A Drop in the Ocean!

With rising costs of production it is important to ensure that all areas of your production system are working efficiently. Some medications can be expensive, so it is vitally important that, when required, antibiotics are used correctly and in a cost efficient manner to reduce the need for further treatments.

Medication of poultry is generally achieved by delivering the medication through the feed or through the water system. In this series of articles we will explore the advantages and disadvantages associated with each method of delivery to free-range poultry and consider what producers can do to improve treatment protocols and responses to treatment. In this article we will look more specifically at water application of medication.

Key to effective delivery of medication is ensuring that the birds actually receive the recommended therapeutic dose. Dose rates are usually published by pharmaceutical companies in milligrams per kilogram (mg/kg). This dose rate represents the amount of active therapeutic ingredient (in mg) which must be delivered to each kg of bird bodyweight. Thus accurate dosing of medication requires a very accurate record of how much the birds are eating or drinking, how much the birds weigh, and the dose rate and concentration of the particular medication in question.

Fortunately the antibiotics, wormers and dietary additives available to free-range producers have a wide safety margin meaning that the drugs are relatively safe to the animal and as such dose rates are given in mg/kg.

So how do we calculate an accurate dose rate?

Lets imagine that following post mortem examination your 41 week old flock has been diagnosed with an infectious condition and you have been

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recommended to treat them with an antibiotic. This particular antibiotic comes in a liquid formulation which is designed to be delivered through the water and is intended to be dosed at 25mg/kg of bodyweight per day. If we wanted to dose the birds at this rate the minimum amount of information required would be the number of birds in the flock, the average weight of the birds and how much they drink in 24 hours.

So, in this example if we imagine that there are 12000 birds in the flock and they weigh 1930g each (target for this particular layer at 41 weeks) we would need to administer 579000mg of Tiamulin in 24 hours:

12000 birds
x
1.93kg bodyweight
x
25mg/kg bodyweight
=
579000 mg
total daily dose

Fortunately this particular product is relatively concentrated with 125mg per ml of product and so the total volume required is 4632ml per day:

579000 mg
total dose
÷
125mg/ml
drug concentration
=
4632ml treatment
volume/day

Next we need to know how it is recommended that the product is delivered to the birds. Some antibiotics work best if they are delivered in a high

An accurate assessment of bodyweight will lead to more precise dosing

dose over a short period of time. This allows for a high concentration of antibiotic to be achieved in the individual animal however it may result in some birds not receiving a therapeutic dose and other receiving a much higher dose depending on when in the day each individual bird chooses to drink, and its position within the pecking order in the flock. Other antibiotics are best delivered in a continuous fashion throughout the day so that there is a more consistent level of antibiotic within the birds. Other factors which affect how the required dose of medication is administered across the day includes the palatability of the product and the solubility of the product. Poor palatability or poor solubility will both reduce the concentration at which medication can be delivered.

In this example, lets say that the drug should be administered continuously throughout the day. Therefore this flock would require 4632mls of product to be included in their daily water provision for 5 days. If the birds are drinking approximately 210L per 1000 birds per day this would equate to a total water consumption of 2520L and thus 4632 mls of product need to be added to 2515L:

Water consumption:

210L/1000 birds x **12** (thousand birds)

=

2520L/day

2520L of water consumption - **4632ml** of treatment

=

2515L of drinking water to which the treatment must be added

An accurate assessment of bodyweight will lead to more precise dosing

The figure I have used in this calculation (of 210L drunk per 1000birds per day) is a very rough approximation which your vet may use in the absence of any more accurate data however it is important to realise that water consumption can be very variable. In very hot weather water consumption will go up. In very wet weather it will go down as free-range birds start drinking from those delicious muddy puddles just outside the pop-holes. Water consumption can also change with different diets, the presence of the antibiotic product in the water, water temperature and if the birds are diseased (which is presumably why you need to treat them in the first place!). So whilst the 210L per 1000 birds may be a good rule of thumb, if you want to ensure that your birds are getting the correct dose of medication over the correct time frame it is important that you use accurate bird weights and accurate water consumption records in your calculations.

How do we deliver this medication? Having worked out the dose rate, the next step in the process is to consider how you are going to combine the necessary volume of product with the necessary volume of drinking water.

Broadly speaking you have 3 options here:

1. You can just mix the product into the header tank.
2. You can mix up a stock solution and use an in-line medication doser.

