

NEWCASTLE DISEASE PREVENTION

MANAGEMENT

Sound management practices aid in disease prevention. Proper management of air quality through correct ventilation and litter management contribute to respiratory health. It also reduces avenues of pathogen entry. Where possible, cleanup and disinfection of problem farms can reduce losses. Newcastle disease (ND) is susceptible to common disinfectants. Knowledge of, and adherence to biosecurity procedures can aid in reduction of disease-causing organisms. Control of infectious bursal disease (IBD) by proper vaccination is the basis for prevention of losses from any infectious disease. Failure to control IBD will make any vaccine ineffective.

There are regulations in some VVND-free countries to help prevent outbreaks of severe ND in commercial poultry. Isolation and quarantine reduce the risk of exposure to exotic birds being imported from VVND areas. While not eliminating ND, these laws decrease the chance of exposure to VVND.

TREATMENT

There are no specific treatments effective against viruses; prevention via vaccination is the only practical way to handle them. It is common to give antibiotics to reduce secondary bacterial invaders like *E. coli*. Antibiotic selection is not critical but should be tempered by regulatory constraints such as withdrawal times. Vitamins and electrolytes are an important part of supportive therapy.

VACCINATION CONSIDERATIONS

Prior to implementing a vaccination program, there are several considerations to be taken into account.

1. What level of immunity is necessary for economic flock protection?
The consistency and level of field challenge strains need to be considered. The best vaccination program is minimal, yet still protective.
2. How reactive is the vaccine?
Some strains are not appropriate for young, unprimed birds. Others are not appropriate via the aerosol route. The pathogenicity of ND strains may also be related to the number of virus passages in chicken embryos. However, highly embryo-adapted strains may be poor immunogens. The pathotype should also be considered. Mesogenic virus will produce more reaction than lentogenic viruses. This increase reaction leads to improved immune response and greater

protection. In areas with a severe challenge, mesogenic virus vaccines may be appropriate.

3. What is the immune competence of the bird?

High levels of maternal antibodies (MA) can interfere with vaccination. Vaccinating in the presence of high MA results in the development of protective local immunity, while the development of high levels of circulating antibodies may be depressed. For ND, maternal antibody half-life is 4.5 days, and HI titers in excess of 1:8 interfere with primary live vaccination. Knowledge of the maternal immune status of a flock is necessary for planning a vaccination program.

4. What does serological monitoring reveal?

A flock with high residual antibody from priming vaccination cannot be properly boosted. Adjustments in timing of boosters can be made. Also, serological monitoring helps identify instances where field challenge may have altered the timing of a vaccination program.

5. What are the chances of reaction?

Consider vaccine reactivity. That information, plus recent disease history and environmental information (season of year, air quality, impending disease), will aid in predicting how severely a flock may react to vaccination.

Respiratory vaccine viruses are capable of spreading from chicken to chicken through respiratory secretions. Depending on the attenuation of vaccine virus, spread can occur from several days to several weeks following vaccination. As the virus is shed, a susceptible bird picks it up, begins shedding, another susceptible bird picks it up, and this continues on. Such terms as "rolling reaction", "cycling vaccine" and "circulating vaccine virus" are commonly used to describe this situation. Clinically, this is seen as continuous respiratory vaccine reactions.

Several management practices may account for a "rolling reaction". First, eggs from several breeder flocks are often mixed. These breeder flocks pass different levels of MAB. Therefore, the chicks become susceptible to vaccination at different periods of time. If vaccinated early, the chicks with moderate and high MA levels will not respond to vaccination. As MA depletes, these birds become susceptible and may receive a dose of vaccine virus from another chicken. Second, if vaccination itself is not done correctly, all birds may not receive a dose. As vaccine virus passes from chicken to chicken, the pathogenicity of this virus may increase ("heats up"). A vaccine will not likely heat up in one broiler or pullet grow out. However, on mixed-age farms the virus may continue to pass in another flock. Also, in broiler houses with a quick turn around on built-up litter, the virus may survive to infect the next flock. More highly attenuated viruses are less likely to revert to virulence. Through proper timing and technique, this will not be a problem.

In order to be effective, a vaccine must be invasive. However, it should not cause permanent damage. This is done by balancing the pathogenicity of the vaccine with the MA or circulating (active) antibody. MA has a protective effect

towards vaccine reactions.

Vaccination schedules for ND are usually a progression from less pathogenic to more pathogenic strains and less invasive application method to more invasive method. Generally, schedules should not progress to a more invasive method of application and a more pathogenic strain of vaccine in one step. In cases where a more pathogenic strain and a more invasive method of application are used, severe reactions may result.

6. What other vaccines are in the program?

Other respiratory vaccines should not be given within a week, before or after an infectious laryngotracheitis (LT) vaccination. ND and IB can interfere with each other. Several ND-IB combination vaccines are available. Studies show no interference. This does not mean that interference may not exist in other unstudied combinations. In other words, it is not advisable mix a ND vaccine with a IB vaccine. Instead, use approved combination products.

7. What diseases are present in the flock?

Mycoplasma gallisepticum (MG)-infected flocks react more severely to respiratory disease vaccine administration. Aerosol application of LaSota strain to MG positive chickens results in unacceptably severe reactions. Historically, high levels of ND or IB on problem farms necessitates moderation of vaccination strains and administration routes. Mycoplasma synoviae (MS)-infected flocks may react more severely. The less attenuated vaccine strains may cause more severe reactions in MS (+) birds.

