

Chapter 7

Poultry Hygiene and Disease Prevention

Ahsan-ul-Haq and Tanveer Ahmad[†]

Abstract

Poultry hygiene and disease prevention is of utmost importance because healthy poultry birds ensure more production and profit margins. However, vaccination and medication is done as and when needed to save birds from lethal diseases. In this way poultry birds are saved from viral, bacterial, protozoal diseases. Feed of good quality is used to avoid mycotoxins which hinder bird's performance.

Keywords: Vaccination, Preventive measures against Viral, Bacterial, Parasitic Diseases, Feed Poisoning

7.1 Vaccine and Vaccination

A vaccine is A suspension of live attenuated or killed organisms (bacteria, viruses, parasites), which stimulate immune responses to prevent infections. Vaccines used in poultry are of two types. Live vaccine usually contains one antigen and may be administered by spray (aerosol), drinking water, eye drop (Ocular) or in some case by injection. Antigen may be either disease organism, which has been attenuated (made less virulent by some suitable means e.g. IB H120) or a naturally occurring mild strain of the organism (e.g. IB Strain of ND). Killed vaccine consists of concentrated antigens combined with an oil emulsion or aluminum hydroxide {Al(OH)₂}. They give high and prolonged level of immunity, especially when use

[†]Ahsan-ul-Haq

Institute of Animal Sciences, University of Agriculture, Faisalabad, Pakistan.
E-mail: deanhaqfah@gmail.com

Tanveer Ahmad

Faculty of Veterinary Sciences, PMAS Arid Agriculture, University, Rawalpindi, Pakistan.

Managing editors: Iqrar Ahmad Khan and Muhammad Farooq

Editors: Muhammad Yousaf, Ahsan ul Haq and Akram ul Haq
University of Agriculture, Faisalabad, Pakistan.

after live vaccine. In bivalent or trivalent vaccine two or three antigens can be included in one vaccine. Oil or adjuvant in killed vaccine causes local inflammation increasing blood circulation which helps transportation of vaccine and releases vaccine slowly to produce antibodies for longer period.

In devising a vaccination program, both immunological and commercial factors must be considered including general health of flock, local pattern of disease, genetic type, cost benefit against potential loss, short or long term protection required and vaccination of flocks exposed to diseases in previous generation which would influence maternal antibodies. Consider type of vaccine required, route, method and frequency administration, type of poultry geographical location. Better management, housing, hygienic conditions and preventive measures are effective disease control measures (Haq et al. 2009).

Vaccination is like an insurance against dreadful diseases. Vaccination also reduces secondary bacterial complication. Following are instructions for vaccination. Purchase vaccine from reputed manufacturers and their authorized or get your vaccine directly and store them in refrigerator at 4-8°C. Check expire date. Preferably do vaccination in cool hours of morning or evening. Preferably keep vaccine container in ice bath and don't expose to sunlight. For vaccination in drinking water, keep birds thirsty for a few hours before giving water-containing vaccine. Ample number of waterers is recommended for proper vaccination. Use cold water, free from chlorine, obnoxious smell or any drug, when vaccine is to be dissolved in it. Use vaccine within prescribed limit after it is dissolved. Generally, use within 1 hour is very safe. Use plastic made drinkers (but not made iron made drinkers) for vaccination in drinking water. If possible, serum of vaccinated birds may be tested to ascertain proper vaccination and immunity against that disease, two weeks or more after vaccination, particularly Newcastle Disease. Restrict traffic near vaccinated birds. Supplement vitamins before and after vaccination. Mostly use automatic injectors. Make sure that nasal of injection and dropper works efficiently. Keep frozen vaccine frozen, mix that thoroughly, and do not vaccinate more birds form a vial than the recommended. Don't rush the vaccination job. Presence of technical person is necessary to avoid skipping of birds.

Below are listed the methods of vaccine administration:

1. Injections I/M and subcutaneous.
2. Ocular: Most effective in case of live vaccine.
3. Nasal
4. Oral
5. Water
6. Dust
7. Cloacal: into the tissues in the upper portion of cloaca.
8. Wing web: by puncturing wing web and applying vaccine.
9. Feather follicles: By removing several feathers and swabbing or spraying vaccine over the area.
10. Spraying: Sprayed in air, on bird, in the mouth very fine mist of size 5 μ m is effective.
11. Beak-dipping (oculo-nasal route).

12. Transfixion and scarification.

Take a bowl containing ice in it, mix vaccine (1000 doses) with diluents of 30 ml in a sterile dropper bottle. Each millilitre should deliver about 35 drops from this dropper bottle, take two other sterile, empty diluents dropper bottles and distribute this reconstituted vaccine (as mentioned in 2) including these two empty sterile bottles evenly. Now mix vaccine in three dropper bottle in almost even quantities i.e. about 10 ml in each dropper bottle and place three dropper bottles in a bowl of ice with their nozzles facing upwards. Two workers should work at a time with three dropper bottles. Third bottle should be placed in bowl contain ice in it. Both workers should keep exchanging their dropper bottle with one in the ice bowl alternatively after about every 5 minutes therefore, they would always have an access of cool vaccine and the quality of the vaccine would be maintained more efficiently during vaccination period. Eyeball of chicken must be held horizontally to prevent droplets of vaccine from rolling off. In case of nasal-drop vaccination, one nostril is covered so that vaccine is inhaled adequately by birds. Keep adding new and good dropper bottles to your stock and keep kicking out old dropper bottles which fall into category of "leaking bottles" or bottles with inadequate nozzles. One may develop multiple replicates of this procedure at one premises at a time if sufficient labour and other resources are available.

The main causes which render vaccines useless are listed below:

Immunosuppression: There are various factors which cause immune-suppression. They are disease like Gumboro, Marek's and Coccidiosis, Mycotoxins in feed, certain bacterial, viral infections and nutritional deficiency.

Handling of Vaccines: If the vaccine is not handled properly, vaccination failure may occur.

Storage of Vaccines: If vaccines are not stored at required temperature (4-8°C), they may lose potency and vaccination failure may occur.

Transport of Vaccines: Vaccines should be transported in a closed chamber packed with ice. Negligence may result in vaccination failure.

Expired Vaccines: If vaccine used is expired one, vaccination failure occur.

