
UNIT 5 DISEASES AND THEIR CONTROL

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5.0 OBJECTIVES

After studying this unit, you will be able to:

- identify important poultry diseases;
- recognize the importance of disease control measures; and
- summarize bio-security measures needed in a poultry farm.

5.1 INTRODUCTION

Disease is deviation from normal functions of any body organ or part of the animal.

It can result on account of various reasons like nutritional deficiency, toxicity, external injury, stress or by infections or parasites. Of these, under good management and diet, only infectious agents and parasites may cause diseases occasionally. In case of broilers, even parasites, both external and internal, are of lesser importance. In any case, as the old saying goes, **it is always better to prevent than cure a disease**. Hence, you should concentrate more on preventive measures than of curing. It is not necessary to know of all the diseases that are recorded in poultry. However, most important of the infectious diseases which are likely to occur among broilers and layers are outlined in this unit.

5.2 DISEASES OF BROILERS

You must have studied in your Science classes that the diseases are caused by micro-organisms. You also know that these are very small organisms and hence cannot be seen by naked eye. Therefore, special “Microscopes” are used to see them. Hence, they are referred to as “Micro-organisms” and may be in the form of bacteria or viruses. There are other diseases caused by worms (Parasites) inside our intestines and some others caused by moulds and fungus. The poultry are likely to get bacterial, viral, parasitic and fungal diseases. In addition, certain diseases are also possible due to faulty management like feeding, housing etc. It is therefore reasonable to study these diseases as classified by their causes.

5.2.1 Bacterial Diseases

Bacterial diseases generally occur due to unhygienic management. They generally enter through feed, water or air or men and material. Most common bacterial diseases are described below:

(i) *Escherichia coli* (*E. coli*) infections

This is caused by *E.coli* which is normally present in the intestines of the animals and humans. Transmission is mainly by faecal contamination of feed, water, litter as well as dust and hatching eggs. It is manifested by symptoms such as swelling and infection of the naval region (called omphalitis) and watery or yellowish faecal matter when bacteria have entered through feed and water (called enteritis). Most of the times, the deaths occur, sometimes in high numbers. Hence, you will suffer severe losses. Therefore, at once you observe more deaths in chicks, you have to consult a specialist nearby and follow the treatment suggested. In general, ampicillin, chloramphenicol, chlortetracycline, ciprofloxacin, nitrofurans etc. have been found to be useful in treatment. Prevention of this disease is by maintaining good sanitary conditions in the farm especially because the major route of transmission is by faecal contamination of feed, water, men and material.

(ii) Infectious Coryza

Caused by a bacteria called *Hemophilus paragallinarum*. Carrier birds are the main reservoirs. Discharge from nose, swelling of the face, infection of the eye, swelling of wattles and sound while breathing are commonly seen in this disease. Sometimes, loose faeces, starvation and faecal matter with very bad odour are noticed. Erythromycin, oxytetracycline, sulfachloropyrazine, sulfadimidine and certain combinations of drugs have been used successfully. Prevention is by rearing broilers of different age groups separately.

(iii) *Mycoplasma gallisepticum* (MG) infection

Popularly called chronic respiratory disease (CRD) and is most severe in large

commercial farms during winter. It is frequently transmitted through hatching eggs to chicks. However, it is also transmitted by contact, air-borne, dust or droplets, contaminated equipment. In broilers, the CRD is mostly as a secondary infection following *E.coli* or other bacterial infections. The characteristic symptoms are sound while breathing, discharge through nose and coughing, loss of body weight and reduced food intake. Deaths may go up to 30% if proper care is not taken immediately. Symptoms are highly suggestive but should be confirmed only by specialist. Several antibiotics like chlortetracycline, erythromycin, oxytetracycline, streptomycin and tylosin can be used to treat the disease under expert supervision. Prevention and control measures must be taken up at the hatchery. At the farm level, good management reduces CRD.