Infectious bursal disease (IBD) affects vaccination of IB and ND two ways. When birds are infected at less than three weeks of age, B-lymphocytes are destroyed and ability to manufacture circulating antibodies is reduced. IBD may also indirectly affect the ability of the Hardarian Gland to mount an immune response. This gland (located behind the eye, on the beak side) is responsible for local antibody production. The bursa populates this gland with B-lymphocytes during the first ten weeks of life (a large percentage during the first 3-4 weeks). These B-lymphocytes produce local antibody in response to intraocular challenge of ND virus (field or vaccine). This local antibody production is independent of MAB interaction. After an IBD infection, there is a lack of B-lymphocytes to "seed" the Hardarian gland.

8. How Does the Environment Affect the Vaccination?

Housing, air and water quality should be evaluated along with management abilities. Air that is low in ammonia and low in dust or particulates, helps improve success of aerosol vaccination. Remove disinfectants from water and add one part skimmed milk to 400 parts of vaccine in softened water to maximize the success of water vaccination. The duration of adequate titer of ND in water under ideal conditions is two hours.

A few general recommendations for water vaccination include:

1. Discontinue medications or sanitizing agents 24 hours before vaccination. Do not

- resume until 24 hours after final consumption of vaccine water.
2. Use non-chlorinated water.
 3. Water starve approximately two hours. Vary this according to environmental temperature. Vaccine should be consumed in one hour but not more than two.
 4. Follow mixing instructions using cool, nonchlorinated water and dried milk.
 5. Add dried milk first. Allow approximately 10 minutes before adding vaccine.

VACCINES

Live attenuated Newcastle disease vaccines are available for use in broilers and breeders. Lentogenic vaccines are widely used and are usually either the B1,B1 or B1,LaSota strains. B1, B1 is very mild. It is used in areas with low challenge or for primary vaccination. LaSota produces more reaction, a stronger immune response and better protection. Roakin strain is a mesogenic strain. It is useful in areas where VVND is a problem. Live vaccines produce both local immunity and circulating antibodies. Live vaccines can be administered by the intraocular method (IO), coarse spray (CS), drinking water (DW) or wing web (WW). When using lentogenic strains, IO gives the highest level of immunity followed by CS and then DW.

Live vaccines are helpful in controlling ND in all areas of the world. Antibodies against ND live vaccines begin to develop five to seven days post-vaccination. Peak antibody response occurs three to four weeks after vaccination. The duration varies depending on whether it is a primary or secondary vaccination, whether the chickens are fully immune competent, the degree of boost from field exposure and other factors. Properly boosted chickens maintain protective immunity for approximately two months. If there is a heavy field challenge, boosting every six weeks should be considered. When a live vaccine is given at one day of age to birds with MA, it should not be considered a primer. Local immunity will develop and help protect the flock against ND challenge, but when birds are revaccinated there will not be a boosting effect. Birds should be revaccinated at 10 to 14 days of age. This vaccination can be considered a primer and later be followed by a boost vaccination at 21 to 28 days of age. The immune response (secondary response) to a boost vaccination will be greater than the primer vaccination. Protection will also be improved with boosting. Generally, allow at least 21 days between live ND vaccinations due to residual antibody interference with live vaccines. Serologic monitoring can aid in more precise timing.

Almost all killed vaccines contain LaSota strain. There are a few companies that use other lentogenic viruses or mesogenic viruses. There is no advantage to using mesogenic or any particular lentogenic virus since there is only one serotype of ND. Furthermore, mesogenic is a live virus term. Once ND virus is inactivated it is "non-genic". What is important is the amount of virus added to the vaccine. Virus titer determines the amount of protection the vaccine will provide.

Killed vaccines must be given by injection. Subcutaneous (SQ) injection into the neck is the most common used method in broilers. In breeders, intramuscular (IM) injection into the breast, thigh, wing or tail head can be used as well as SQ in the neck. Antibody response begins about ten to twelve days after vaccination and peaks approximately four to six weeks later. Although the immune response is slower than with live vaccines, the response is greater and long lived. Two live primes followed by a killed vaccine results in a tertiary (third degree) response. Killed ND vaccine-induced tertiary responses are needed when a long duration of immunity without boosting is desired. Since boosting during lay has an adverse effect on egg production, killed vaccines are advantageous in layers and breeders. Under field conditions, immunity could last beyond 48 weeks because of re-exposure to field virus. In broilers, the use of killed vaccine

during the first week of life in combination with live vaccines helps protect the flock in high challenge areas.

VACCINATION PROGRAMS

Vaccination programs will vary according to local conditions. No single program is appropriate for all situations. Variations must be made for each area and disease challenge situation. The following are examples of programs that would work in various situations where VVND is a problem. They are described for discussion purposes only. Follow label directions for timing and route of inoculation.

BREEDERS

Age	Type of Vaccine	Method of Vaccination
1 day	B1,B1	IO
14 day	LaSota	Water
6 week	LaSota	IO
12 week	LaSota	IO
18 week	Killed	IM
	or:	
1 day	LaSota	IO
14 day	LaSota	IO
5 week	LaSota	IO
10-12 week	Killed	IM
18-20 week	Killed	IM

* live boosting through out production with live ND may be needed in

high challenge areas.

BROILERS

Age	Type of Vaccine	Route
1-7 Days	Killed	SQ
	LaSota	IO
14-18 Day	LaSota	IO

There has been an increase in the use of killed ND vaccine in VVND high-risk areas. Some protocols in layers and breeders call for administration at three weeks of age. Others suggest multiple killed vaccine injections in breeders during production. In some areas where there is VVND, regional surveys classify areas as high or medium risk. This is done to aid in designing effective vaccination programs. It allows targeting high-risk areas for special effort. The idea is to reduce cycles of exposure to velogenic strains and make economic production feasible.