Presence of Maternal Antibodies: After hatching chicks have some antibodies that are transmitted from parents. These antibodies protect them in early life. Sometimes, antibodies produced because of vaccination interfere with the maternal antibodies and hence desired immunity does not develop.

Interval between Two Different Vaccines: Sometime birds are vaccinated against two different diseases within a very small gap. This can also result in vaccination failure may be due to interference of direction of different vaccines, existing antibodies may get neutralized due to encountering antibodies produced by other vaccine, birds are exposed to additional stress.

Health Status of the Flock: Weak sick or diseased birds should never be vaccinated. If carried on vaccination failure occurs.

Stress: Never vaccinate before or after deworming or before or after debeaking.

Worms: if present interfere with defense mechanism of the bird. Due to weakness, proper immunity is not produced. Therefore, deworming should be done prior to vaccination.

Weather/Climate: Always avoid administration of vaccine during warm hours of the days.

Different Age Groups: Vaccination failure may also occur if different age birds are reared at the same time and vaccinated separately. If diluent is not pre-chilled it may contribute to breakdown in immunity. Diluent should be sterile.

Reconstitution of Vaccines: If vaccines are not reconstituted properly, exact is not supplied to birds so it results in vaccination failure.

Storage of Reconstituted Vaccine: Reconstituted vaccine should be stored under refrigerated conditions in an ice packed container, otherwise it results in failure.

Time between Reconstitution and Administration: Reconstituted vaccine should be administered within an hour or maximum within two hours otherwise. Potency of vaccine diminishes greatly.

Antibiotic in Feed/Water: No antibiotic should be given in feed or water three days before and after the vaccination.

Poor Sanitation: If hygienic conditions are not maintained at farm, failure of vaccination occurs frequently.

Pesticides Consumption: Pesticides in feed if consumed by bird depresses defense mechanism and hence immunity is not developed.

Disposal of Vaccine: vaccine vials should be properly disposed off. They may cause problems. Vaccination Period (Age): There is an age of administration of each vaccine. If age factor is neglected vaccine may fail to produce immunity in birds. Vaccination route: If vaccine administration route is changed vaccine fails. Under Dosing: If vaccine dose is less failure may occur.

7.1.1.5 Defects in the Method of Administration Water Vaccination

When water vaccination is done, chances of failure may be due to more number of birds, more quantity of water added, some sanitizer is used, high water temperature, exposure to direct sunlight, sick birds unable to drink water, water contains high metallic level and pH. When birds are not of uniform age/size, smaller birds not able to drink well.

In Spray vaccines, improper spraying, dilution, equipment not working well and all birds cannot come under the range of spray. Intra-Ocular vaccine could not be dropped in eye due to blockage in dropper. Wing Web vaccine not administered properly or stabber not properly dipped in vaccine vial. Injectable vaccine not injected at proper site, non-sterile syringe or needles or having residues of disinfectants and birds let unvaccinated.

7.1.1.6 Vaccination Schedules

Vaccination schedule for broiler, layer and breeder flock is given in Tables 7.1, 7.2 and 7.3, respectively.

Table 7.1. Broiler vaccination schedule.

Age (days)	Vaccine
4	ND+IB Live and ND Killed
8	IBD Intermediate
14	ND Lasoota
16	IBD Hot Strain/Intermediate Plus

Table 7.2. Layer vaccination schedule.

Age in Days	Name of Vaccine	Company
1	ND + IB	Intervet
8	ND + IB + IBD Killed IBD Live	Merial
18	IBD Live	Intervet
26	H9 Killed	Merial
33	IB 4/91 Live	Intervet
45	FOWL POX	Merial
53	ND + IB Live/ND+H9 Killed	Intervet/Merial
62	IB 4/91 Live	Intervet
83	ND + IB Live/H9 Killed	Intervet/Merial
92	ND + IB +E.D.S	Merial/Ceva
After every two month	ND (Lasoota)	Intervet/Merial

Table 7.3. Broiler breeder vaccination schedule.

Age (Days)	Name of Vaccine	Company	Route
1	Ma5+IB4/91 Live	Intervet	Hatchery spray
4	Cocci Live	ICI/Pfizer	Drinking Water
7	ND Lasoota+ H9 Killed	Intervet/Merial	Eye drop +Injection
10	IBD D-78Live+ND/IB/IBD Killed	Intervet /CEVA	Eyed op+ Injection
18	Hydro Killed (Anga Vac)	Merial	Injection
22	IBD(D78) +H5Killed	Intervet +Merial	Eye drop +Injection
28	ND Live +(ND+H9) Killed	Intervet + Merial	Eye drop +Injection
36	IB 120 + H7 Killed	Ceva + Merial	Eye drop +Injection
44	Fowl Pox	Ceva+ Merial	Injection
48	IB 4/91	Intervet	Eye drop
52	ND+ IB Killed	Merial	Injection
60	SHS Live	Merial	Eye Drop
70	AE Live+ H9 Killed	Merial	Eye Drop+ Injection
77	CAV Live	Intervet	Injection
80	EDS Killed	Intervet	Injection
86	FowlCholera +Reo	Merial + Intervet	Injection +Eye drop
92	ND+IB Live+H7	Intervet + Merial	Eye drop
105	AE Live + H5 Killed	Merial	Eye Drop+ Injection

Age (Days)	Name of Vaccine	Company	Route
112	ILT Live	Intervet	Eye drop
119	SHS+ Fowl Cholera	Merial	Eye Drop + Injection
130	ND+H9 Killed+ Reo	Merial+ Intervet	Injection + Eye drop
140	ND+IB+EDS+SHS	Merial	Injection
144	IB Variant Killed	Merial/Intervet	Injection
147	IBD Killed	Merial	Injection
150	H7 Killed	Merial	Injection
158	H5 Killed	Merial	Injection
168	NDI+IB Live+ ND Killed	Intervet + Merial	Eye drop+ Injection

7.2 Parasitic Diseases and their Control

7.2.1 Coccidiosis

Light to severe acute, chronic disease exhibiting high mortality, anorexia, enteritis, drooping wings, mild to severe pin point hemorrhages on external surface of intestine and caecal lesions, fluffy birds and death may occur. This disease can be classified into two types: intestinal and caecal Coccidiosis.

