

Vaccine administration techniques – drinking water

The success or failure of vaccination depends almost entirely on how the vaccine is administered. Here, Intervet's poultry veterinary adviser, Dr. Tibor Cserep provides an in-depth look at the most widely used method - administration of live vaccines via drinking water.

Mass application techniques for live vaccines are preferred by today's large poultry operations. The goal for mass vaccination is the same as for individual bird vaccination: to deliver a minimum of one dose of live vaccine to each bird.

Application in drinking water offers the advantages of lower labour costs, minimal bird stress and stimulation of good mucosal immunity. Gumboro, for example, is one disease that is best controlled through vaccination in water. Products for its control include Nobilis D78 or Nobilis 228.

The two biggest concerns or possible disadvantages of this method are inadequate vaccine distribution, which can leave some birds receiving little or no vaccine, and inactivation of the vaccine before it reaches the birds.

Incomplete coverage of the flock through inadequate distribution can also result in post vaccinal reaction and/or 'heating up' of the vaccine due to repeated bird-to-bird transmission.

Prevent inactivation

Vaccine inactivation can be prevented by ensuring rapid administration and by protecting the virus from inactivating agents that may be present in the water and water lines. Rapid administration can be facilitated by a number of methods. Submersible pumps can be connected to both bell drinker and nipple line systems, which 'push' the vaccinated water through the lines very quickly helping to distribute the vaccine evenly.

Each bird must have sufficient drinker space to drink enough of the vaccinated water in 2-3 hours. Nipple drinkers are associated with less water wastage and also less social competition for drinking sites. Where bell drinkers are used, it may be necessary for additional drinkers (*for example, plastic trays*) to be installed for the period of vaccination.

The vaccine can also be inactivated by impurities or additives in the water system. Cleaning products such as chlorine, ammonia compounds, or acidifiers such as citric acid, and residual sediment in the water lines and in the filters can all inactivate a vaccine. Checking the quality of the drinking water on a regular basis is a wise precaution.

A chlorine level as low as one ppm may inactivate the vaccine. Skimmed milk powder (2g per 100 litres) can be used to neutralise the detrimental effect of chlorine or other

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sanitisers in the water. Oxygenated water has a strong antimicrobial effect, so oxygenating systems should be switched off at least 48 hours before vaccination.

In-line water filters should be removed or bypassed before vaccination, as slime and dirt build-up can concentrate undesirable disinfectants and minerals on the surface of the filter, which may inactivate the vaccine. Thorough cleaning of drinkers on the morning of vaccination (avoiding the use of disinfectant) is also advisable.

Efficient distribution

Correct distribution and effectiveness of a vaccine can be influenced by the physical properties of the drinking water installation. For example, some systems are difficult to drain and can retain substantial volumes of chlorinated water in their 'dead spaces'. If drinker lines are not drained before vaccination the residual water in them can neutralise a vaccine and slow down its distribution - birds at the top of the shed may consume enough vaccinated water while those at the bottom of the shed may receive none. It is therefore essential to allow birds to drink only after the drinker lines have been completely drained and then primed with vaccinated water.

Some additional factors that also affect the outcome of water vaccination include the age of the bird, the amount of water consumed and the time of day the vaccination is given.

Vaccinating birds younger than three weeks old needs to be done with extra care because the intake of water in such young birds can be irregular. As well as age, breed, type of feed, ambient temperature, length of water withdrawal time, lighting programme and the type of drinker system all affect water intake.

The most effective way of determining the actual volume of water that will be required is to perform a 'trial vaccination' a day or two before the real one. This will also detect and rectify any flaws in the delivery of the vaccine.

Withdrawal time

Once the correct amount of water has been established, it is essential that this is consumed within 2-3 hours, before the vaccine starts to degrade. This is influenced by water withdrawal time.

Water should be withheld from the birds for a period of time prior to vaccination. The length of time depends on several factors such as the type and age of the birds, and climatic conditions. Trial results suggest that the ideal length of water withdrawal for vaccination of broilers is 1-1 ½ hours. However, ambient temperature must be carefully considered because if birds are made excessively thirsty they will fight for water, leading to uneven uptake and spillage of vaccine.

Vaccination early in the morning is recommended since this is the time when birds will exhibit peak activity and therefore peak water consumption.

The four common methods of delivering vaccines through water are directly pouring vaccine solutions into drinkers, using overhead gravity flow tanks, pumping vaccine solution from a mixing tank (power flush) or delivery through a proportioner.

