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Popular Article

Vaccination in Poultry

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Abstract

Livestock and poultry farming face significant threats from diseases impacting economic development, food security, and trade. Protecting these animals and birds, particularly in countries like India, is crucial for combating hunger, malnutrition, and poverty. Focusing on chickens, vaccination emerges as a pivotal factor in maintaining productive health. Vaccines, categorized as live, killed, or recombinant, play a vital role in preventing a range of diseases, contributing to individual and herd immunity.

Introduction

Small holdings, commercial and emerging livestock and poultry farmers, are all vulnerable to the ravages of disease in terms of livelihood and food security and it can further impact the economic development, food security and trade of the country. Protecting livestock against diseases and preventing their spread is one of the important aspects to fighting hunger, malnutrition and poverty in a developing country like India.

Chicken is the most abundant bird globally, with a population exceeding 23 billion at any given moment. These birds are primarily raised for commercial meat production. They are the bird species that are most heavily immunized since their existence depends on human management.

Vaccination is an important factor in maintaining the productive health of poultry. However, vaccination cannot replace effective management but still vaccination have significantly reduced the impact of some important diseases or is an effective method of preventing a wide range of animal diseases. The vaccine is effective in lowering clinical sickness, but exposed birds still run the risk of becoming unwell and shedding pathogens. The best method of protection is vaccination done before an infection strikes a flock. Vaccines are designed to stimulate an animal's immune system to produce antibodies that will inactivate pathogens.

A vaccine is defined as a preparation of dead or weakened pathogens, or their antigenic components which induces protective immunity against the specific pathogen (micro-organism, tumour, toxin), but which does not itself cause disease. Birds are immunized with vaccines against three types of pathogens: bacteria, viruses, and parasites.

Importance of Vaccines:

- Protection of individual birds
- Herd immunity to break chains of transmission
- Safe and efficient food production
- Control of emerging, re-emerging and exotic diseases of animals and people
- Reduction of transmission of food borne disease
- Reduction of animal suffering
- Reduction in the need for antibiotics or more costly alternatives to treat animals

Types of Vaccines

Live or attenuated vaccine:

Live, attenuated vaccines contain a version of the living pathogenic microbe that has been attenuated or weakened by growing it in the lab so that it has lost its significant pathogenicity. These vaccines are created by passage of viruses or bacteria in an unnatural host or cell. As the live attenuated organism can still infect target cells, these vaccines can replicate and induce both cellular and humoral immunity. However, as these are live pathogens injected into the host there are always a risk that pathogen may revert back to full virulence or these vaccines may also cause local inflammation.

Killed or inactivated vaccine:

Vaccines that are "killed" or "inactivated" contain pathogens that have been chemically rendered inactive, either with or without the use of an appropriate adjuvant, in order to produce immunity while remaining incapable of causing or spreading the disease. A minor reaction to the adjuvant at the injection site draws in cells like macrophages, which trigger the immunological response. The immune system is not fully stimulated by inactivated vaccinations the way it is by

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live vaccine. Typically, vaccines that have been inactivated (killed) cover either viruses or bacteria. Immunity that is strong, consistent, and long-lasting is typically produced by killed vaccinations.

Recombinant vaccine:

Recombinant vaccines are those vaccines which are produced by utilizing the recombinant DNA technology. Recombinant vaccines introduce microbial DNA or antigenic protein into the host directly or by using an attenuated virus or bacterium. Recombinant vector vaccines closely resemble a natural infection and boost the immune system.

Table 1: Vaccination Schedule for Layer Chicken

Sr. no.	Disease	Age	Type	Route
1.	Marek's disease (MD)	0 day	Turkey herpesvirus and SB-1	S/C
2.	Ranikhet disease/ Newcastle disease (ND) + Infectious Bronchitis (IB)	5-7 days	Lentogenic (F/LaSota) + Massachusetts (live)	I/N or oral drop
3.	Infectious bursal disease (IBD)	12-14 days	Intermediate	I/O
4.	IBD (Booster)	22-24 days	Intermediate	I/O
5.	ND + IB	28-30 days	Lentogenic (F/LaSota) + Mass	I/O, D/W
6.	Coryza	35-37 days	Killed	S/C
7.	Fowl Pox	6^{th} Week	Modified live	I/M or wing web puncture
8.	Infectious Coryza (Booster)	9 Weeks	Killed	S/C
9.	ND	10^{th} Week	Mesogenic (R2B)	I/M
10.	IB	11-12 Week	Massachusetts	D/W
11.	Fowl Pox (Booster)	12 -13 week	Live	I/M
12.	ND	15^{th} Week	Lentogenic (F1/ LaSota)	D/W
13.	ND + IB	19^{th} Week	B1 or LaSota/Mass	D/W or aerosol
14.	ND + IB	40-45 Week	Killed	I/M

Note: I/N – Intra Nasal; I/O – Intra Ocular; D/W – Drinking water; I/M – Intra Muscular; S/C- Subcutaneous

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Table 2: Vaccination Schedule for Broiler Chicken