7.2.1.1 Etiology

Coccidiosis is caused by *E. acervulina*, *E. nagani*, *E. maxima*, *E. mitis*, *E. mivati*, *E. necatrix*, *E. praecox*, *E. brunetti* and *E. tenella*.

7.2.1.2 Factors Influencing Susceptibility

High humidity overcrowding and moist litter causes severe disease outbreak. Broilers are more susceptible than layers and disease can occur at any age but mostly during 3rd week of age.

7.2.1.3 Symptoms

a. External Signs

Birds seem fluffy, having blood in droppings.

b. Postmortem Symptoms

There are pin point hemorrhages on small intestine which can be seen from outer surface and intestine when cut re-fold immediately. Blood in small intestine and caeca can be observed in severe coccidiosis outbreak, which is full of bloody feces.

7.2.1.4 Prevention and Control

a. Hygiene

Proper disinfection and sanitation is required at poultry farm.

b. Management

Keep young stock away from adults, regular stirring of litter. Prevent dampness in shed. To keep litter dry add super phosphate at the rate of 15-20 kg/1000 feet².

c. Treatment

Any one of the followings may be given for treatment of coccidiosis

- SB Amprol-50 1g/litter
- ESB3 @1 g/litter water
- Diasulfina @1 cc/litter water
- Amprolium @1 g/litter water
- Darvisul AK plus @1 teaspoon/gallon water
- Embazine @ 4 ml/litter water
- Narcox @ 1 teaspoon/gallon water
- Coxeva powder @ 1 teaspoon/gallon water
-

Administer medicine for 3 days then 2 days rest and then 2 days. Always use vitamins A and K with medicine, never use vitamins of B group during treatment. Move the bird in case of severe disease outbreak so that they can drink medicated water. In broilers for preventive measures use any one of the following continuously

- Nopidol 125 g/ton of feed
- Coccidine ½ kg/ton of feed or 25 g/kg feed
- Clopidol-25 ½ kg/ton of feed or 25 g/kg feed
-

In layers for coccidiosis treatment Stenrol 1-2 kg/ton of feed is given for 7 days as it does not affect egg production.

7.3 Prophylactic Measures against Bacterial Diseases

7.3.1 Omphalitis

This disease affects chicks when they are hatching. It results in an infection of umbilical opening. Disease is also known as yolk sac infection, naval infection and mushy chick disease. There is an inflammation of navel when chicks are hatching or during first week of life. It is commonest cause of early chick mortality. Infection of yolk sac and navel are responsible for majority of deaths in chicks after three days of hatching and up to 14 days of their life.

7.3.1.1 Etiology

It is a disease of single or mixed bacterial infection. Mainly it is a salmonella infection, however, *Salmonella gallinarum*, *Salmonella typhimurium*, Coli form (*E. coli*), *Staphylococcus aureus*, *Clostridia* spp. (*C. Welchii*, *C. Sporogenes*), *Enterococci* and *Pseudomonas* are causative agents for coccidiosis disease.

Bacteria invade umbilical tissues because of improper conditions in hatcher. Navel opening does not close, and infection passes to the internal organs. Mostly neonatal chicks are affected. This cause stress to newly hatched chicks which is mainly due to improper hatchery hygiene, low humidity in hatchery and imperfect healing of naval

7.3.1.2 Pathogenesis

Seat of infection is incubator due to high humidity, fluctuating temperature, poor hygiene and penetration through shell into yolk. Bacteria There is deterioration and decomposition of yolk causing nutrient deprivation. Umbilical penetration during last days of incubation or immediately after hatching due to high humidity which prevents closure of umbilical opening, infection passes to internal organs and septicemia leading to death.

7.3.1.3 Signs and Symptoms

There are weak chicks that huddle near heat source. Vent pasting (may be due to high temp.). Pungent odor from yolk is unique symptom of this disease. Infected skin around navel with inflammation, abdomen soft, mushy, flabby and distended due to enlarged yolk sac.

7.3.1.4 Postmortem Symptoms

Abdomen filled with yolk, inflamed and discoloured yolk (yellow, blue or green). Large watery yolk with foul smell. Sometimes bean shaped yolk at duodenum and jejunum junction. Lungs congested, liver and kidney are dark and swollen.

7.3.1.5 Prevention and Control

For Salmonella free breeder, set clean eggs (check storage and fumigation process at hatchery), avoid chilling or overheating, improve hatchery cleanliness, management and provide best brooding conditions.

7.3.1.6 Treatment

In case of outbreak do flushing to open closed vent (2.5 kg molasses solution/1000 chicks or 250 g sugar per gal water), high quality feed (give mold free ground maize), green fodder (to increase motility of intestine). Use antibiotics any one of these; Nitrofurans (Furazolidone @ 20 g/bag of feed, Furasole 1 teaspoon/gal water, Furazole 80 g/bag of feed, Erythro-FZ 4-5 teaspoon/gal water) or Tribissen @ 1 cc/gal 5-7 days.

7.3.2 Pullorum

Acute, infectious and highly fatal disease of young chicks and mature poultry birds, caused by *Salmonella pullorum* having vertical and horizontal transmission. Predisposing factors are overcrowding, poor ventilation and high brooding temperature

7.3.2.1 Symptoms (Chicks)

Small grayish nodules on heart, gizzard muscles, leg paralysis and swollen joints.

7.3.2.2 Diagnosis and Control

Whole blood test, remove carrier birds from the parent flock and use proper medicine for parent flock and proper sanitation and disinfection of hatchery and poultry house.

7.3.2.3 Treatment Anyone for 5-7 Days

Furazolidone (Furazolidone @ 20 g/bag of feed, Furasole 1 teaspoon/gal water, Furazole 80 g/bag of feed)

Sulpha drugs (Tribrissen @ 1 cc/gal, Trimodin 1 teaspoon/gal water)

Erythro FZ. (4-5 teaspoon/gal water or 150 g/bag of feed)

7.3.3 Fowl Typhoid

This disease is associated with unhygienic condition and poor management. Most commonly found in egg producing units. Fowl Typhoid is also known as Infectious leukemia and Klien's disease. It is characterized by profuse, bright, sulfur yellow diarrhea, sleepiness and anemia of the comb and wattles.