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Steps for drinking water vaccination

As delivery systems vary from farm to farm the following guidelines should be used as a guide to developing a SOP (Standard Operating Procedure) for vaccine administration.

One or two days before vaccination	Day of vaccination (<i>for vaccination of broilers on nipple system with header tank</i>)
<ul style="list-style-type: none"> • Keep vaccine refrigerated. • Observe expiry date, batch number and type of vaccine and record them. • Read manufacturer's recommendations on the insert label. • Check the health status of birds and only vaccinate healthy birds. • Make sure there are no sanitisers or acidifiers in the water system. Remove all medications, acidifiers and sanitisers at least 48 hours before vaccination. • Calculate the dead space in the system and include extra vaccine for it. • If you use header tanks for vaccination clean them if needed and check water levels. • Record water meter readings for the time period you intend to vaccinate. • If in doubt do a trial vaccination using dye or milk as an indicator. • Prepare clean utensils (measuring jug, stirrer, bucket, watering can, scales etc.). • Wash troughs or bell drinkers with clear water without any disinfectant or sanitisers. • Test run submersible pumps if you intend to use them. • If you do not use a header tank, fill 	<ul style="list-style-type: none"> • Turn off the main tap to the drinker lines, let the birds 'drink the lines dry' and then raise the drinkers. Fill up the header tank with the volume of water required for two-three hours. Shut down water supply to the header tank. If header tanks contain too much water for the vaccination drain the tanks till the required volume is reached. • Mix the skimmed milk into the water in the header tank to achieve a 2% solution (<i>two litres of milk into 98 litres of water</i>). • Dim the light and drain the water lines to get rid of residual water in the system. • Prepare the right type and amount of vaccine for vaccination on a clean surface, free of residues of sanitizers or disinfectants. • Mix the vaccine in a jug or bucket of milky water by opening the vials under the water. Rinse the vials of vaccine several times to ensure there is no vaccine left in the vials. • Pour the vaccine solution into the header tank and mix it thoroughly. • Prime the drinker lines with vaccinated water and let the milk-stained water reach the far end of each line. • Close the end valves of the lines and lower the drinkers to bird level.

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<p>up plastic bins/containers with the required amount of water the evening before vaccination.</p> <ul style="list-style-type: none">• Ensure adequate amount of skimmed milk powder or liquid skimmed milk are available.• If you use a proportioner, a separate proportioner should be used for vaccination only.• Plan timing and other details to avoid failure on "D-day".	<ul style="list-style-type: none">• Increase light intensity and activate feeders.• Walk along the drinkers and encourage birds to go to the feeders and drinkers.• Check drinkers for any blockage or leakage.• Ensure the main tap of the water system is reopened just before the header tank runs dry to prevent air locks.• Rinse utensils used for preparation and administration with plenty of water. Do not use any sanitiser or disinfectant for this job!• Dispose of vaccine vials following waste disposal guidelines.• Store dry utensils in sealed plastic bags in a clean area of the farm.
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These steps and principles can be adapted for any drinker system. Careful planning and testing will enable the establishment of a farm specific vaccination protocol that can be adhered to by existing and future farm staff.

However, although vaccination via drinking water would seem to be the least labour intensive, it is certainly not the simplest and fastest method if done correctly!

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The following list of precautions will help to ensure that time and effort spent vaccinating your flock is not wasted:

- Live vaccine viruses are quite stable so long as they are in freeze-dried form and stored in the fridge. However, they are particularly susceptible to exposure to:
 - Ultraviolet light: avoid exposure to sunlight.
 - Heat: avoid prolonged exposure to high temperatures.
 - Heavy metals: don't use utensils or drinking water containing these. Use plastic buckets or containers for vaccine reconstitution.
 - Chlorine: Do not administer vaccines in drinking water containing chlorine
 - Disinfectants and detergents: make sure that all utensils are free from traces of these.
 - Organic matter (litter, feed etc): make sure that all utensils and drinkers are clean.
 - Moisture: don't use the contents of damaged vials and only break the seals on the vaccine vials when you are ready to use them.

When administered correctly, modern vaccines like Intervet's Nobilis D78 or 228E can be very effective. However, vaccination by any method is unlikely to achieve 100% protection. It is possible to overwhelm the immunity of a flock when the infection pressure is high, for example, if cleanout is inadequate following an outbreak of gumboro disease. It is therefore imperative to implement comprehensive bio-security and hygiene measures in addition to vaccination.