5.2.2 Viral Diseases

The viruses are smaller than bacteria. These may cause several diseases listed below:

(i) Avian Influenza (Avian Flu, Bird Flu, Fowl Plague)

It can spread to humans and hence, it is under focus worldwide at present. The migratory water birds, especially wild ducks are the natural hosts of influenza A virus. Infection of domestic poultry within a farm is spread by direct contact, contact with contaminated equipments and farm staff. Between farms, it spreads by the transfer of infected faeces, staff members, contaminated equipments, delivery trucks and air transmission over short distances. Infection with a highly virulent virus is characterized by depression, decreased appetite, nervous signs, swollen blue combs and wattles, coughing, sneezing, diarrhoea, sudden death and mortality may go up to 100%. Symptoms are only suggestive, but when mortality is high and sudden, **it is necessary that it is informed to the nearest Animal Husbandry Department or Disease Diagnostic Unit for further action in the matter.** Isolation and destruction of affected birds is the first line of action. Usual bio-security measures must be ensured to control spread of disease (see Section on “Bio-security” at the end of this unit).

(ii) Infectious Bursal Disease (IBD)

This disease spreads very fast through water, feed and droppings from infected pens. Mortality begins 3rd day post-infection and will further increase and reduce in a period of 5 to 7 days. The birds show a peculiar tendency of pecking at their own vents (anus). There may be whitish or watery diarrhoea, lack of appetite (not interested to eat), depression, dehydration (loss of body water), ruffled feathers, trembling (shivering), and shrill cry (loud sound) while passing faeces and fall flat before they actually die. Most birds quickly pick up infection and death does not exceed 20 to 30%. The disease can be diagnosed by typical symptoms. Vaccination is the principal method of controlling the disease and it is given separately along with other vaccinations.

(iii) Ranikhet Disease

The Ranikhet disease is also known as Newcastle disease. Contaminated air, food and water are important routes for the spread of this disease. When the disease is severe, the birds will be found dead without any symptoms. More often, they will be restless, uncomfortable, show difficulty in respiration, weakness and death within 4 to 8 days are seen. Greenish diarrhoea and twisting of neck are also frequently observed, though not always. There may be other nervous symptoms including paralysis of legs and wings. Mortality is usually as high as 90%. When the disease is mild, there may be difficulty in respiration when a close observation is made.

A combination of sanitary measures and vaccination is important in controlling this disease. Vaccination for this disease is given along with other diseases.

5.2.3 Parasitic Diseases

The parasites can infect both externally and internally. In case of broilers, which are grown only for a maximum of 6 to 8 weeks, there is very low possibility of any parasitic infestation.

(i) Coccidiosis

The faeces from infected birds contain “oocysts” (similar to eggs), which contain the infective protozoa in an inactive form. They become active after they are eaten and their external cover is digested by other birds. Then, the infective organism attacks the intestines and multiplies. The birds will be pale, dull, keep away from the flock in a corner, pass bloody droppings, sleep while standing, show ruffled feathers, retract their head and finally show emaciation (loss of body condition). However, microscopic examination for presence of oocysts is highly useful for confirmation. While preventing and controlling of this disease, the litter moisture should not exceed 30%, otherwise, the dampness will lead to growth of oocysts and the drug called “Cocciostat” is added mainly in the feed or water.

5.2.4 Fungal Diseases

Fungi (plural of Fungus) usually live outside a cell and they produce toxins (poisonous substances). They generally do not enter the blood stream but their toxins do. You might have seen blue or bluish green strands growing on bread/cake/fruits etc. when kept outside for few days. That structure is a fungus. There are many diseases caused by fungi in poultry; some of the important ones are as follows:

(i) Aflatoxicosis

The aflatoxicosis is caused by ingestion of toxic substances produced by moulds growing on feed, feed ingredients and possibly litter. Several types of fungi produce toxins that may cause problems in poultry, but the most commonly encountered mycotoxin is produced by *Aspergillus flavus* popularly known as aflatoxicosis. Maximum level of tolerance in chicken up to 10 to 12 weeks of age appears to be 0.25 mg/kg (ppm) in feed. Most of the signs are associated with “physiological stress” and ability to develop immunity to infectious agents is severely reduced. The aflatoxins under certain conditions can cause death, reduce growth etc. History and symptoms are helpful in making the tentative diagnosis. The feed samples have to be analyzed for aflatoxin residues for confirmation. There seems to be no satisfactory treatment. However, the birds recover rapidly at once the toxin is removed from the diet. Feed supplier should be immediately informed to replace the feed.