7.3.3.1 Etiology and Transmission

Cause of this disease is *Baccillus gallinarum* also known as *Salmonella gallinarum*. It is killed in a few minutes by direct sunlight. Ingestion of contaminated feed, water, droppings, contaminated hands of workers and careless disposing of dead bird carcass. In carcass, it survives 7 months and in droppings 1-2 months.

7.3.3.2 Signs and Symptoms

Birds become weak. Comb and wattles become black and congested. Yellowish colour faeces sometimes green or gray or sulphur yellow colour. High body temperature 110-113°F is noticed in this disease. Liver become dark red, when exposed to air its colour change into bronze. Swollen and congested spleen. Lungs show yellowish, brown colour, congested and edematous. On opening intestine, there may be yellow colour faeces and mucus.

7.3.3.3 Prevention and Control

Visibly affected birds should be destroyed and carcasses of dead birds should be disposed off. Proper hygienic conditions must be maintained at farm. Droppings of infected birds should be properly dumped. Furazolidone is added in feed @ 0.04% for 10 days. Carrier birds must be detected and culled from flock. Do proper disinfection of hatchery and chick transporting vehicles. Vaccination of birds if available.

7.3.3.4 Treatment

In case of outbreak, first reduce body temperature of birds by calpol syrup or soda salicylate 1 teaspoon/gallon or 5 tablets of paracetamol/gallon. Furazolidone is drug of choice. Use any one of the followings for 5-7 days.

Furavex 1 TSP/gal.

CF suspension ½ TSP/gal.

Chlorophenical capsules 5-6 /gal.

Furazolidone 20 g/bag

Furasole 1 TSP/gal.

Furazole 80 g/bag

7.3.4 Fowl Cholera

It is infectious bacterial disease which may be in acute septicaemic or chronic form. In septicaemic form there is high mortality, while in chronic form production losses occur. Causative organism *Pasteurella multocida*, which is transmitted by contamination from carrier birds, rodents, nasal exudates, cannibalism of dead carcass and mechanical carriers.

7.3.4.1 Symptoms

Acute infection: Visibly sick birds, ruffled feathers, mucous discharge from beak, diarrhoea, cyanosis of combs and wattles and respiratory distress prior to death.

Chronic infection: Swollen wattles, swollen sinuses, arthritis, respiratory distress, drop in egg production and low mortality.

Postmortem findings: Small haemorrhages on heart, lungs, abdominal fat and intestines. There is congested liver having yellowish follicles. Facial oedema and blood stained mucous in mouth, cheesy plugs in conjunctivae sac and in wattles.

7.3.4.2 Diagnosis

Inject 0.2 ml suspension of infect tissues in the sparrows s/c route if death occur within 24 hrs then fowl cholera is confirmed. In A.I. large blood splashes are found on sternum, proventriculus and other abdominal organs. In case of cholera small haemorrhages may be found on abdominal organs.

7.3.4.3 Prevention and Treatment

All in all out system is method of choice with proper disposal of dead birds. Carrier birds should be removed. Proper sanitation and hygiene should be adopted.

Use any of the following medicines.

- TM 200 65 g/bag for 7 days.
- Tribriksen 1 cc/gal water for 7 days.
- Polymycin 1 TSP/gal water for 7 days.

7.3.5 *E. coli* Infection

E. coli is normal inhabitant of intestinal tract of birds, animals and man. This is also found in dust, water, on skin, hair, feathers and in all places contaminated with feces. There are many specific conditions showing involvement of *E. coli*, usually it appears as thin white creamy layer over liver and abdominal organs. Enteritis, pericarditis, salpingitis, synovitis, omphalitis, coligranuloma, septicemia, air sacculitis and peri hepatitis are specific conditions of *E. coli*. *E. coli* is usually a secondary cause.

7.3.5.1 Transmission, Prevention and Control

Transmission to egg is either by faeces or salpingitis. Other sources are feed, hatchery and water. Cross ventilation help reduce *E. coli* load. Pelleted feed has less chances of contamination. Keep chicks warm and well fed. Proper egg storage and hatchery sanitation. Rodent droppings are source of pathogenic *E. coli*.

7.3.5.2 Treatment

Disinfection: With KMnO_4 and then keep equipment in sunlight and spray formalin 1:24 inside the shed and 1:12 outside. Use any of the following medicines for 5-7 days.

- Tribriksen 1 cc/gal water
- Gallamycine 2 TSP/gal water
- Tylan premix 80-100 g/bag feed
- Lincospectin 1 g/2 liter water
- TSC-80 1 g/2 liter water

7.3.6 Infectious Coryza Infection

Acute or sub acute rapidly spreading respiratory disease, characterized by swelling of face, nasal discharge and sneezing. Causative Organism is *Hemophilus gallinarum*. Mostly outbreaks occur at high altitude and in cold damp weather. It is transmitted through carrier birds, air, feed and water.

7.3.6.1 Symptoms

There is foul smelling, nasal, eye discharge and sticking of feed on beak. Swelling of face, eyes, comb, wattles, decreased egg production (10-40%), Haemorrhages and mucous in respiratory tract is also observed in this disease.

7.3.6.2 Prevention and Control

Provide good hygienic and sanitary conditions to birds. Proper sanitation and disinfection is recommended of poultry house. Isolate sick birds. In case of outbreak: Wash equipment with KMnO_4 and spray formalin (1:24 inside and 1:12 outside shed).

7.3.6.3 Treatment

1. TSE 380 @ ½ Tsp/gal. for 5-7 days
2. Tribriksen @ 1.0 ml/gal. for 5-7 days or Inj. 0.1 ml/kg
3. Gallamycine @ 2 Tsp/gal. for 5-7 days
4. Terravet @ 3-6 g/gal. for 3-5 days
5. Oxy-N50 @ 2.5 g/liter for 5-7 days
6. Tyloxox @ 1.0 g/gal. for 5 days
7. Fumicin @ 0.5 ml/liter for 5 days
8. Streptomycin Inj. @ 1.0 g/5 birds
9. Procaine Penicillin @ 40 Lac. One inj./250 birds.
10. Erythrocin powder @ 150-200 g/bag feed.

