The Poultry Practice
POULTRY PRODUCTION PRACTITIONERS

NEWSLETTER

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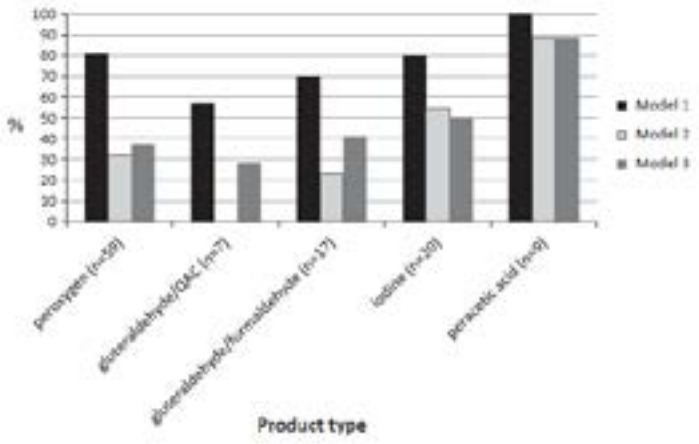
Do Bootdips Work?

WITH the advent of Avian Influenza outbreaks in South Africa, every one started to look more carefully at biosecurity. There was great concern about what pathogens can be walked into the house on peoples shoes and boots, and if boot dips really work. This reminded me of a 2015 paper that appeared in Avian Pathology on this topic and I thought I would share it with you.

In this study the authors tested over a hundred samples of boot dip wash (taken from working farms from the actual boot dip) for activity against Salmonella Enteritidis. They found that 83.6% of samples had anti-salmonella activity if there was no other organic material in the sample. They also looked had a test that mimicked how well the boot dip would penetrate the thin layer of organic material on the boot and in that test only 37.3 % of boot dips were effective, they then had a test which mimicked how well the boot dip would work if there were other organisms present and for that model they found that only 44.5% of boot dips were effective. Clearly, boot dips have some drawbacks and cannot be relied on to work 100% of the time.

WHAT CHEMICAL TO USE?

The authors in this study tested 18 different chemicals, including peroxygen, glutaraldehyde combinations with quaternary ammonium, and formalin, iodine combinations and peracetic acid.



The graph above shows the anti-salmonella activity done by the three methods of the different types of boot dip taken from 'Assessment of anti-salmonella activity in boot dip samples' by Rabie *et al* published in Avian Pathology 44:2 129-134.

As can be seen, the peracetic acid boot dip performed consistently well over the 3 methods. Glutaraldehyde quaternary ammonium combination boot

dips performed worst and peroxygen and iodine boot dip solutions were intermediate. (It is important to remember that all these samples were made up by farmers on their farms and this dilution could have been a real issue)

Each class of disinfectant has its drawbacks. The glutaraldehyde disinfectants are active at an alkaline pH and are not corrosive but are inactivated quickly by organic material. According to Rabie et al the recommended rates on the package material are too low and the concentration should be increased. Formaldehyde type disinfectants are easily inactivated by low temperatures. Peracetic and peroxygen disinfectants are inactivated by organic material. Iodine based disinfectants are known to be unstable but rapidly bactericidal at low concentrations and inactivated by organic material.

So what is the take home message about using boot dips?

- Whatever chemical is used, the amount of chemical needs to be carefully measured into a known quantity of water to achieve the correct dilution.
- Since most disinfectants are inactivated by organic material, placing a container of water and a boot brush to be used prior to the use of the active boot dip will enhance the effectiveness of the boot dip.
- Boot dips need to be changed regularly (mostly once a day)
- If the boot dip solution is cloudy, it is likely too contaminated with organic material and needs to be changed.
- Rain water will dilute the boot dip disinfectant and make it inactive
- Low and high temperatures will affect the effectiveness of the boot dip.
- Contact time is important in ensuring that a boot dip is effective. The boot must be in contact with the solution for a minimum period of time. (When shoes and sandals are used instead of boots, it is likely that the contact time is too low to be effective, which is why I recommend boots are used which can be fully immersed in a solution for at least 30s, using mats are also not advised for this reason, as there needs to be a contact with the upper part of the footwear and not only the lower part)