5.2.5 Other Diseases

Health need not necessarily be affected only by infection by bacteria or virus or parasites or fungi etc. If normal processes in the body are affected due to many other causes like feed, temperature, overcrowding etc., disease occurs. Some of these diseases are as follows:

(i) Leg Disorders

Improved growth rate in broilers has resulted in greater strain on legs. Therefore, in the beginning, there will be some sort of bending of tibia which, later on, corrects itself when the growth rate falls. However, many diseases and disorders occur with

impaired walking or refusal to walk. Cause of each of the leg disorders is not very easy to be defined. However, some of them which could be due to nutrition are presented in Table 5.1.

Table 5.1: Various Causes of Leg Disorders in Broilers

Disorder	Causes
Chondrodystrophy (enlarged hock)	Deficiency of choline, folic acid, manganese, niacin, pyridoxine and zinc
Plantar pododermatitis	Genetic
Rickets	Deficiency of Vitamin D
Spondylolisthesis (Kinky back)	Genetic
Tibial dyschongroplasia	Excessive pressure due to faulty walking style

(ii) Breast Blisters

In chicken and turkey, a bursa (a closed cavity) lined with synovial membrane normally exists over the anterior (front) projection of the keel (breast) bone. Causes of injury to this bursa include poor feathering, hard flooring and leg weakness, which is associated with increased sitting. Breast buttons are changes in a similar location that have a hard crust on the surface and a core of dead skin and nodule-like reaction. Unlike breast blisters, they are likely to be chemical burns due to prolonged contact of poorly feathered skin with wet litter containing ammonia or toxins. Therefore, proper litter-management with balanced diet is the only way to avoid breast blisters or buttons.

Check Your Progress 1

Note: a) Use the space given below for your answers.

b) Check your answers with those given at the end of the unit.

- 1) Give a brief notes on “Leg disorders in broilers”.

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- 2) What are the different forms of diseases *E.coli* organisms can produce in broilers?

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- 3) Define breast blister.

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Activity 1

Visit a nearby broiler farm or veterinary hospital. Collect information on the different types of diseases encountered by broilers in the farm. Prepare a list by classify the diseases based on the causative agent as bacterial, viral, parasitic, fungal and other diseases.

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5.3 DISEASES OF LAYERS

Similar to broilers, the layers can also suffer from diseases caused by bacteria, virus, parasite, fungi and others. Some of the diseases of broilers are also common in layers; whereas, there are some other diseases which do occur in layer only which are discussed below:

5.3.1 Bacterial Diseases

Though there are several bacterial diseases affecting layers, but, only one very common disease is described for your information.

(i) Pullorum Disease (Bacillary White Diarrhoea)

Caused by *Salmonella pullorum*. Spreads primarily through hatching eggs; cannibalism of infected birds, egg eating, wound infection and contaminated feed. Newly hatched chicks from infected eggs will be about to die and few may even be dead. They exhibit sleepiness, weakness, no interest to eat, shrill cry while defecating and chalky white diarrhoea; peak mortality (death) occurs during 2nd or 3rd week. Recovered birds are carriers and spread infection to healthy flock. In adult birds, no distinct signs are seen on most occasions, reduction in egg production is also highly variable. In rare cases, sudden infection results in depression, anorexia (not eating), diarrhoea and dehydration. Deaths due to the disease may go up to 100%, if no care is taken. A tentative diagnosis can be made on the basis of symptoms; but has to be confirmed by specialists. No drug or combination of drugs is capable of eliminating infection from treated birds. In chicken, several drugs have been tried and found effective in reducing mortality. Identification and elimination of carriers is most important. Stained antigen whole blood test is commonly used to identify the carriers in chicken. But, under commercial conditions and good management, this is not yet popular in India.

5.3.2 Viral Diseases

The layers are also affected by several viral diseases; most of them are routinely prevented by following a proper vaccination schedule. Important viral diseases are:

(i) Egg Drop Syndrome (EDS 76)

Disease is mainly from hatchery; bird to bird transmission is slow and intermittent, especially in caged birds. The first sign is loss of colour in coloured eggs followed quickly by production of thin- and soft-shelled eggs or shell-less eggs. The thin-shelled eggs often have a rubbed, sand paper-like texture or a granular roughening of the shell at one end. There will be a sudden drop in egg production, if infection

has occurred in late production. Small eggs and eggs with poor interior quality are produced. There may be delayed sexual maturity.