7.3.7 Chronic Respiratory Disease (Mycoplasma)

Chronic respiratory disease affects upper and lower respiratory tract of chickens, turkeys and other birds. Characterized by gasping, rales, coughing, nasal discharge

and rhinitis. *Mycoplasma gallisepticum* smallest bacterium with no rigid cell wall. Infected eggs, contact with infected birds and equipment.

7.3.7.1 Signs and Symptoms

Chickens: Nasal discharge, rattling in wind pipe, coughing, gasping, sneezing and shaking of head. Males have more prominent signs.

Broilers: Poor carcass quality, high condemnation rate. Thin and weak birds with razor blade breasts are seen. Most outbreaks occur between 4-8 weeks of age. Poor feed conversion, sharp decline in weight gain. Morbidity rate is fairly high.

7.3.7.2 Postmortem Findings

Early stage: Excess mucous in trachea, consolidated and solid spots on lungs, cheesy material in lungs, air sacculitis, beaded or lymph follicular appearance and caseous exudates in air sacs. "Foamy or Soapy" air sacs are observed in the disease.

Advanced stage: Perihepatitis and pericarditis. Formation of creamy color layer over heart and liver. Abdominal organs are covered, thickness of layer will indicate advancement of CRD and plugs of pus are seen in trachea and pale muscles.

7.3.7.3 Prevention

Prevention is through establishment of Mycoplasma free breeders, purchase CRD free chicks from hatchery, keep good biosecurity conditions, dispose dead birds properly. Avoid wild birds, prohibition of visitors and strict sanitary measures should be adopted.

7.3.7.4 Treatment

Disinfect equipment with KMnO₄. Spray formalin solution or TH₄ @ 4 cc/liter. Use any one of the following medicines.

- Imequyl 20% @ 2-2.5 ml/gal for 7 days
- Avitryl @ 2-2.5 ml/gal for 7 days
- Norfloxillin 200 @ 1.0 cc/gal for 7 days
- Tribriksen @ 1.0 ml/gal for 7 days
- Terramycin L.A. Inj. @ 1.0 cc/kg body wt.
- Gallamycin @ 2 Tsp/gal for 7 days
- Linco-Spectin @ 0.5 Tsp/gal for 7 days

Use any of Tylan preparation.

- Tylan premix @ 80 g/bag for 7 days
- Pulmotil @ 15-20 mg/kg body weight 3-5 days
- Tyleco Solubal @ 1.0 g/2 liter water 3-5 days
- Tylodox injection.
- Tylodox powder 1.0 g/gal for 7 days
- Tylotad injection
- Tylan D.H.S. Injection.

Tylomycin F @ 2.5 g/liter for 7 days.

Cenamycin Sol. @ 2.5 g/liter for 7 days.

Quimicoli @ 1.0 cc/2 liter for 7 days.

Eriprim @ 2.0 g/liter for 7 days.

Floxatxil @ 1 cc/2.0 liter for 7 days.
Sintisol @ 1 cc/2.0 liter for 7 days.
Atiquinine @ 1.0 g/5 liter for 7 days.
Doxycycline powder @ 1.0 Tsp + Oxy-N50 @ 1.0 Tsp /gal for 7 days
Improve ventilation for having good results of medicine.

7.4 Preventive Measures for Viral Diseases

7.4.1 Newcastle Disease

It is an infectious, highly contagious and fatal disease chiefly affecting chickens and characterized by respiratory, digestive and nervous symptoms and high mortality in susceptible birds. Caused by a paramyxovirus type-1.

7.4.1.1 Transmission

Transmission of this disease is through infected, carrier birds, poultry products, offals from infected birds, mechanical vectors, wild birds, incomplete vaccination, contaminated feed and water.

7.4.1.2 Signs and Symptoms

Incubation period is 2-15 days. ND affects 3 major systems; respiratory, digestive and nervous system. There is voice production during disease period. Greenish white diarrhoea and nervous signs i.e. convulsions, muscular tremors, stargazing, walking in circles.

7.4.1.3 Internal Signs

In this disease haemorrhages are Present on glandular portion of proventriculus. There is reddening of trachea, cloudy air sacs, lung congestion and haemorrhages in mucosa and submucosa of intestine. Dark red and purple red hemorrhagic lesions are seen on intestinal wall. Spleen may be enlarged in early stages and shrunken in late stages.

7.4.1.4 Differential Diagnosis

Voice production: voice production is also found in IB, ILT, Coryza, CRD and Fowl pox (in case of fowl pox, pox lesions are present in mucosa of buckle cavity).

Haemorrhages on proventriculus: This present in case of Gumboro but these are found on the junction of proventriculus and gizzard.

Backward movement of bird: This is also found in case of Vitamin E deficiency. Respiratory symptoms along with greenish white diarrhoea and haemorrhages on glandular portion of proventriculus confirm N.D. disease.

7.4.1.5 Prevention and Control

Avoid entry of carrier birds. Feed and water should not be contaminated. Prevent contact of virus with susceptible birds. Hatchery should be away from broiler dressing and other poultry operations. Adopt strict biosecurity measures. Vaccinate broilers at 7-10 days and 25-28 days while layers at 7-10 days, 25-28 days and 4

month then repeat every 3 months. Repeat after every three months, Lasoota in drinking water. Due to any stress or disease antibody level may reduce then do not wait for three month interval but vaccinate birds as early as they recover for disease. In case of outbreak, adopt all sanitary measures and vaccinate all healthy birds as early as possible. There is proper treatment but to avoid secondary infection some antibiotics should be used.

7.4.2 Infectious Bursal Disease

Synonyms are Gumboro, Infectious Bursitis and Avian Nephrosis Syndrome. It is characterized by destruction of lymphocytes, β cells which are responsible for antibody production. Destruction of these cells immune response to vaccines is reduced and birds become susceptible to other infections like CRD, Coryza and enteritis etc. Causative organism is a virus of Birna viridae family.

7.4.2.1 Transmission and Symptoms

No vertical transmission. Virus is secreted in droppings even after 2 week of infection. Disease is transmitted through contaminated feed, water, worms, mites and blood sucking insects. Whitish watery mucoid diarrhoea, soiled vent feather with white diarrhoea, ruffled feather and trembling of birds. There is high body temperature 110-112°F when bird is suffering from this disease.

