Suggestions to prevent / control Respiratory Disease Complex in poultry

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Introduction

Today, respiratory disease complex has emerged as a great challenge to poultry industry. The complex comprises a group of diseases that consistently involve respiratory system and produce closely resembling symptoms. As a result, diagnosis of each disease, its differentiation from the others, their treatment, control and prevention have become extremely complicated and shrouded in uncertainty. The farmer is at a loss to understand what exactly he is dealing with unless he has recourse to sophisticated laboratory tests. However, such tests are beyond the reach of most farmers. But the question is why this situation now?

Ever since the arrival of avian influenza in our country in 2006, the overall picture of respiratory diseases in poultry has changed and become more complex. These diseases include **avian influenza** (particularly its low pathogenic form, **LPAI**), **Newcastle disease** (**Ranikhet disease**), **infectious bronchitis, infectious laryngotracheitis,** and **mycoplasmosis**. All involve bird's respiratory system and produce almost similar symptoms. Therefore, on the basis of symptoms alone they could not be diagnosed. The main problem, however, is that even on postmortem examination no specific lesions are seen that may help in arriving at an accurate diagnosis. This has added to the complexity of the problem regarding correct identification and differentiation of respiratory diseases, as there could be even mixed infections. In the absence of clear-cut diagnosis, proper preventive and control measures could not be implemented. The farmer then remains confused and frustrated, and is at a loss to understand such an unprecedented scenario. The problem of respiratory disease complex has thus emerged as a serious challenge for everyone associated with poultry, and indeed, for the industry as a whole. Here, an attempt has been made to suggest briefly ways and means to tackle the problem, minimize the losses, and keep diseases under control to safeguard poultry.

1. Avian Influenza

1. Maintain good immunity in the flocks against Newcastle disease (Ranikhet disease) by using good and effective live and killed vaccines. This is advised because of the structural similarity between avian influenza virus and Newcastle disease virus. Hence, good protection against Newcastle disease (ND) could be helpful against avian influenza (AI).
2. Prime the birds with the mildest ND vaccine such as clone or B1, and not LaSota. LaSota is an excellent and safe vaccine, but in the presence of complicating pathogens like low-pathogenic avian influenza virus (LPAI) and infectious bronchitis virus, or mycoplasma, it may precipitate mild to severe outbreaks of Newcastle disease.
3. Use of LPAI vaccine is recommended. LPAI may be prevented using good quality inactivated (killed) H9N2 oil adjuvant vaccine. Live vaccine is not used for fear of mutation of the vaccine virus. While using vaccines, manufacturer's instructions must be strictly followed to ensure best protection.
4. However, inactivated H9N2 vaccine has certain limitations in providing good protective titres. These are:
    - **i.** Vaccine will provide good protection only if vaccine and the field virus are antigenically same. Small differences between proteins of vaccine and challenge virus will reduce the efficacy of the vaccine. If they are completely different then no protection will occur and the birds will remain susceptible; and if they are only partially different, the partial protection will occur.
    - **ii.** As there is no priming with the live vaccine virus, protective IgA antibodies are not produced locally in the respiratory tract, the site of viral entry.
    - **iii.** Circulating neutralizing antibodies alone are unable to provide adequate protection at the respiratory epithelial level. However, the high levels of circulating IgG (5-7 HI tires), induced by the killed vaccines, may reach the tracheal epithelium and reduce colonization and growth of H9N2 virus. (**HI** stands for haemagglutination inhibition test).

      The use of inactivated H9N2 vaccine in commercial layers appears to provide good protection.
5. Vaccination of layer chicks with half dose at 7^{th} day and full dose at pre-lay and mid- lay has shown satisfactory results. Commercial layers/breeders can be vaccinated between 12-15 days, a second vaccination between 6-12 weeks and a thirds vaccination at 18 weeks to get the antibody titres of 5-7. However, this schedule can be modified based on the experience and virus challenge in the endemic area. In the commercial broiler chicks, protection levels achieved following vaccination during the first five days are doubtful. Vaccination with full dose between 12-14 days and repeated at 24^{th} day appears to impart good protection.

6. Chicks with higher maternal antibodies (MAb) against H9N2 perform better. This can be achieved by repeated killed vaccination in breeders.
7. However, biosecurity remains the first line of defence and must be strictly followed. Vaccination is no substitute for biosecurity. In fact, they are complementary to each other. One of the most important aspects of biosecurity should include regular use of disinfectants at the farm even when there is no threat of LPAI. Disinfectants must be used in the dosage recommended by the manufacturers. The use of effective disinfectants will guarantee good protection for the birds.
8. ***E. coli*** is the most common secondary bacterial invader in LPAI, and being very powerful, inflicts maximum damage. One of its best preventive measures is the use of acidifier. At the very start of an outbreak, continuous use of good and effective acidifier, both in water and feed, is very helpful in controlling ***E. coli*** infection. Organic acids ate more effective than inorganic acids in inhibiting their growth. In addition, acidifiers also reduce the adherence potential of ***E. coli***, ***Staphylococcus aureus***, salmonella, and ***Clostridium perfringens***.

   In broilers, besides feed, use acidifiers also in water during the 1st and 2nd week continuously, and from 3rd week onwards for 6-8 hours a day. In layers, use acidifiers for 2 days per week and in breeders 3-3days per week.

   Treatment of litter with acidifiers is also advised. Treatment with citric acid, tartaric, salicylic acids significantly reduces ***E. coli*** counts in poultry litter.

