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How to be successful with water medication

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Introduction

This is the first of a series of articles on how to optimize water medication.

The primary focus of farm management should be to prevent disease. However, if animals are unwell it is crucial to start treatment as soon as possible.

A treatment method that is being used more and more with increasing farm size is water medication. Water medication is relatively easy and has major advantages as long as it is carried out in a proper manner. First of all, with water medication you can start treatment within hours of a disease being detected. Secondly you can quickly change the antimicrobial according to the outcome of sensitivity tests in the lab. In short, water medication allows you to follow the four principal rules of responsible use of antimicrobials: treat the right animals at the right time with the right antimicrobial and with the right dose.

In order to be successful with water medication you need good water quality, a proper drinking water system and products that have the right formulation (Fig1).

Figure 1 Requirements for successful drinking water medication.



Drinking water quality

Drinking water should have good bacteriological (total bacterial count and the number of coliform bacteria) and chemical quality. It is important to check the water quality at least two times per year. Take samples at different points and include high risk areas like header tanks, the sick bay and the last nipple in any compartment.

Water quality can show significant regional differences so one should not rely on general data.

Besides microbiological quality, water hardness and pH are of specific importance for water medication as they have a direct impact on solubility and stability of medication. Hard water can also

cause deposits of calcium (scaling) in the pipes which can lead to reduced diameter. This can result in reduced water intake and incorrect dosing.

Ions like calcium and iron can form complexes with some antimicrobials (e.g. tetracyclines), so high levels should be avoided.

Also, high levels of iron or manganese can give the water an bad taste.

Drinking water system

To ensure sufficient supply of drinking water and correct administration of medication the drinking water system should be well designed and properly installed. Some key points to pay attention to:

- When using water from a local well adequate water treatment is often necessary.
- The system should have a separate line for medicated water ("double system") so medication can be given by compartment and not just for the whole barn.
- PVC is the preferred material for the piping and the pipes should be of the right diameter, installed as straight as possible without unnecessary bends (bends cause turbulence that promotes deposits and biofilm).
- Regular maintenance of the drinking water system is very important as well as cleaning and disinfection.

When installing or renovating a drinking water system it is recommended to involve a company that has a lot of expertise in animal drinking water systems.

Quality products

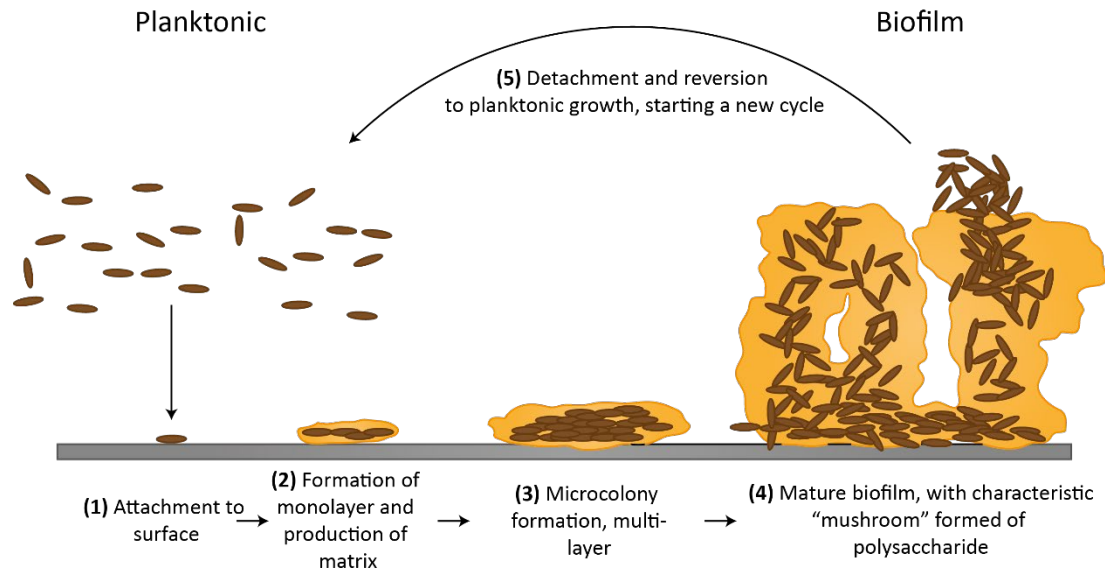
For drinking water medication you need products that dissolve well and that are stable in solution. Also water medication products should be suitable for use in water with different hardness and buffering capacity. Products without lactose and with an optimal balance between solubility and stability should be preferred for water medication.