7.4.2.2 Postmortem Lesions

Bursa becomes congested oedematous and swollen, 2-3 times than normal size. There are haemorrhages inside the bursal folds. Mucosal haemorrhages seen at proventriculus and gizzard junction. In this disease kidneys become pale and swollen with deposition of urates. Haemorrhages are seen on breast and thigh muscles, sometimes with pus formation.

7.4.2.3 Prevention and Control

Proper hygiene and sanitation (with formaldehyde and phenolic compounds) conditions are required for prevention and control of this disease. Vaccination is done on day 7th, 14th and 28th. Disease attack is maximum up to 12-16 weeks of age. Phenyl is disinfectant of choice after Gumboro attack at farm, it can kill virus. Vaccines are Bur706, Gumboral CT, Gumbopest, Bigopest, Gumboro vaccine Nobillis D78 and Bursine II.

7.4.2.4 Treatment

In case of outbreak if symptoms appear after 1-2 days of vaccine, then it is vaccine reaction and if after 15 days then it is Gumboro attack then repeat vaccination to healthy birds. Reduce temperature by APC, paracetamol tablets or Calpol syrup 5 tsp or 5 tablets/gal. or soda salisilate 1 tsp/gal. or 5 Brufen tablet/gallon water. Use any antibiotic to reduce secondary infection chances. Use vitamins and dilute feed i.e. corn 50 parts, wheat and rice 25 parts each with ½ kg dry milk for 100 kg ration.

7.4.3 Hydro Pericardium Syndrome

Hydro pericardium means water in pericardium (membrane surrounding heart filled with water). This disease is also called as Angara, Hydro pericardium pulmonary edema, hepato nephrosis complex or inclusion body hepatitis. Hydropericardium disease was first observed in Pakistan in 1987-88 and is caused by Adenovirus strain K31/89. Broilers, layers as well as breeder birds are susceptible birds. Birds shed virus in feces which is source of infection.

7.4.3.1 Predisposing Factors

Highly pathogenic to day old chicks causes 80% mortality. Most susceptible age is 3 to 5 weeks. No sex predisposition. Predisposing factors are overcrowding, unhygienic and poor sanitary conditions. Presence of hepatotoxins and mycotoxins in feed is one of the predisposing factors for this disease. Any type of stress in farm can cause this disease.

7.4.3.2 External Symptoms

Externally it is very much difficult to diagnose it. There is chalky gray to bright light yellow mucoid droppings. Jaundice signs in some birds. Sudden mortality in 3rd week peaks in 4/5 week subsides in 5/6 week. Sometimes birds show signs of difficult breathing.

7.4.3.3 Postmortem Symptoms

Febrile carcass like Gumboro and Fowl Typhoid are found in case of this disease. Most important organ to be observed is heart. Pericardium sac is distended with fluid. Mostly amount of fluid is 5-8 ml. Colour of fluid is clear to light yellow. There is non-clotted fluid but gelatinizes on exposure to air. Misshapen and flabby heart i.e. soft and cracks on touching. Sub cutaneous and body fat of pale yellow color. Enlarged, congested, pale and necrotic liver are seen during postmortem. Pale bone marrow, death of bird occurs due to heart and liver failure.

7.4.3.4 Vaccination and Treatment

½ cc inj. preferably intramuscular on 15-17 or 21 day of age. No treatment but supportive therapy can be done. Protein and fat content of diet is reduced. Provide glucose in water. Feed grains only. Provide liver tonic medicines like Hepamerz or Jetepar @ 2 teaspoon/gal water.

7.4.3.5 Prevention and Control

Purchase Adenovirus free chicks. Proper cleanliness and disinfection of shed is required for prevention and control of this disease. Isolate sick birds. Keep all birds of same age. It is recommended to provide mycotoxin free feed and stress free environment to birds.

7.4.3.6 Outbreak Management

No treatment, vaccinate birds, repeat vaccine only if previous vaccine was done 15-20 days before. Surviving birds are susceptible to E. coli, respiratory infections, coccidiosis, IBD and ND so precautionary measures should be taken. To avoid

secondary infections especially respiratory infections, use broad spectrum antibiotics after vaccination.

7.4.4 Infectious Bronchitis

It is an acute or sub-acute highly contagious disease of chicken, characterized by respiratory symptoms and high mortality in young chicks and decreased egg production and deterioration of egg quality in laying birds. Corona virus is the cause of this disease. Chicken is susceptible host. Mostly it attacks at 10-12 weeks of age. ND, Coryza and CRD are influencing factors.

7.4.4.1 Clinical Signs

In young chicks: coughing, sneezing and nasal discharge, huddle under heat source, mortality up to 30%, it damages oviduct; birds grow like normal birds but produce less eggs. In growing birds: mild respiratory signs and may remain unnoticed. Disease may lead to permanent oviduct injury resulting in 20% non-layers with 1-2% mortality. Adult birds: less severe or absent respiratory signs, egg production comes to normal in 30 days, misshapen eggs, moulting before time, watery albumin. Sometimes with haemorrhages on albumin or yolk

7.4.4.2 Postmortem Lesions and Control

Same symptoms as of ILT but accumulates watery mucous in trachea, acute tracheitis. Ovary looks normal but oviduct is affected (abnormal), kidneys of chicks are damaged (swollen). Follow vaccination program. In case of disease outbreak antibiotics are used to avoid secondary infection. To reduce misshapen eggs, use DCP @ 1 kg/bag and Ferrous sulphate @ 10 g/bag for 5-7 days.

7.4.5 Avian Influenza

There are three types of influenza viruses namely influenza A, B and C. Type C influenza virus shows very mild symptoms and does not cause epidemic. Type A and B influenza viruses are epidemic causing viruses. Type B influenza virus is not having any subtypes but it can be divided into strains viz. B Yamagata and B Victoria viruses. Influenza A virus has numerous subtypes base on surface antigens haemagglutinin (H) and neuraminidase (N) having 18 and 11 subtypes, respectively (Anonymous 1980; Anonymous 2014). Influenza A type virus infection can be classified into low pathogenic and high pathogenic infections. High pathogenic influenza virus strains include H1N1, H3N2 and H5N1. This infection can cause a wide variety of symptoms ranging from conjunctivitis to dyspnea, acute respiratory distress which may lead to respiratory failure etc. Sometimes it can show even neurologic symptoms like fits along with abdominal pain, nausea and diarrhea. Diagnosis of highly pathogenic influenza A from B or C type virus is not possible as this virus shows overlapping symptoms and requires laboratory testing.

