Commercial chicken vaccination: part 1 – spray and aerosol usage

Author : William Garton

Categories : General, Vets

Date : April 25, 2016

ABSTRACT

Vaccination has enabled the poultry industry to develop to the scale it is today, through effective control of infectious disease. This development has led to greater stocking densities, higher welfare and control of prevalent diseases.

Vaccines are the most commonly administered veterinary medicines in poultry production. The productive life of laying hens is increasing – from the standard 72 weeks to 74 weeks, up to 80 weeks to 90 weeks – to match higher welfare pressures found across the continent. Furthermore, the national flock (approximately 36.4 million) has never been greater, highlighting the size of the industry and the importance of disease control.

The past year has demonstrated the vulnerability of the UK poultry industry to infectious, notifiable disease, with outbreaks of avian influenza. While no viable commercial vaccine for avian influenza exists, control of other infectious diseases that impact on health, welfare and egg production remain paramount.

Vaccination is core to successful commercial pullet rearing operations (**Table 1**) and a pillar in their health and welfare. Several routes exist through which mass vaccination can be easily and successfully achieved. This article outlines the main administration routes used in commercial pullet rearing – sprayed aerosol vaccines (part one), vaccines administered via drinking water (part two) and injectable vaccination (part three).

Several routes exist through which mass poultry vaccination can be easily and successfully achieved.

Figure 1. Spray vaccination of day-old chicks is possible at the hatchery or once they arrive at the farm. Spray 30cm to 40cm above the chicks in delivery boxes, aiming for even and complete coverage.

Spray or aerosol vaccination is both cost-effective and efficient for large numbers of birds, regardless of their life stage.

By administering a live respiratory vaccine through an aerosol, we can be sure the vaccine reaches the mucosal lining and Harderian gland of the upper respiratory system when the bird inhales, allowing the development of local immunity (**Table 2**).

Licensed vaccines administered by spray or aerosol are available for the following diseases:

- infectious bronchitis
- *Mycoplasma gallisepticum*
- Newcastle disease
- avian rhinotracheitis (pneumovirus)
- coccidiosis (droplets are ingested rather than inhaled)

Spray vaccinating day-old chicks

Hatchery vaccination will be delivered through vaccination chambers or inline automatic sprayers. The chambers, also known as cabinets, vaccinate one crate of chicks at any one time and are manually operated.

Automatic spray vaccinators work on conveyor belts and use a flat, fan-type spray. Both should offer an even mist of a coarse spray (100 microns to 300 microns) at a fixed pressure over the chicks, which need to remain moist for 10 minutes to 15 minutes. Chicks should only be transported once dry.

The irregular drinking of young chicks means administration of vaccine by spray is preferred over vaccines given through the drinking water. When vaccinating day-old chicks on farm, keep boxes away from heaters and spray 30cm to 40cm above the boxes (**Figure 1**).

Spray uniformly and ensure all chicks are covered. Allow 15 minutes for the chicks to dry before tipping out into the building.

Table 1. An example of a standard pullet rearing vaccine programme, showing the number of vaccines administered to pullets and the different routes used prior to the onset of lay

Age	Disease	Route
Day 0	Marek's disease	Injection at hatchery
	Infectious bronchitis M41	Spray at hatchery
Week 1/7 days	*Salmonella enteritidis, Salmonella typhimurium*	Drinking water
Week 2/14 days	Infectious bronchitis 793b	Drinking water
Week 3/18 days	Infectious bursal disease (gumboro)	Drinking water
Week 4/25 days	Infectious bursal disease (gumboro)	Drinking water
Week 5/35 days	Infectious bronchitis M41, Newcastle disease	Drinking water
Week 6/42 days	*S enteritidis, S typhimurium*	Drinking water
Week 7/49 days	Infectious laryngotracheitis	Spray
Week 9/63 days	*Mycoplasma gallisepticum*	Spray
Week 10/70 days	Avian rhinotracheitis	Drinking water
Week 11/77 days	Infectious bronchitis M41 and 274, Newcastle disease	Drinking water
Week 12/84 days	Avian encephalomyelitis	Drinking water
Week 14/98 days	*M gallisepticum*	Spray
Week 15/105 days	*S enteritidis, S typhimurium*	Water
Week 16/112 days	Infectious bronchitis virus, Newcastle disease, egg drop syndrome, avian rhinotracheitis	Injection on transfer to laying unit

Table 1. An example of a standard pullet rearing vaccine programme, showing the number of vaccines administered to pullets and the different routes used prior to the onset of lay .

Table 2. Factors affecting successful spray vaccination	
Droplet behaviour	Droplets can settle or evaporate after emission. Consider spray pressure and nozzle size.
Impact of droplet size	Smaller droplets (<100 microns) remain suspended in the air and travel further down respiratory tracts. Coarse droplets (>100 microns) settle around upper respiratory tract.
Water quality	Use cool, fresh, distilled water free of minerals or chlorine, which can reduce the liveability of vaccine. Water stabilisers can protect the vaccine virus. Ideal temperature 8°C to 20°C.
Climatic conditions	Group birds together by dimming lights, closing popholes and reducing temperature. Turn off radiant heaters and ventilation during spraying.
House layout	Divide the house in 2m to 4m strips and draw up a spray route prior to vaccinating. Attempt to cover as many birds as possible by walking around twice and spraying 30cm to 40cm above their heads.
Vaccination site (hatchery/farm)	Day-old chicks in boxes at hatchery sprayed uniformly with automatic sprayers, or on farm with pressurised spray – ensure even and total coverage.
Vaccinator experience	Factors such as technique, height of spray relevant to bird and frequency of vaccination should be consistent. Adequate training is essential to success.
Equipment	Reliability of automatic sprayers in hatchery production line. Cleanliness, including disinfectant free of pressurised spray equipment or charge of battery or electric powered sprayers.