CONCLUSION

Although boot dips can be effective, there are many factors that affect the performance of boot dips. In high risk situations, consider having a change of foot-

wear at the door of the poultry house with dedicated indoor boots and outdoor footwear. Make sure the indoor and outdoor footwear are easily distinguished from each other. When using boot dips, the factors above must be taken into account.

The information discussed above is based on an article 'Assessment of anti-salmonella activity in boot dip samples' by Rabie *et al* published in Avian Pathology 44:2 129-134.

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SE IN EGGS

"Its not my fault, Bro" This was the response of the Australian egg farmer to an outbreak of Salmonella traced to eggs from his farm. And while there may be some truth in his statement, this is unlikely to satisfy sick consumers. In South Africa, a recent outbreak of Listeria nearly brought the pig industry to its knees and saw the WHO intervening to strengthen the investigative capability of the NICD in South Africa. This is likely to improve the response to other food borne outbreaks.

Although there are over 4000 types of salmonella that can cause outbreaks of foodborne disease, the only significant salmonella in eggs is Salmonella Enteritidis(SE). This is because SE often invades the ovary and oviduct and therefore will be found in the contents of the egg itself , as well as on the outside of the shell. Although other salmonellas can be found in the flock, it is less likely that they will result in contamination of the egg.

SO WHAT IS MY RESPONSIBILITY AS A PRODUCER OF TABLE EGGS?

Prevention of salmonella in flocks is essential since salmonella cannot be treated in such a way that the birds no longer shed the bacteria. Prevention involves implementing standard biosecurity. Flocks where there is a have high level of environmental contamination are more likely to have outbreaks of SE than flocks where there are lower levels. Sourcing chicks and point of lay pullets from flocks that are negative for salmonella is the first step. Pullets may be infected if the eggs from which they are hatched come from infected parent flocks. Do you check the status of your point of lay pullets?

Salmonella is ubiquitous and is found in soil, animals, water, dust, insects etc. Pullets need to be placed in a clean environment so they don't acquire the disease. Proper cleaning involves an effective dry clean to reduce the organic load, a wet clean with a degreaser and a disinfectant used at the right concentration as well as an effective decontamination of the water lines. Neglected areas for cleaning often involve water cups, light covers, the inside of electric boxes. Once the shed is clean, it is important to pay attention to rodent and insect control (you can request the TPP Cleaning SOP).

Mice are important biological vectors of SE and have been found to amplify an SE infection. SE survives in mice populations for up to 10 months and in mice droppings for 148d. Rodent control should include rodent proofing the shed, removing weeds and other debris from the apron of the house, using effective bait and monitoring of the area. Sheds with ceilings can be particularly challenging to keep mice out of. Insects especially flies, mites, litter beetles

can also be salmonella vectors. Effective treatments for these pests must be in place.

Since people can also carry SE, often without showing symptoms, basic hygiene for people working on a poultry farm is important. Ideally a system where all staff and visitors shower in is important but failing that, the use of overclothes that are kept on the farm as well as regular washing of hands and or the use of sanitiser will be effective. Equipment should be disinfected before being allowed into the sheds.

A number of highly effective live vaccines consisting of genetically modified SE can be administered to young poultry to prevent infections. The use of probiotics, prebiotics to encourage the so called good bacteria can also be placed in the feed or water to prevent SE from becoming established in the gut.

HOW DO I KNOW IF MY FLOCK IS INFECTED?