3. You can use an active medication doser to mix the neat product into the drinking water.

Water-powered dosers are a common method of administering medication

When applying treatment through the header tank, it is important to remember that the birds should receive a consistent concentration of antibiotic throughout the day. This is achieved by turning off the water supply to the header tank, determining how much water is within the tank and applying the necessary volume of product to the tank. There are several problems with this approach to treatment. The first is that you header tank is unlikely to hold an entire days water supply (in this case 2520L) and so you will have to calculate how much water is in the tank, what proportion of the days water this represents and then measure out the correct amount of product. The second problem here, is that you will then have to check the water level within the tank very regularly to prevent the birds running out of water. When doing this it is important to realise that water consumption may vary significantly during the day. Most flocks will drink more first thing in the morning (although there are variations between flocks) and you will have to check the water level very regularly to ensure that sudden increases in water consumption do not leave the birds running dry. The third issue is that header tanks are, by virtue of mother nature, positioned high-up and access to them can be difficult and hazardous. This may make administration of the product into the tank, monitoring the tank, and post-treatment cleaning particularly difficult. Also, once the tank has nearly run dry it can take a very long time to refill.

Using an in-line medication doser is a more common practice. The doser uses the water pressure to drive a little pump which clicks up and down sucking medicated water from the stock solution and delivering it into the water lines. The doser is not powered by electricity but by the flow of water. When medicating in this way it is important to realise the limitations of this equipment. The first is that they are generally only accurate down to concentrations of 1%. What this means is that for every 99ml of water which passes from the header to the drinker lines, 1ml of the medicated stock solution is added. From our previous example we can see that we wanted to add 4.632L of product to 2515L of drinking water. If we used the product in its neat form, set to 1% the doser would administer over 25L of product and so when using these dosers the medication product needs to be diluted down to create a stock solution which can be sucked up and added to the drinking water over the entire day. Using our previous assumption that the birds are drinking 2520L per day, if we were using an in-line doser set to 1% this would mean that 99% of the birds' drinking water would come from the header tank (2494.8L) and the remaining 1% would come from the stock solution (25.2L).

2520L water consumption
x
0.01 (ie 1% of 2520)
=
25.2L (the volume of stock solution)
25.2L total stock solution
–
4.632L (treatment volume)
=
20.57L of plain water to which the treatment is added

We already know that we wish to provide the birds with 4632mls of product and so the stock solution needs to be made up by mixing 20.57L of plain water and 4632mls of product:
Once we have mastered the calculations required to determine how to mix up your stock solution we next need to turn our attention to the practical matter of whether the product in question will dissolve in such a small volume of water. Some products will readily dissolve in a few litres of water, others are much more stubborn and may precipitate to the bottom of you stock solution bucket. In East Anglia we struggle with particularly hard water and we find that solubility can be a particular issue. Depending on the chemical formulation of the product in question you may be able to improve solubility by altering the pH of the water.

For some products you may need to increase the pH (make the stock solution more alkali) and for others you may need to reduce the pH (make the solution more acidic). When altering the pH of drinking water you must be careful to make the correct alteration for the product concerned and ensure that the resulting water is neither too acidic or too alkali so as it may cause damage to the birds, the treatment or the equipment. Generally I would recommend that this kind of change is done in close consultation with your vet.

Finally when using an in-line water dosers it is important to remember that there are no electronic parts, it is a mechanical gadget like granddad's watch and its accuracy and longevity will depend on regular maintenance and calibration. Active medication dosers are similar to in-line dosers except that they are actively powered and controlled by electronics which allows them to be accurate down to much lower concentrations (often 1 in 5000). When liquid medications are being used (as in our example) a narrow pipe can be placed directly into the neat product and a small volume of the treatment is added to the drinking lines in a continuous manor. As with the other methods of dosing there are several issues. Firstly you will have to perform further calculations to determine the rate at which the product needs to be added (in this case approximately 1:500). Secondly when using products which are powders that need reconstituting with water you may run into the same solubility issues described previously and finally the narrow pipe work and small mechanism in these machines can make them prone to becoming blocked. As before, maintenance and regular cleaning is essential.

I think that is probably enough maths for this month! In summary, achieving therapeutic doses when treating free-range poultry depends on accurate measurements of bird weights and water consumption followed by accurate calculations to make the best use of dosing modalities available.

Next time we will look at cleaning the water lines after treatment.

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