaining importance along with MG infection. MS initially was thought to only damage synovial joints, predominantly in males. Now it is clear that MS infection occurs subclinically as upper respiratory infection causing air sac lesions when combined with other viral diseases like ND, and IB.

Further to this, systemic infection of MS results in synovitis and damage to the reproductive system. The egg production is negatively affected, and the respective production graph might give the appearance of a rollercoaster ride. The synovitis is described as tenosynovitis resulting in lameness in both male and female birds, but predominantly noticed in male birds.

As this affects the gait and mobility it directly impacts the chance of getting fertile eggs. Also, male birds become carriers and there is a chance of infection through natural breeding or the insemination act. In female birds the infection is predominantly noticed by production disturbances, egg quality alterations and respiratory challenges.

Egg quality

In breeders eggshell quality is of major importance to achieve the standard number of hatching eggs and chicks. Many factors affect eggshell quality, such as breed, age, disease, water quality, temperature, lighting programme, nutrition, etc. Reproductive system changes caused by mycoplasma infection directly affect egg quality, and key performance indicators, such as selection percentage and hatching percentages, will take a direct hit. Less saleable table eggs and increased secondary grade eggs will cause a direct economic loss in laying hens.

Air sac is clear and glistening which means no vertical transmission – marked as negative in PIPS analysis.

For MS, numerous reports exist linking various strains to changes of the reproductive system.

For a long time, the clinical and economical effects of MS have been a subject of debate, however this has changed due to the emergence of new pathogenic strains causing infectious synovitis, eggshell apex abnormalities and production losses. Those strains linked to the formation of eggshell abnormalities (EAA) were first described in 2009 by Feberwee et al.

The higher breakage of eggs at farm level, but also when processing the eggs in the table egg industry, will lead to refusal of those eggs for the table egg industry. The estimated average economic loss of a flock in which 5% of the eggs had EAA between 30 and 75 weeks of age was about 3% of the gross return on the egg price. As demonstrated by Feberwee et al, broiler breeder birds are however less susceptible to EAA than commercial layers.

Hatchery

Hatching egg quality gets affected directly by mycoplasma infections, and thereby leads to poor selection percentages. This, in turn, reduces the number of hatching eggs per parent. Speaking from practical hatchery experience: not only MG- but also MS-inflicted changes lead to more disturbances in hatchability.

Because of the increased porosity of the eggshell surface, bacterias like

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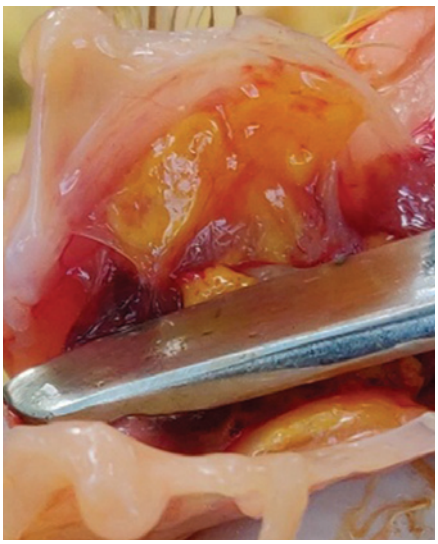
Air sac showing few lesions in grade one stage – marked as 1x in PIPs analysis.

Air sacs showing lesions with cloudiness in second grade vertical transmission – marked as 2x in PIPs analysis.



Air sac showing severe lesions due to high levels of vertical transmission – marked as 3x in PIPs analysis.

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E. coli or Pseudomonas spp. can easily enter into the egg and cause yolk infection which leads to explosions of hatching eggs in the setter. During this explosion, egg material will be pasted on the nearby non-infected hatching eggs and subsequently cause their infection. This results in increased embryonic mortalities reducing hatchability and triggering a chain reaction: a lower number of day-old chicks, poorer chick quality and increased early chick mortality.

During candling for fertility screening, it is also possible to check the eggshell strength. Hatching eggs from MS infected flocks may show more porosity on the apex part or total surface. This can get corrected when the breeder birds are treated with a good antibiotic like tylvalosin.

After treatment, improved eggshell quality can be noticed which in turn increases the hatching egg selection percentage and improves the candling process. For all practical purposes this observation can be used to judge the efficacy of the mycoplasma treatment or control programme.