Its symptoms range from mild upper respiratory disease to reproductive failure or highly fatal generalized disease caused by Orthomixovirus A type. There are two types of attack; less virulent influenza virus and highly pathogenic virus.

7.4.5.1 Low Pathogenic Avian Influenza

Anorexia, huddling, ruffled feathers. Mild respiratory signs, sinusitis, sneezing. There is severe drop in egg production, decreased fertility. There may be low mortality or high (60-70%) in case of secondary infection.

7.4.5.2 Highly Pathogenic Avian Influenza

Sudden onset of disease may cause high mortality. High and body temperature (113°F). Swelling (subcutaneous oedema) of head, face especially wattles, severe respiratory signs, rales, coughing, oedema of glottis excessive fluid from sinusitis and cessation of egg laying is noticed in this disease.

7.4.5.3 Postmortem Lesions and Diagnosis

Blood splashes on sternum, proventriculus, heart, trachea and intestine. Haemorrhagic tracheitis and dark red muscles are observed in this disease. Disease occurs in late summer, fall or early winter. Decreased egg production or increased condemnation for secondary colibacillosis. Severe drop (90%) in egg production, blood splashes on sternum, proventriculus, heart and intestine will confirm the disease.

7.4.5.4 Differential Diagnosis

In case of ND haemorrhages on glandular portion of proventriculus while in case of influenza there are blood splashes on whole proventriculus. In case of fowl cholera apparently, bird shows similar conditions (wattles swollen and dark blue) but signs are less pronounced.

7.4.5.5 Treatment, Prevention and Control

Disease spread through infected birds or wild birds, infected feed/water utensils. Vaccinate birds, isolate sick birds and destroy them. No specific treatment.

7.4.6 Fowl Pox

Fowl Pox is characterized by formation of lesions and scab on soft parts of body (comb, wattles, mouth, under wings). Disease is caused by a virus of genus avipox and family pox viridae. Mechanical transmission to injure and lacerated skin. Mosquitoes can also transmit it. Incubation period is 4-10 days.

7.4.6.1 Symptoms

This occurs in following three forms i.e. cutaneous, diphtheritic and oculo-nasal form.

Cutaneous (dry) Form: Most common, small lesions on comb and wattle remain moist for short time then dry, turn yellow, brown and then dark brown. Lesions at the angle of beak, mouth, around eyes, ventral surface of wings on legs and vent. Removal of lesion leaves dry or moist hemorrhages. Negligible mortality but high morbidity is noticed in this disease.

Diphtheritic (wet) Form: This is also known as avian diphtheria. There is voice production, lesions on moist mucus membranes, white opaque nodules develop and

increase rapidly, gasping, suffocation occur due to lesions in larynx, mortality prevails due to suffocation.

Oculo-nasal Form: Swelling of eyes (conjunctivitis), infra orbital sinuses and in breeders lesions are in oviduct, cloaca and skin of vent.

7.4.6.2 Effects of Disease

Reduced growth and abnormal feathering, lowered production even remains out of production for several weeks, lowered fertility and infection prevails even from 8-9 weeks of age.

7.4.6.3 Postmortem Lesions

Lesions are seen on mucus membrane of mouth, respiratory tract and oesophagus.

7.4.6.4 Prevention and Control

Dead birds must be buried or incinerated, proper disinfection, control of cannibalism, beak trimming not recommended during disease outbreak and vaccinate at 6-8 weeks along with vitamin A, K to overcome stress.

7.4.6.5 Treatment

No treatment, avoid secondary infections. Apply tincture iodine on lesions. Application of vaseline around lesions and in mouth will facilitate feeding and prevent secondary infection. Use any one of the followings for 7 days.

- TM200 @ 65 g/bag feed
- Oxytetracycline (11%) @ 125 g/bag
- Tribissen @ 1.0 ml/gallon
- Tylomycin @ 2.5 g/liter etc.

7.4.7 Avian Leukosis Complex

Viruses of leukosis group induce a spectrum of neoplasm including following,

7.4.7.1 Leukosis

Leukosis is a condition of malignancy of haemopoietic (blood producing) cells. There are mainly 5 types of leukosis as given in Table 7.4.

1. **Lymphoid Leukosis** (Big liver disease): Caused by malignancy of lymphoblasts, the precursor of the lymphocytes. Under field conditions this is most prevalent form.
2. **Erythroid Leukosis** (Erythroblastosis): Caused by malignancy of the erythroblasts, the precursors of red blood cells.
3. **Myeloid Leukosis** (Myeloblastosis): Caused by malignancy of the myeloblasts, the precursor cells of the granulocytic series.
4. **Myelocytomatosis** (Myelocytosis): Characterized by myelocytic tumors of the skull, ribs and long bones.
5. **Osteopetrosis**: Affect long bones.

7.4.7.2 History

Disease was initially described in first decade of 20th century by Ellerman and Bang. Disease has worldwide distribution. This disease is one of the most important causes of loss to poultry industry throughout the world.

7.4.7.3 Etiology

Leukosis group of viruses belong to genus 'Oncoronavirus C', RNA containing virus of family 'Retroviridae'. There are at least 5 subgroups, A to E. Each subgroup consists of several distinct antigenic types. Virus survives at 37°C from 3-15 Hours at pH 5-9.

7.4.7.4 Susceptible Hosts

Chicken, pheasants, Guinea fowl, ducks, quails and turkeys are affected by this disease. Disease is mostly seen in chicken.

7.4.7.5 Transmission

Vertical Transmission: From parent to offspring through infected ova or sperm.
Horizontal transmission: Virus die quickly outside host body thus horizontal transmission is slow and inefficient. Use live vaccines when eggs do not originate from LL-free flock.

7.4.7.6 Factors Influencing Susceptibility

Genetic constitution of chicken, virus strain, route of exposure (I/M Sarcoma, I/V Erythroblastosis and haemorrhages) and age of bird (resistance increases with age).

