To combat mycoplasma, poultry producers need an effective strategy

In an ever-changing world, where demand for poultry meat and eggs is increasing, several challenges exist for industrial scale production. One of these challenges is the concentration of large, multi-age production complexes within a restricted geographical area.

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Naturally, in those environments certain disease organisms like mycoplasma can spread and negatively impact a very substantial part of production. It is important to focus on a strategic approach for the best mycoplasma control: treatment, vaccination, and biosecurity. This article will focus on treatment and vaccination. Where true economic damage caused by mycoplasma is a real possibility – for example in large poultry operations – a strategy to combat mycoplasma disease is needed.

What is the difference between eradication and control?

Often the two terms eradication and control are used in the same context when, in fact, they are not describing the same thing.

A few principles must be understood to combat mycoplasma effectively. With mycoplasma infections, both horizontal as well as vertical transmission are of importance so any resulting action plan will not be limited to one element of the production chain only. Parent flocks and hatcheries must also be part of the strategy if vertical transmission is suspected. In scenarios with horizontal transmission, the guiding principle that 'birds that remain positive for life, remain shedding for life' should be kept in mind.

As with other diseases, different species can both transmit and act as a reservoir for mycoplasma. Fomites and survival in the environment must not be forgotten.

● **Eradication strategies:**
For an eradication strategy to be a wise course of action, a large proportion of birds should be mycoplasma negative. Elements of this strategy include surveillance, containment, and elimination of positive birds. Where there is little willingness to cull infected parent stock, eradication might be the wrong strategic choice.

Looking at the general rules given to maintain mycoplasma-free flocks, this is not an easy option to follow. To make economic sense, a general low status of mycoplasma infection should be reached. Combatting mycoplasma in a multi-age or free-range environment is especially challenging. In many parts of the world Mycoplasma gallisepticum (MG) is strictly regulated and well checked for, whereas in some parts of the poultry producing world this is not the case.

Eradication of Mycoplasma synoviae (MS) can be viewed as a rare event, particularly in the lower levels of the production pyramid.

Where MG has been eradicated or at least very well controlled there is more room for MS to flourish.

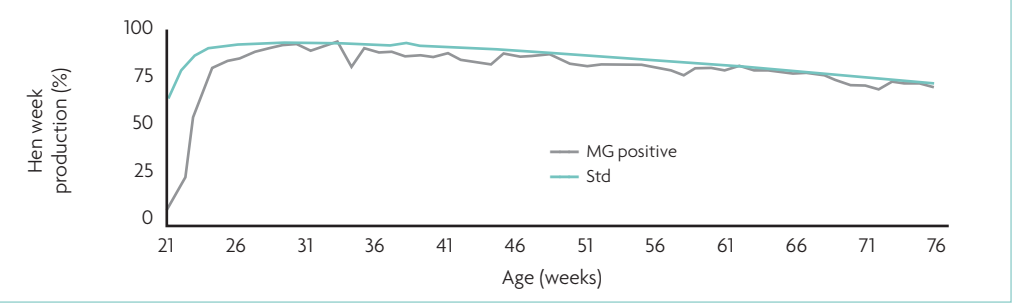
In recent decades a new clinical picture for MS, egg apex abnormality (EAA), has emerged, giving the discussion surrounding eradication and control of MS further urgency. Apart from EAA, MS is also responsible for the loss of general egg quality.

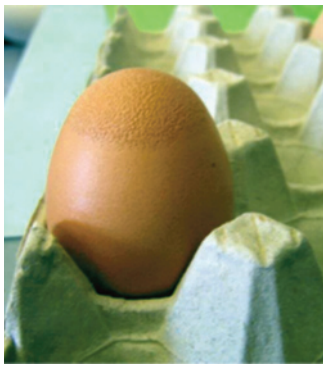
● **Control strategies:**
Control strategies are the method of choice when a large proportion of birds are mycoplasma positive. This is often the case for MS, but in certain geographical areas it is still the case for MG as well.