Diagnosis

Using laboratory support to make a correct diagnosis in breeders is necessary, because clinical signs caused by both mycoplasmas may be easily confused with other diseases.

Molecular diagnosis, like qPCR, or also serological diagnosis, like ELISA (enzyme linked immunosorbent assay) or RPA (rapid plate agglutination), can be used to confirm mycoplasma infection.

In the hatchery another valuable diagnostic technique is Pipped Embryo Analysis (PIPs). Here the effect of vertical transmission is measured by the evaluation of unhatched pipped eggs.

The embryo starts pipping the eggshell around the 18th day of incubation when the beak passes through the air chamber of the egg and then works its way through the shell. The chick does not fully emerge from the egg, staying alive usually for 12 hours after the end of the estimated hatch time. This is of consequence as for the PIPs analysis it is necessary to have live embryos.

This procedure should be performed routinely as part of the programme of embryo diagnosis, especially in MG high challenge areas. PIPs analysis is recommended to be performed during all hatch out days even though the flock is mycoplasma negative. This will ensure a proper baseline is obtained.

There are many infectious or non-infectious diseases that can cause an increase of PIPs, not only mycoplasmosis, like salmonellosis, low humidity or leg deformation.

For mycoplasma, this test will provide better knowledge on the vertical transmission of MG. To find out the incidence of vertical transmission based on increasing the PIPs, it is necessary not only to evaluate the percentage of PIPs but also the severity of the air sac lesions.

It is recommended to do PIPs analysis in at least 25 pipped embryos per flock establishing score lesions between one to four according to the severity of the air sac lesion. An example would be if only one thoracic air sac is slightly affected this could be considered as 1x, however if all the air sacs are filled with caseous content it should be considered 4x.

Based on the information obtained during the examination a chart can be made in order to record the results and evaluate the results more easily. Once the analysis is finished, the percentage of positive embryos is calculated, and could be reported as the percentage of vertical transmission, clarifying the severity of the lesions found.

As a general rule, with less than 10% positive embryos good mycoplasma control has been achieved. With 10-25% a moderate control is achieved. With more than 25% positive it is necessary to take urgent corrective measures since the vertical transmission is very high. If MG infection is under control in breeders, PIPs analysis can be used as a valuable indicator that will demonstrate the success of these chosen corrective measures, such as treatment, vaccination, and proper biosecurity.

Intervention

Based on the described methods, it can now be clearly defined how widespread a mycoplasma problem is. Based on clinical signs, PIPs and laboratory results, the next step is to plan appropriate intervention measures. For example, if the breeder flock is positive only to MS and the PIPs values are higher than usual it should be necessary to consider another infectious or non-infectious source that could cause PIPs to increase.

Vaccination usage is well complemented by anti-mycoplasma treatment when increased complaints of a lack in broiler performance attributable to mycoplasma infections are evident. Further diagnostic evidence such as a sudden increase in the ELISA titres or a PCR are excellent supporting evidence.

Different regions have different approaches to mycoplasma control which are largely dependent on challenge levels and, of course, local regulations.

Selecting the proper antibiotic treatment regime should be based on choosing a product with the narrowest spectrum of activity, best bioactivity and availability, and the lowest MIC. Currently, tylvalosin has the lowest MIC values to control not only MG but also MS and has zero withdrawal days in eggs registered in many countries for human consumption.

Conclusion

Due to the important economic impact of mycoplasma infections, MG and MS are definitely among the most relevant pathogens in breeders.

Continuous monitoring of flock health, clinical and autopsy investigations, keeping accurate hatching egg selection and candling records are therefore of prime importance to design much needed control schemes.

Pipped embryo analysis to determine the rate of vertical and horizontal transmission is a useful tool to further assess and evaluate what impact a putative mycoplasma control programme may have.

Controlling mycoplasma efficiently in breeders is doubly useful as it helps to maintain good health and better production parameters in breeder birds and decreased vertical transmission to their offspring. This directly increases day-old chicks quality. Based on what is mentioned above, it is important to have all information available to design a proper mycoplasma control programme for breeders.

The ultimate goal is to improve breeder health, achieve better production, and control vertical transmission and thereby the quality of day-old chicks. ■