Typical symptoms help in diagnosis and by isolation and identification of the virus by experts. Since the disease is egg-borne, birds must be obtained from unaffected flocks.

(ii) Fowl Pox

Spreads by mechanical transmission of the virus to the injured or broken skin. When skin is affected, typical pox swellings are seen on head region and on featherless areas such as legs, feet and vent. When respiratory tract is affected, coryza-like signs are noticed. Spread of the disease is usually high, but mortality, especially in the skin form, is quite low. Mortality in severe cases of respiratory form may go as high as 50%. It can be identified by typical symptoms and changes on featherless areas of skin. It can also be confirmed by isolation and identification by experts. It can easily be prevented by vaccination.

(iii) Infectious Bronchitis (IB)

In young birds, the respiratory symptoms predominate (gasping, coughing, tracheal rales and nasal discharge). Chicks huddle under the brooder. Severe reduction in growth and feed consumption may occur. In adults, respiratory symptoms, reduced egg production, especially in those which are in the latter part of egg production are noticed. In addition, shell-quality as well as internal quality of eggs falls. The eggs may be soft-shelled, misshapen or rough-shelled. The contents may show watery albumen or yolk separating from albumen or albumen sticking to the shell membrane. Most birds may get infected, but mortality is high only in young birds (25%). The disease can be diagnosed by symptoms and confirmed by isolation of virus by experts. It can be controlled by proper management and vaccination.

(iv) Lymphoid Leucosis

The lymphoid leukosis viruses (LLVs) are transmitted through hatching eggs and also bird to bird, by direct or, to a lesser extent, by indirect contact. Depending on the virus involved, various conditions are seen; most common is Lymphoid leucosis. Its occurrence is usually highest at about sexual maturity. No specific sign is noticed, although pale and bluish combs, emaciation (loss of body condition) and lack of interest to eat may be noticed. Abdomen is often enlarged and on palpation reveals enlargement of liver, bursa, and kidneys. Diagnosis is by symptoms and to be confirmed by virus isolation. Obtaining chicks from disease-free source is the only way to prevent the disease. Most of the hatcheries in our country are supplying leucosis-free chicks.

5.3.3 Parasitic Diseases

Layers are reared up to 18 months of age. Therefore, external and internal parasites are equally important. In any case of the internal parasites, coccidiosis, the protozoan, is as important as in case of broilers.

(i) External and Internal Parasites

The period for which the layers are grown is so short that there is negligible possibility of any parasitic infestation, both external and internal. Measures to control of external parasites (ectoparasites) like ticks, mites etc. include careful use of carbamate, organophosphorus and pyrethroid insecticides. The pyrethroids are most effective on flies (most of the evaporating solutions we use at home for control of mosquitoes belong to this group only).

The insecticides may be applied either by dusting (scrubbing the powder on to the skin) or by spraying or misting. Internal parasites (endoparasites) will be very few in number especially with all-in-all-out system. However, when multiple age groups are reared, the endoparasites are definitely a matter to be considered. They are usually controlled by regular deworming using fenbendazole, mebendazole, piperazine etc. as per dose prescribed by manufacturer.

5.3.4 Fungal Diseases

Fungi, which mostly cause diseases by their toxins, cause diseases in layers also. The most important fungal diseases in layers is brooder pneumonia.

(i) Brooder Pneumonia

In case of layers which are reared till they are 18 months of age, more chronic (delayed) form usually results in loss of appetite, gasping or coughing and a rapid loss of body weight. Mortality is usually low and only a few birds are affected at one time.

5.3.5 Other Diseases

Diseases caused by factors other than infection by bacteria/virus/parasite/fungi etc. are also identified in layers. Important among them is:

(i) Cage Layer Fatigue

This condition, occurring only in caged birds, is characterized by inability of birds to stand and brittle (easily breaking) bones. Thinning of long bones occurs and hence they break very easily. This also increases rejection of carcasses at the slaughter house. The affected birds, when allowed on deep litter for 4-7 days, recover. Differences are observed between strains and seasons. Several courses have been suggested i.e. calcium deficiency, phosphorus deficiency etc. The condition is yet to be completely understood.