You can test either the flock or the eggs. At present, the SE testing is driven by the supermarket chains and often involves testing of eggs. It is quite difficult to detect SE in eggs as the infection is seldom found in more than 10% of eggs in an infected flock. This SE still presents a risk to the consumer as the SE present initially in small numbers will multiply to larger numbers if the eggs are stored in certain conditions or for long periods of time. If eggs are to be tested, a minimum of 1000 eggs should be tested per flock. The poultry veterinarians of South Africa recommend that environmental swabs be taken in early, mid and late lay to assess the risk of salmonella. Environmental swabs are very sensitive samples and are taken from the pit or the belt in the poultry house in a controlled manner. Dust samples can also be taken (you can request the TPP SOP on sampling for SE).

Salmonella infections are likely to become more important in South Africa as the infection in humans is better detected and traced. Farmers need to be more proactive when it comes to Salmonella in layers.

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PRACTICAL REVIEW OF COCCIDIOSTATS

INTRODUCTION

Coccidiosis is one of the most economically important diseases in broiler production. It occurs wherever broilers are farmed, and it is fair to say that all broilers will be affected in some way or other. The life cycle of coccidiosis is well described, but for the broiler producer it is important to know that oocysts are produced during this cycle. These oocysts are excreted by the birds and will survive in the environment for a very long time. Oocysts are also resistant

to all the common disinfectants used, making eradication of the disease virtually impossible. One must rely on medication or vaccination to control the disease.

There are many good reviews of the available coccidiostats, their chemical classification, structure and function. This review does not aim to duplicate that, but rather give a practical review on the use of coccidiostats based on experience.

The views expressed in this review are my own. Exclusion of a discussion on certain products does not imply that they are not important or efficacious. Vaccination as a means to control coccidiosis will be discussed in a future article.

THE IMPORTANT SPECIES OF COCCIDIA IN BROILERS

Eimeria acervulina

This occurs in the duodenum and first part of the jejunum and is clinically seen as small white spots or stripes. The lesions occur from as early as 16 days and only affects the tips of the villi, it might be present for only 2-3 days, and thereafter the only lesion that will be seen is an inflamed intestine. The economic impact of *E acervulina* is variable.

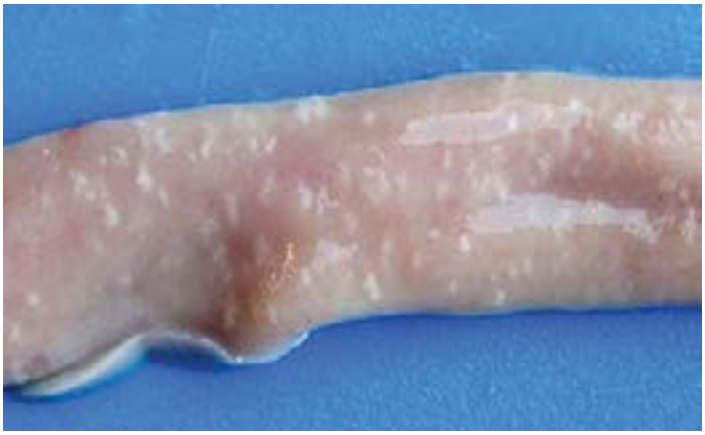


Fig.1 E acervulina

Eimeria maxima

Lesions produced by this organism are seen as red dots, and because it extends deep into the intestinal mucosa, it can be seen from the outside as well. This species is economically important and is currently the dominant species that is seen on most broiler farms. Severe infection with *E maxima* often leads to pale birds.

Fig.2 E maxima

Eimeria tenella

Lesions occur in the ceca, and the typical signs of blood is well known. It can lead to significant mortality.