9. It will be a good policy to procure chicks free of mycoplasma. If this is not possible, ensure best protection of the flock against ***M. gallisepticum*** infection (mycoplasmosis, CRD) through good biosecurity, use of effective anti-mycoplasmal drugs, and best live and killed vaccines. A flock well protected against mycoplasma will be less prone to LPAI.

2. Newcastle Disease (Ranikhet Disease)

1. Maintain good immunity in the flocks against Newcastle disease using good and effective live and killed vaccines. This is particularly advised because of the close structural similarity between AI and ND virus. Thus good protection against ND would be helpful against AI.
2. Prime the birds with the mildest ND vaccine such as clone or B1, and not LaSota. LaSota is an excellent and safe vaccine, but in the presence of complicating pathogens like LPAI and infectious bronchitis virus, or mycoplasma, it may precipitate mild to severe outbreaks of Newcastle disease.
3. Biosecurity remains the first line of defence and must be strictly followed. Vaccination is no substitute for biosecurity. In fact, they are complementary to each other. One of the most important aspects of biosecurity should include regular use of disinfectants at the farm even when there is no threat of LPAI. The use of effective disinfectants will guarantee good protection for the birds.

4. It will be a good policy to procure chicks free of mycoplasma. If this is not possible, ensure best protection of the flock against ***M. gallisepticum*** infection (mycoplasmosis, CRD) through good biosecurity, use of effective anti-mycoplasmal drugs, and best live and killed vaccines. A flock well protected against mycoplasma will be less prone to ND, IB, LPAI, and ***E. coli*** infection.

3. Infectious Bronchitis

1. For killed vaccines to be effective, chickens must first be primed with a live vaccine. The efficacy of the killed vaccines depends on proper priming with a live vaccine.
2. Two or more applications of live vaccine should be given with different serotypes of infectious bronchitis virus in the later vaccinations. Incorporation of different serotypes is very important to obtain better protection.
3. In contrast to live vaccines, killed vaccines are not as effective at preventing infection of the respiratory tract.
4. An important aspect of vaccination is that protection is short-lived (about nine weeks). Therefore, it is advisable to vaccinate layers several times with live vaccines, with more than one serotype.

4. Infectious Laryngotracheitis

1. Eradication of infectious laryngotracheitis virus from poultry production sites appears possible due to its several biological properties. These properties include:
   - **i.** Its relatively slow spread,
   - **ii.** The high degree of host specificity,
   - **iii.** Fragility of its specificity outside the chicken,
   - **iv.** No egg transmission, and
   - **v.** Antigenic stability of its genome.

   The chicken is the primary host species and reservoir host. Wildlife reservoirs are either non-existent or of minor importance. However, backyard flocks are likely reservoirs of ILT virus. Therefore, any eradication effort would require identification and inclusion of these birds.
2. Laryngotracheitis virus strains are antigenically homogeneous. Therefore, a single ILT virus vaccine produces cross-protective immunity for all ILT virus strains.
3. However, an eradication strategy would depend on the provision of a genetically modified deletion vaccine and an appropriate ELISA to differentiate vaccinated birds from those infected naturally.
4. Eradication of ILT virus will require a change in the present ILT vaccination practices. This will require the replacement of conventional modified-live vaccines in vaccination programmes with vaccines produced by recombinant DNA technology. Vaccines produced by recombinant DNA technology induce protective immunity without development of latently infected carrier chickens.

5. Since vaccination can result in latently infected carrier birds, it should be used only in areas where the disease is endemic. A serious disadvantage of the live vaccine is the production of carriers, since it can become latent.

5. Mycoplasmosis

1. In mycoplasmosis, there is poor correlation between the levels of circulating antibody and protection. Therefore, after priming with a live vaccine, and followed after an interval by a killed vaccine, more attention should be given to incorporate effective anti-mycoplasmal drugs in the feed. Repeating killed vaccinations twice or thrice may not be helpful. This is particularly important for hatchery. Also, anti-mycoplasmal drugs should be changed periodically to avoid development of resistance.
2. Despite success in eliminating the disease in grand parents (GP) stock, ***Mycoplasma gallisepticum*** persists in broiler breeders and broilers in many areas.
3. However, combination of live and killed vaccines and anti-mycoplasmal drugs is helpful in keeping the disease under control.
4. Stringent biosecurity is extremely important in the prevention and control of the disease.
5. Good management by ensuring good ventilation, no overcrowding, and good nutrition are very helpful.
6. It is strongly emphasized that ***M. gallisepticum*** must be controlled at all cost. Because if this is not done, apart from inflicting the damage on its own, the disease will also act as a great predisposition to ***E. coli***, Newcastle disease, and infectious bronchitis viruses.

Conclusions

The use of vaccines in the prevention and control of respiratory diseases of poultry has its limitations, mainly because of the erratic and changeable nature of the pathogens. That is, their unpredictable behaviour! On the other hand, management, biosecurity and treatment too have their limitations, mainly because of the development of resistance against disinfectants and drugs, and lapses in the management. The technical skill and expertise, therefore, lie in striking a right balance between the two. That is, use of vaccines on the one hand and implementation of management, biosecurity, and treatment on the other.

It is about time the industry realizes theses hard facts and ponders over how powerful is the enemy and where lie our weaknesses.

Meanwhile, the never ending tug-of-war between the pathogen and the host continues!

Research and development must surpass to safeguard the future!
