Commercial chicken vaccination: part 3 – injectable administration

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The two most common vaccine administration routes used for commercial chicken flocks – sprayed aerosol and drinking water – have been covered in part one (VT46.16) and part two (VT46.21) of this article.

This final part will discuss use of injectable vaccination, looking at common pitfalls and the main anatomical locations for injection.

All inactivated (killed) vaccines, whether licensed or autogenous, are given via an injectable route – IM or SC. The convenience and efficiency of hatchery operations, plus the naïve immune status of day-old chicks, makes this an ideal place to administer injectable vaccination alongside the aerosol counterparts.

The majority of modern day hatcheries use automated vaccination equipment for delivery of SC Marek’s disease vaccine. This, however, hasn’t totally replaced the need for IM or SC vaccine at later stages in the bird’s productive life.
**Equipment**

Automated machinery needs to be calibrated before use to ensure each bird receives the required dose (0.1ml to 0.5ml), with fresh, sterile needles inserted at the right position.

Equipment, such as handheld vaccination guns, should be tested before use and completely sanitised. Some vaccinators are self-sanitising through biocidal sleeves or sponges.

Needles should be replaced every 500 birds or with each new vaccine vial. Day-old chicks tend to be injected SC in the neck region, where a dyed or emulsion-based vaccine can be visualised (Figure 1). The alternative location would be into the musculature of the leg, although this has close association with nerves and tendons, and can be difficult to achieve, even in adult birds.

Injectable vaccines should be stored between 4°C and 8°C (or according to manufacturers’ guidelines) and removed from the refrigerator 24 hours prior to use, allowing them to reach room temperature. The injection of a cold, oily substance at 4°C into the muscle of a 41°C bird can be extremely painful and stressful – a welfare consideration often overlooked.

Various automatically reloaded syringes are available – these should be used with an 18-gauge or 19-gauge quarter-inch or half-inch needle to allow easy passage of the injected substrate and are easier if pre-warmed as recommended. It is important to ensure all the dosage has been injected into the bird before withdrawing to maintain even and uniform vaccination.

It is necessary to regularly check the vial and replace needles. Poor accuracy can not only blunt needles, but also be traumatic or fatal if vaccine is injected directly into the bird’s liver.

**Administration**

Methods of vaccine administration include:

- in-ovo (in the egg embryo)
- day of hatch (SC)
- inactivated vaccines (IM/SC)
- wing web

**Sites**

Various sites can be used for vaccine injection.

**Breast**
Figure 2. When administering IM vaccine into the pectoral muscle, locate the most forward point of
the keel bone and the shoulder joint, then inject into the third point of an equilateral triangle in the
deepest part of the muscle. This route is often
used in small animal practice for off licence antibiotic therapy.

Locate the most forward point of the keel bone and the shoulder joint, then inject the vaccine into
the third point of an equilateral triangle into the deepest part of the pectoral muscle (Figure 2).
Avoid the thinning, peripheral region of the muscle where it is possible to inject through into the
liver.

Thigh

Ensure the limb is immobilised and take care to avoid major vessels, tendons and nerves. Contact
with, or penetration into, the bone can cause an osteomyelitis.

Wing web

Remove feathers from the wing web and inject using a two-pronged needle into the centre of the
web, avoiding major vasculature.

Wing muscle

Inject into the underside of the wing and direct the needle towards the body.

Tail head

Direct the needle into the underside of the pygostyle, towards the side of the tail bone and in a
cranial direction.

**Neck**

Raise a flap of skin at the base of the neck, avoiding major structures (such as vertebrae and the spinal column). Inject parallel into the skin fold.

**Inguinal skin fold**

Inject the vaccine into a pocket of skin created by lifting the skin connecting the abdomen and the thigh.

**Leg muscle**

Inject into the external side of the gastrocnemius muscle, around midway between the stifle and the tarsus. Direct the needle upwards towards the head, avoiding nerves and joints.

**In-ovo vaccination**

Vaccination of a 17-day to 19-day-old embryo while still within the egg is a relatively new development made possible due to highly sophisticated automated equipment that requires complex management for repeatable and hygienic performance.

The method ensures each embryo receives an equal dose, allowing an enhanced level of immune protection from the first day of life, but carries the risk of parental introduction of pathogen material.

**Common pitfalls**

With injectable vaccination, hygiene is essential as inoculation of a bird with a contaminated needle will lead to disease.

All equipment should be properly maintained and sterilised before each vaccinating session and regular needle changes will reduce the incidence of contamination. Disposable equipment will help maintain high hygiene standards.

Rushed or inappropriate vaccine delivery will reduce vaccine uptake and efficacy. Common errors include withdrawing the needle too soon, depressing the syringe plunger on withdrawal or using a needle with an insufficient diameter and length. Vaccine delivery into an inappropriate muscle or at an inappropriate temperature will predispose to an adverse vaccine reaction and tissue trauma.

**Series conclusion**
It is possible to quantify vaccine success by measuring the antibody titre in blood samples post-vaccination.

A high titre of antibody with low individual variation denotes the ideal result. Production of antibodies against a vaccine can take two weeks to three weeks. There is value in obtaining antibody titres pre-vaccination to establish a baseline titre – again at two weeks post-vaccination and then at four weeks.

The staged collection of blood samples allows for interpretation of immune response over a time period, throughout which antibody titre should continue to raise, assuming successful vaccination.

Vaccinations are an effective tool in disease control and prevention, but are not a replacement for poor management and inadequate biosecurity. Several factors need to be considered when employing a vaccination strategy for the purposes of practicality, repeatability and vaccination success.

Injectable vaccination can be labour-intensive when used in adult birds, but simple and effective with the proper equipment in day-old chicks. Stringent hygiene and correct technique are paramount when opting for injectable vaccination.

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- **Commercial chicken vaccination: part 1 – spray and aerosol usage**
- **Commercial chicken vaccination: part 2 – drinking water administration**

**Further Reading**