By using such products you can achieve the correct concentrations at drinking nipple level quickly, while reducing waste and ensuring the swift recovery of the animals. Also labor cost for preparing solutions or dealing with clogged nipples will be reduced.

Lactose free

In water bacteria are always present, mostly in low numbers. However, they can multiply very quickly when products with sugars (e.g. lactose) are added to the water. This will result in biofilm (Fig 2), a slime similar to tooth plaque. Biofilm can clog nipples and it can contain pathogens. Also the microorganisms in biofilm can produce enzymes that degrade antimicrobials, which might reduce the efficacy of a treatment.

Figure 2 Biofilm



Solubility

In itself some antimicrobials (amoxicillin, trimethoprim) do not dissolve very well in water, but this can be improved by adding buffers to create the right pH (acidifiers or alkalifiers).

Stability

Once the product is dissolved the active ingredient of course has to stay active for a sufficient amount of time. This is again depending on pH of the solution. Because pH can change over time due to exposure to oxygen in the air it is important to have sufficient buffering capacity in the solution. When buffering capacity is too low in doxycycline solutions the pH will increase within 24 hours leading to sedimentation (Fig 3).

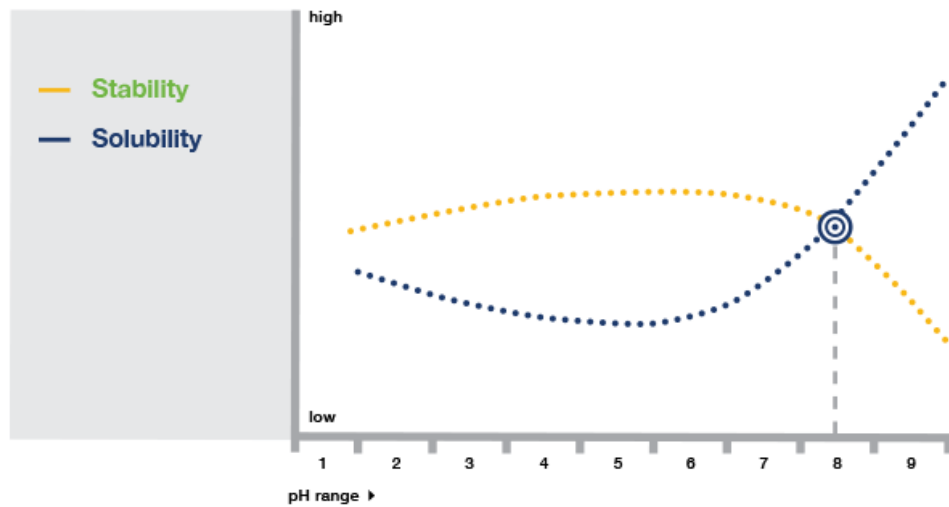
Figure 3 sedimentation of doxycycline within 24h when pH is too high.



Optimal balance

Unfortunately the pH required for the best solubility and the best stability are not always the same (Fig 4). For example solubility of amoxicillin can be increased significantly by increasing the pH, but then stability will decrease. At high pH the amoxicillin solution will remain perfectly clear but the active ingredient will completely disappear within hours.

Figure 4 optimal balance amoxicillin



Practical use

These products can be used in water with pH between 5 and 8 and hardness up to 20° dH. They are able to generate and maintain the right pH for the active ingredient for at least 12 hours because of the buffers included. This guarantees maximum efficacy with minimal waste.

Finally it is important to calculate the dose correctly. Always use the dose in mg or ml of product per kg body weight and the actual water intake. Water intake varies with temperature, disease and feed composition (salt!), so it is recommended to install water meters per compartment to avoid under- or overdosing.

For correct dosing visit calculator.solustab.eu

Conclusion

Water medication is relatively easy and has major advantages as long as it is carried out in a proper manner. It is possible to be successful with water medication by using good water quality, a proper drinking water system and products that have the right formulation. In the next article we have a closer look at water quality and the drinking water system.