7.4.7.7 Tumors

Tumors growth is seen on some part of body. Tumors are of three types.

- a) Nodules: Soft smooth and glistening (0.5mm-5cm)
- b) Miliary: (less than 2 mm)
- c) Diffuse: (patches)

7.4.7.8 Internal and External Signs

Table 7.4. Diseases, clinical signs and postmortem lesions.

Disease	Clinical Signs	Postmortem Lesions
1. Lymphoid Leukosis	1) Comb pale and shrunken. 2) Slight drop in feed consumption or egg production.	1. Grayish white tumors in liver, spleen and kidneys. 2. Uniform enlargement of affected organs.
2. Erythroid Leukosis	A. Acute form: Sudden death B. Chronic form: Anemia, Emaciation, Diarrhea	1. Diffuse bright cherry red discoloration. 2. Enlargement of liver & spleen.
3. Myeloid Leukosis	Occurs sporadically in mature birds	1. Liver has a granular appearance. 2. Discolored grayish yellow liver. 3. Hyperplastic and pale bone marrow.

4. Myelocytomatosis	Occurs sporadically in immature birds.	1. Soft yellowish-white tumors on cranium (skull), long bones and pleural surface of the thoracic cage.
5. Osteopetrosis	1. Occurs sporadically in birds of all ages. 2. More often in males than in females.	1. Affect long bones. 2. Abnormally shaped. 3. Thickened. 4. Hard to break.

7.4.7.9 Diagnosis

In this disease tumors are observed in liver, spleen or kidneys without nerve or ovarian involvement, abnormal thickened bones and thin keel bone results in case of this disease. Microscopic examination of tumors or blood confirms disease.

7.4.7.10 Prevention and Control.

There is no effective treatment, practice high hygiene standards in the flock. Detect and eliminate birds that shed viruses in their eggs. Many virus infected birds do not shed their virus in their eggs. Establish leukosis free breeding stock. Avoid contact with carrier birds particularly in early age. Do not mix separate broods of chickens until after 20 weeks of age. Selection of genetically resistant birds for breeder flock (Resistance of infection is controlled by recessive genes present in varying frequencies). Use live vaccines (of other diseases) of pathogen free source (egg or flocks). Drug administration: "Miboleron" in feed for first 49 days reduced incidence of tumour but it did not prevent proliferation of virus. Thoroughly clean and disinfect houses, equipment and building premises. Use fresh litter for each new batch of chicks. Spray with an efficient insecticide to eliminate external parasites and other insects, between and during broods. Disease can be carried by rats, mice, wild birds, insects, mosquitoes and pets (Finberg and Wilson 2010). Comparison of Marek's and Leukosis diseases is given in Table 7.5.

Table 7.5. Comparison of Marek's and Leukosis diseases.

Particulars	Marek's Disease	Lymphoid Leukosis
1. Age of group affected	Usually 6-16 weeks	16 weeks or older
2. Etiology	DNA virus	RNA virus
3. Common tumor sites	Nerves, eyes, skin, liver, spleen, kidney, lung, heart, proventriculus, bursa	Bursa(common), liver, spleen and kidney
4. Transmission	Horizontal, through dander from feather follicles	Vertical
5. Paralysis	Usually present	Absent
6. Enlargement of nerves	Usually present	Absent
7. Bursa of fabricious	Diffuse enlargement or atrophy.	Nodular tumors
8. Skin and muscle tumors	May be present	Usually absent
9. Prevention	Vaccine at 1 st day with HVT is effective	Raise birds with high genetic resistance to LL.
10. Treatment	No successful treatment	No effective treatment

7.4.7.12 Tests

Tests available to detect the presence of virus in breeder flock are as follow;

1. Resistance inducing factors (RIF) test.
2. Complement Fixation of Avian Leukosis virus (COFAL) test.
3. Phenotypic Mixing test (PM) test (currently preferred)
4. Enzyme Linked Immunosorbent Assay (EUSA) test.

7.4.7.13 In Case of Outbreak

Collect feathers and burn them. Give antibiotic and vitamins to birds.

7.4.8 Marek's Disease

Marek's disease is also known as gray eye, polyneuritis, range paralysis, neural leucosis and skin leukosis. Viral disease destroy nervous system especially peripheral nerves. Disease is characterized by legs and wings paralysis with a critical sign of one leg in front and one leg behind. In Marek's disease tumor forms on skin, muscles, digestive and respiratory tract. Marek's disease virus lives in feather follicle epithelium.

7.4.8.1 Etiology and Transmission

Caused by Group B cell associated Herpes Virus (DNA virus) there are 3 serotypes; Type 1: Pathogenic Marek's disease virus, Type 2: Naturally a pathogenic virus and Type 3: Herpes virus of Turkey. No vertical transmission, direct or indirect contact, air borne through feathers. No vector birds or biting insects. Mechanical: clothing, feed bags, equipment and persons.

7.4.8.2 Signs and Symptoms

Classical Form: Symptoms are related to peripheral nerves. Brachial nerve (wing paralysis), schiatic nerve (leg paralysis, cervical nerve (torticollis), vagus and intercostal nerves (respiratory symptoms) are mainly affected by this disease.

Acute Form: Paralysis with greenish white diarrhoea, affected nerve is 2-3 times more thick, enlargement of liver, ovaries, spleen, kidney, proventriculus, bursa and sometimes tumours on skin, muscles, digestive and respiratory tract.

7.4.8.3 Control and Treatment

No effective treatments, vaccinate birds at day old age, collect infected feathers daily from the shed and burn them. Use vitamins.

7.5 Feed Poisoning

7.5.1 Poisons in Feed Ingredients of Vegetable Origin

It includes gossypol in cotton seed meal, glucosides in rape seed meal, antipyridoxine in linseed meal and gums in guar meal.

7.5.2 Poisons in Feed Ingredients of Animal Origin

It includes anti-thiamine factor in fish meal, contaminants in meat and blood meal and rancid fat in poultry by-product meal.

Conclusion

Live and killed vaccines are administered to the poultry birds keeping in view their health status. Different medicines are also used to treat the birds in various bacterial, viral and protozoal diseases. Good biosecurity measures are recommended.

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