Sr. No.	Disease	Age	Type	Route
1.	Marek's disease	Day old	Turkey herpesvirus and SB-1	S/C
2.	Infectious bursal disease (IBD)	3-7 days	Leukert's strain + killed	I/O
3.	Ranikhet disease/ Newcastle disease (ND)	8-10 days	LaSota	D/W
4.	IBD	14-18 days	Intermediate	D/W or I/O
5.	Infectious Bronchitis	14–21 days	Massachusetts	D/W or coarse spray
6.	ND	28-30 days	LaSota	D/W or I/O

Note: I/O – Intra Ocular; D/W – Drinking water; S/C- Subcutaneous

Table 3: Vaccination Schedule for Broiler Breeder Chicken

Sr. no.	Disease	Age	Type	Route
1.	Marek's disease	0 day	Turkey herpesvirus	Subcutaneous
2.	Tenosynovitis	6-7 days	Live (mild)	Subcutaneous
3.	Newcastle /Infectious bronchitis	14–21 days	B1/Mass	Water
4.	Infectious bursal disease	14–28 days	Intermediate	Water
5.	Newcastle	4 weeks	B1	Water
6.	Tenosynovitis	6–8 weeks	Live (Mild)	Subcutaneous
7.	Infectious bursal disease	8–10 weeks	Live	Water or coarse spray
8.	Newcastle /infectious bronchitis	8–10 weeks	B1 or LaSota/ Mass	Water or coarse spray
9.	Encephalomyelitis	10–12 weeks	Live, chick-embryo origin	Wing web puncture
10.	Fowl pox	10–12 weeks	Modified live	Wing web puncture
11.	Chicken infectious anaemia	10–12 weeks	Modified live	Wing web puncture
12.	Laryngotracheitis	10–12 weeks	Modified live	Intraocular
13.	Tenosynovitis	10–12 weeks	Parenteral	Inactivated
14.	Fowl cholera	10–12 weeks	Inactivated Live CU, PM-1, or M9	Parenteral *or* Wing web

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15.	Newcastle/infectious bronchitis	12–14 weeks	B1 or LaSota/Mass	Parenteral
16.	Fowl cholera	14–18 weeks	Inactivated Live CU, PM-1, or M9	Parenteral or Wing web
17.	Infectious bursal disease	16–18 weeks	Parenteral	Inactivated
18.	Tenosynovitis	16–18 weeks	Parenteral	Inactivated
19.	Newcastle /infectious bronchitis	16–18 weeks	Water or aerosol	B1 or LaSota/Mass
20.	Newcastle /infectious bronchitis	Every 60–90 days or 18 weeks	Parenteral	Inactivated

Table 1, 2 and 3 serve as illustrations of common immunization schedules. Each programme is unique and takes into account the bird health, local environmental and housing circumstances, the difficulty of the task, the incidence of diseases, and expert judgement. The directions listed on the label of each vaccine must be followed exactly. Proper storage is crucial for all vaccines. They must be carefully stored in accordance with the manufacturer's recommendations and they must never be allowed to get hot. They should be reconstituted with the proper diluent and allowed to warm to room temperature before the immunization procedure starts. Before usage, automatic syringes need to be thoroughly sanitised, accurately calibrated, and verified for accuracy.

The following point should be considered to prevent their interference during vaccination:

1. **Passive immunity:** Primary defence comes from maternal immunity, which is a passive immunity that hens pass on to their chicks. If given too early, maternal antibodies may render the immunization ineffective in young chickens. After roughly 5 to 7 days, when passive immunity is at its lowest, it is preferable to administer the vaccine.
2. **Stress:** Stress has a negative impact on immunity, which can make vaccinations ineffective. Only immunise birds in a stress-free environment.
3. **Inactivation of live vaccine & spilling of vaccine:** The failure of vaccines may result from improper handling during shipment, storage, and administration. Live vaccines are disease agents that, in some situations, might lead to infection. Vaccine that has spilled or been left over must be neutralised with a powerful disinfectant since it become a source of disease to birds.

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4. **Birds' health status:** A sick bird's immune system is frail and cannot successfully withstand a vaccine. The vaccination of unwell birds may hasten the spread of disease.
5. **Temperature & Ventilation:** Birds' immune systems are negatively impacted by temperatures exceeding 30°C, thus only immunize birds during cooler times of the day. Improper ventilation causes a higher ammonia (NH_3) content in the chicken house, which results in immune-suppression and vaccination failure. Hence, there should be adequate ventilation.

Conclusion

In conclusion, safeguarding the health of poultry is paramount for ensuring food security, economic development, and poverty alleviation in countries like India. Vaccination plays a pivotal role in protecting individual birds, establishing herd immunity, ensuring safe and efficient food production, controlling diseases, reducing transmission of foodborne illnesses, minimizing animal suffering, and decreasing reliance on antibiotics. By prioritizing proactive vaccination strategies, we not only mitigate the impact of diseases but also contribute to sustainable agricultural practices and the overall well-being of both birds and humans.

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