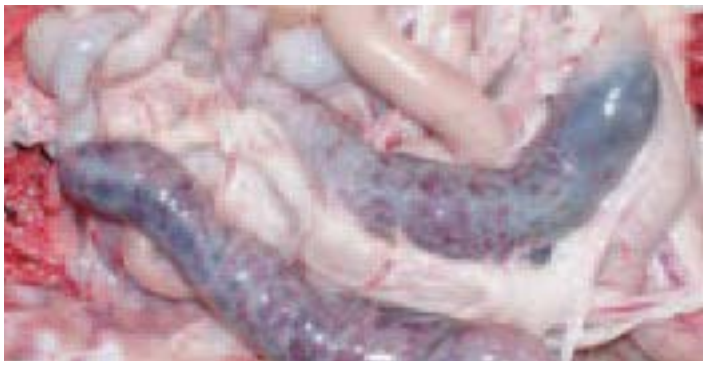


Fig.3 E tenella

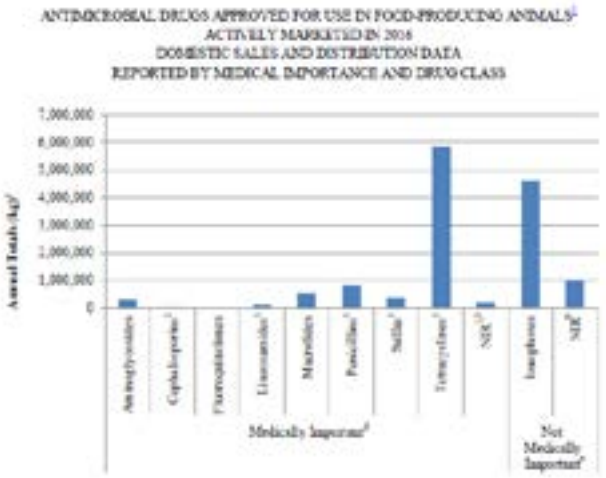
Other species

E mitis, E mivati and *E preacox* do occur but are less recognized species. *E necatrix* and *E brunetti* typically occurs in longer living birds e.g. breeders and is seldom seen in broilers.

PRACTICAL USE OF COCCIDIOSTATS IN BROILERS

The biggest volume of antimicrobials sold, apart from tetracyclines, are the coccidiostats (including both ionophores and chemicals). The data in the graph below comes from the FDA (2016) and although it is thus applicable to the USA, the same trend exist

in the rest of the world. The improvement in FCR, resulting in lower total feed consumption, as well as a strong move towards vaccination of broilers, might soon change that.



CHANGES THROUGH TIME

Most poultry veterinarian would agree that the prevalence of clinical of coccidiosis in broilers, as well as the impact of the disease on broiler performance, is not as severe as what it used to be.

E. tenella was a common finding in broilers 15 years ago but is rarely reported today. In my opinion, one of the main reasons for this is the younger processing age, as well as effective cleanout protocols.

PRACTICAL USE OF SOME OF THE COMMON COCCIDIOSTATS

ROTATION AND SHUTTLE PROGRAMS

Shuttle programs refers to the use of two products, typically a chemical and an ionophore, being used in the same flock. It was a popular strategy when broilers were processed at an older age.

Rotation refers to the rotation of products over time e.g. a product will be used for 3-6 months, and then be rotated with another product. Chemical products will typically be used between the rotation of two ionophore products.

MONENSIN

This molecule has been used in broiler production since the 1970's and is still widely used.

Soon after the introduction of monensin, a theory was put forward that it led to poor feathering. This was particularly seen in hot and humid areas. It was soon learned that feed intake was reduced by the molecule, and when low protein diets were fed this presented as poor feathering. This finding led to a cyclical use of monensin, with a preference for the colder months.