Table 2. Factors affecting successful spray vaccination.

Table 3. Characteristics of coarse and fine sprayers

Coarse sprayers: recommended for hatchery, day-old, first Newcastle disease and infectious bronchitis vaccination and for birds in production

Type	Droplet size	Advantages	Disadvantages
Knapsack sprayer	60 microns to 300 microns 50 microns to 1,000 microns	Extendable lance to reach all birds, changeable and adjustable nozzles	Requires regular pumping to maintain pressure
Spray chambers and inline conveyors	100 microns to 200 microns	Even fan spray coverage, part of hatchery production line	Must calibrate spray to chick box, excess moisture can chill chicks
Cage sprayers	Dependent on nozzle	Quick for cage setups, changeable nozzle	Spray may not reach birds at back of cage

Fine sprayers: smaller droplets allow the vaccine virus to penetrate further into the respiratory tract

Type	Droplet size	Advantages	Disadvantages
Controlled droplet application	Uniform size 70 microns to 100 microns	Small volume of water required, battery-operated (no cables)	Must charge battery regularly – low battery slows fan speed, uneven bird coverage with small water volume
Fogger/ atomist	20.50 microns	Electric and flexible nozzle, droplet size adjustable with air flow	Noisy, requires electric cable

Table 3. Characteristics of coarse and fine sprayers.

Spray vaccinating older birds

Figure 2. Knapsack-style sprayers create a coarser droplet size – typically 50 microns to 1,000 microns – although this can be adjusted with the type of nozzle. This image is a demonstration and not representative of internal building conditions required for spray vaccination.

Vaccination of older birds is based on the type of sprayer used. They range from simple handheld sprayers to sophisticated, motorised equipment with multiple nozzles.

Coarse sprays are suited to younger birds and offer reliable immune activation. Fine spray will remain suspended for longer and travel deeper into the bird's respiratory system (**Table 3**).

Some adverse vaccine reactions or insufficient vaccine uptakes are seen in flocks with concurrent *M gallisepticum* infections. Observe birds closely during vaccination to avoid smothering.

Types of aerosol spray vaccinators

Aerosol or controlled droplet application

“Spray fans” (**Figure 2**) have a spinning fan that produces small droplets (70 microns to 100 microns) and propel the vaccine 3m in front of the fan and approximately 1m either side.

Vaccinators should use drinker or feeder lines as a guide to ensure adequate coverage of the flock. Always start with a fully charged battery to avoid voltage changes affecting fan speed and particle distribution.

Electric foggers and atomists

Foggers or atomists tend to produce a finer, more uniform particle size (30 microns to 60 microns). These fine particles are readily inhaled by the birds, but – particularly in conditions of low humidity – the aerosol will tend to dry out quickly.

Pressurised spray equipment

Figure 3. Handheld fans use battery power to aerosolise water-soluble vaccines. They produce particles 70 microns to 100 microns in width and can propel up to 3m.

Pressured chambers with hydraulic and adjustable nozzles can vary in droplet size (50 microns to 1,000 microns). The range in particle size limits the amount of vaccine birds will receive and the spray should be administered 30cm to 40cm from the bird’s head. Examples include the knapsack sprayer (**Figure 3**).

Conclusion

Success of spray vaccination depends on correct vaccine selection and appropriate selection of vaccinating equipment. Uniform droplet size and even flock coverage are the main objectives when spray vaccinating poultry. The volume of water used and the quality of it will influence vaccination

success, as will environmental factors.

Acknowledgement

The author would like to thank MSD Animal Health and Alastair Johnston of The Minster Veterinary Practice poultry department for use of images.

- Commercial chicken vaccination: part 2 – drinking water administration
- Commercial chicken vaccination: part 3 – injectable administration

Further Reading

- Cobb-Vantress (2013). Vaccination procedure guide, www.cobb-vantress.com/docs/default-source/management-guides/cobb-vaccination-procedure-guide---english.pdf
- Cserep T (2002). Datafile: drinking water vaccination, Intervet Poultry Division, www.gumboro.com/downloads/english/watervaccination.pdf
- Defra (2014). National statistics: latest poultry and poultry meat statistics, www.gov.uk/government/statistics/poultry-and-poultry-meat-statistics
- Ferndandez A (2008). Drinking water vaccination – a few simple rules, Ross Tech Notes, September.
- Pattison M, McMullin PF, Bradbury JM and Alexander DJ (2008). Poultry Diseases (6th edn), Elsevier, Philadelphia, US.
- Responsible Use of Medicines in Agriculture Alliance (2006). Responsible use of vaccines and vaccination in poultry production, www.ruma.org.uk/poultry/responsible-use-vaccines-vaccination-poultry-production-2
- Wyatt Poultry Health Services (2015). Vaccination strategies and application of vaccines, poultry health course.