Vaccination and treatment, used in conjunction and instituted at the appropriate times, have an important place in this approach. If used correctly, both tools can strongly reduce the amount of mycoplasma being shed. However, they can not stop shedding altogether.

It is important to understand exactly what can be achieved with which tool and what the limitations are. Often the expectations from vaccination are disproportionate to what vaccines can actually deliver. Unfortunately, antibiotics are certainly not the complete solution either. It is imperative to select several tools to control a situation wisely. The following steps commonly play a part in combatting mycoplasma.

Fig. 1. The egg production data of a commercial layer flock infected with Mycoplasma gallisepticum infection compared to the standard.





Egg apex abnormality (EAA) caused by Mycoplasma synoviae infection.

First: Quantify the mycoplasma challenge

Upon discovering the need to combat mycoplasma within an organisation, it is helpful to first formulate a clear objective. What is it exactly that needs to be achieved? Which steps can be realistically taken? How much time and resources can be dedicated to reaching that exact goal? How is success going to be measured and also maintained?

The first step is often neglected; but how can something be controlled effectively if it is not measured?

After understanding the difference between control and eradication, it becomes clear that the first course of action should be to gain a clear overview of the current situation. With this in hand, objectives for a strategic mycoplasma combat approach can be easily and realistically formulated.

Choosing the correct monitoring/ diagnostic tools and the interpretation of results is such a vast topic that it cannot be covered in this article. There are resources that detail how such monitoring concepts should be built up for the individual situation of producers.

If unclear on how to proceed further, advice from diagnostic, vaccine-producing or treatment-producing companies is often very helpful.

Continued on page 9

Continued from page 7

Second: Selection of tools and approaches

As previously mentioned, a plethora of tools exist. Some have advantages and disadvantages, for example vaccination and treatment. Others are necessities, for example biosecurity. All tools are going to be more successful if used in the right combination and, of course, the right order.

Mycoplasma synoviae can also cause infectious synovitis in chickens and turkeys. Such affected birds have difficulties in getting sufficient feed intake and egg production may be affected.

● **Treatment:**
Antibiotics are an essential part of a strategic mycoplasma control approach. Sadly, this valuable tool has been used rather indiscriminately in the past and consequently has lost some of its effectiveness. In addition, research into antibiotics has not been at the forefront of current scientific interest. However, alongside older compounds, more recent treatments with favourable antibiotic resistance profiles and no influence on palatability exist.

The use of antibiotics for prophylaxis has been justifiably reduced by many government bodies worldwide. Treatment, however, is different from prophylaxis. Many rules have been established to facilitate a clear distinction between the two approaches.

In the case of mycoplasma, the justification of treatment by means of antibiogram (isolation) is difficult to achieve.

Mycoplasma take a very long time to grow. It is therefore often necessary to also rely on other means of diagnosis to understand the necessity for treatment, such as molecular biology and serology as well as clinical signs.

Treatment and vaccination can work well together. In high challenge situations we frequently see that protection conveyed by MG and MS vaccines wane even before mid-lay is reached.

A live vaccination in production is rarely an option. Treatment is an option when mycoplasma levels get high and are threatening to cause more than slight mortalities, production losses and, very harmfully, vertical transmission.

Live vaccination is usually done between 5-12 weeks of age in pullet flocks, but what happens if vertical transmission occurs, and a pullet flock is positive before that time? Here again treatment is a viable option.

To give a practical example: medication at 50 weeks in layers may be necessary if flocks have been live vaccinated around 5-12 weeks of age.

How can we justify treatment at that point? A combination of the following factors: a sudden increase in the ELISA titers plus apparent mycoplasma-like symptoms in that flock should open your eyes and alert you to an increase in mycoplasma in the vaccinated flock.

Furthermore, sequencing can help you to identify which strains are prevalent in the flocks and give an indication if displacement of the field strain by the vaccine strain has been successful in this flock.

It is essential to use an antibiotic of high and consistent quality – a compound that is well controlled and consistently adheres to the same standards. Preferably it should also demonstrate low resistance profiles through regular monitoring of in vitro susceptibility (minimum inhibitory concentrations (MICs)) testing conducted across the globe.