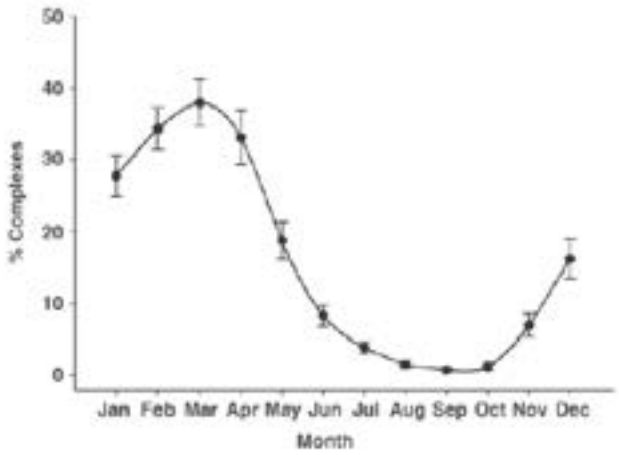


Figure 4. Monensin use in broilers in the United States during 2000 to 2009. The number of complexes using monensin in the grower feed was expressed as a percentage of the total number of complexes. Mean value ± SEM for each month is presented. Data from Agri Stats Inc., Fort Wayne, IN.

SALINOMYCIN

Salinomycin was introduced into broiler production in the 1970's and is still today one of the most common molecules found in coccidiosis control programs, mainly due to the low cost of the product. It does not appear to supress feed intake as much as monensin does and is therefore often used in summer.

LASALOCID

Lasalocid is a polyether divalent carboxylic ionophore, unlike salinomycin and monensin which are monovalent, and can therefor be used in rotational programs if resistance is suspected. It is well known to lead to wet litter, and the use of this molecule in winter is typically not advised.

DICLAZURIL

This chemical molecule was introduced on the late 1990's in RSA, and the initial responses were very good. Resistance however developed very quickly, and the use thereof became limited. Field experience showed that on had to wait for very long periods (up to 4 years) before the product could be used again.

NICARBAZIN

Nicarbazin was introduced as early as 1955 and is still widely being used today. It is well known that this product makes birds more susceptible to heat stress, and the use thereof in summer is avoided. This practice most probably preserved the efficacy of the molecule. It is a popular molecule used in combination with other molecules e.g. narasin, monensin or semduramycin.

SIDE EFFECTS AND TOXICITY OF COCCIDIOSTATS.

The ionophores have a very narrow margin of safety, and problems often occur in the field. The examples mentioned are based on practical experiences.

One of the most common non-lethal side-effects is reduced weight gain to due higher than normal inclusion rates. Poor mixing can lead to certain portions of a batch of feed containing high levels of coccidiostat, weighing errors are not that uncommon either.

Adult birds are more susceptible to ionophore toxicity, and we have seen disastrous consequences when broiler feed was accidently fed to breeders.

Coccidiostats can also have adverse effect on egg production and hatchability, one of the worst cases I had seen was where lasalocid was included in a broiler breeder ration to control coccidiosis. Hatchability dropped to 10% due to male infertility, damage the testis were permanent, and the flocks had to be culled.

Nicarbazin is well known to cause white eggs, as well as reduction in hatchability. The use of 0.5% nicarbazin in a feed can be used as population control for pigeons around mills.

The interaction between ionophores and tiamulin is well described, but sometimes still happen. Some years ago, tiamulin was included in broilers rations, and it worked well when non-ionophores were used. The mill decided to change the coccidiostat to monensin, unaware of the interaction, with disastrous consequences. There was complete feed refusal, most of the mortality was due to cannibalism and not toxicity.

WHY DO COCCIDIOSTATS NOT WORK

Resistance to ionophore coccidiostats does not develop quickly, we can still use them effectively after many decades, but they need to be looked after. *The following factors could be reasons for reduced efficacy;*

- Incorrect inclusion rates, particularly due to poor mixing.
- High infection pressure due to improper cleanout. Particular attention should be paid to the dry cleaning as disinfectants are not effective. Application of lime to the floors is a very good method to assist in the control of coccidiosis.
- Low feed intakes, with the current FCR's this is something that one should keep in mind, original dose rates were calculated on significantly higher intakes.

SUMMARY

Coccidiostats play a very important role in broiler production, one cannot imagine where we would have been if it had not been for them. Careful consideration should be given to the molecule selected for the time of the year, as well as the duration for it is to be used. A routine monitoring program should be used to ensure that efficacy is maintained.

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