Although evaluating resistance in the face of an acute MG or MS outbreak is very difficult, doing regular investigation of resistance levels has the clear advantage of understanding the overall development of resistance in a region. As resistance mechanisms are complex, it is important to understand their full extent. The market age of a compound for example is important, as resistances have been more likely developed over time.

The chicken has a clear preference for not eating too much of something it does not like. Hence, palatability needs to be a consideration when administering either a premix or water-soluble granule compound into the diet.

There are reports of reduced palatability of the feed ration with certain antimicrobials regularly used in the treatment of mycoplasma. Some treatments also exhibit incompatibility with Ionophores.

Given all the challenges of dealing with mycoplasma infections in poultry production, it is very reasonable and economical to consider responsible therapeutic treatment with effective antimicrobials with the added benefit of a zero egg withdrawal time in layers.

● **Vaccination:**
Live and inactivated vaccines that are currently used to control mycoplasma (MG and MS) have not been able to completely prevent the occurrence of mycoplasmosis in breeders and in commercial layers. The situation is further exacerbated by the increasing length of laying periods still being covered by the same unaltered vaccination schedules.

If vaccination is the only tool used to address mycoplasma in those situations, vaccine breaks from mid-production onwards (depending on the level of field challenge) may be encountered.

Here of course the extension of mycoplasma protection with antibiotic treatment may be a wise course of action. The scenarios described above specifically do not cover the many aspects of wrongful live vaccine administration.

Vaccination is one of the most appropriate tools to achieve control over a mycoplasma situation. However, it should be used wisely in conjunction with other tools, such as treatment with appropriate and modern antibiotics and with other biosecurity measures. Many tools can and should be used together.

As for every intervention, for the successful outcome of any vaccination a realistic objective must be formulated. Is it, for example, realistic to expect 100% protection when live vaccinating a diseased flock or when the administration technique used is inadequate?

In other words, vaccination must be done correctly, just as other tools must also be employed correctly. Of course, this is also true for treatment.

Just as there is an imminent danger in using antibiotics wrongly, there is also potential for disaster in using live mycoplasma vaccines incorrectly.

Live vaccines should not cause disease in vaccinated animals and certainly not cause disease in neighbouring flocks. Attenuated strains should not revert to a virulent form. Sadly, both have been reported for the most widely existing live mycoplasma vaccines.

Considering those practical examples, live vaccines may behave unpredictably, when administered in field situations. In deciding whether to use a live vaccine, producers should consider all the benefits, complications, and risks involved.

Vaccines are an excellent tool for a reason, but they must be used with care and attention to detail. Expectations regarding the outcome should be realistic and birds need to be free of disease when vaccinated.

Third: Evaluate your success regularly and respond appropriately

A strategy to combat mycoplasma not only needs to be effective, but the results should ideally also be long lasting. Therefore, one of the central questions is how diligently is success measured and, most importantly, how long can it be maintained?

Start off with a shorter monitoring frequency (for example monthly) to see how MG and MS levels are influenced by the chosen tools. Long term surveillance is also needed to evaluate how the corrective actions might secure results.

To monitor long term success and in the interest of overall cost monitoring, tools and frequency of use can later be changed to ELISA and the occasional PCR. It is always prudent to include hatcheries or packaging stations into surveillance concepts, especially in an early warning system.

Conclusion

Limited results may be achieved if only one method from the strategy to combat mycoplasma is available. By using the correct mycoplasma combat strategy, especially in high challenge MG, but also MS situations, vaccination and treatment together can achieve true control of a situation.

Treatment is by no means a thing of the past but has a firm place in every complete strategic approach to mycoplasma. It is vital to understand that high expectations of any single tool used in any strategic programme must be regarded with scepticism as the combination of multiple tools is usually the key to success. Biosecurity measures complete the picture and cannot be omitted, regardless of how repetitive discussion on biosecurity sometimes might feel.

Strategies should be formulated with a clear objective and realistic goals in mind to achieve success. Evaluation of the outcome of used tools over time by appropriate measures and corrective actions will ensure long term success. ■

References are available from the author on request