Check Your Progress 2

Note: a) Use the space given below for your answers.

b) Check your answers with those given at the end of the unit.

1) Describe the symptoms of Egg Drop Syndrome.

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2) What is Lymphoid Leukosis?

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3) Explain about Pullorum Disease.

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Activity 2

Visit a nearby layer farm or a veterinary hospital. Collect information on the different types of diseases encountered by layers in the farm. Prepare a list by classify the diseases based on the causative agent as bacterial, viral, parasitic, fungal and other diseases.

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5.4. BIO-SECURITY MEASURES

The term “Bio-security” in simple words means security or protection of animals in a farm from diseases and preventing spread of diseases. Bio-security involves Isolation, Disinfection, Sanitation and Traffic Control.

5.4.1 Isolation

As the name indicates, isolation is separation from one another. Now, imagine the two situations in two broiler farms below:

- a) Farm 1: Chicks are brought once every 8 weeks
- b) Farm 2: Chicks are brought once every 2 weeks and housed in the same building

What are the consequences in these two farms?

You can obviously tell that in Farm 1, it is easy to clean and disinfect the shed before the next batch arrives. In other words, all chicks come at one time and all broilers are sold at one time. Such system of management or flock schedule is referred to as All-in-all-out system.

On the other hand, you can easily imagine that in Farm 2, birds of different ages will be reared at any one time and it is not possible to clean and disinfect the entire shed unless flock schedule gives a gap of 8 weeks. Otherwise, pens (rooms in which the birds grow) which become empty after sale of birds can be cleaned and disinfected. Such rearing is highly risky although many farmers do practice this system to save upon building cost and to produce smaller number of broilers more often.

Wherever all-in-all-out system is not possible, a separate pen referred to as “Quarantine” pen or a place to isolate sick birds for at least 2 weeks or 4 weeks is recommended. Such an isolation pen should be:

- As far away as possible from other sheds.
- Located in such a way that most of the times wind blows from other shed towards the isolation pen.
- A separate attendant should work in such a pen and he or she should not come to any of the other sheds. If this is not possible, work in isolation pen should be taken up after work in all other sheds is over and on that day, should not go back to the sheds again.

You should always be alert and aware that the diseases can spread by various means:

- Introduction of diseased or birds not completely recovered from a disease.
- Shoes and clothing of visitors or attendants who move from flock to flock.
- Contact with equipment and other objects that are contaminated with disease causing organisms.
- Carcasses of dead birds that have not been disposed of properly.
- Impure or dirty water.
- Rodents, wild animals, free-flying birds and insects.
- Contaminated feed and feed bags.
- Contaminated trucks which come to supply chicks, feed etc. and those to pick up birds/eggs which are sold at the farm.
- Contaminated sheds through soil or old litter.
- Air-borne; when wind blows from a diseased area into sheds with healthy birds.
- Egg transmission: chicks at birth may be infected from its mother or at hatchery itself. Farmer has little control over it. For such emergencies, insurance can be useful.

5.4.2 Disinfection

Disinfection means getting rid of infection, if present. Disinfection involves the use of a disinfectant that will reduce or kill the pathogens. Disinfectants are more effective at warmer temperatures. There are several types of disinfectants and several commercial preparations are available in the market. For understanding the disinfectants tabulated below (Table 5.2), you have to remember the chemistry lessons from your school.

Table 5.2: Recommended uses for Disinfectants

Disinfectant	Recommended Use
Alcohols (like spirit)	Small utensils
Aldehydes like formaldehyde	Fumigation
Halogens like chlorine in bleaching powder	Water systems, foot baths
Oxidizing agents like hydrogen peroxide	Small utensils
Phenols	General house use
Quaternary ammonium compounds	Feeding systems
Note: Each has to be used at levels recommended (on the label) by the manufacturer	

In any case, most commonly used disinfectants are:

- 1) Bleaching powder for water and waterlines
- 2) Phenol in foot baths.
- 3) Formaldehyde to disinfect houses, equipment, vehicles etc.

(i) Formaldehyde fumigation

Now, you may ask how to use formaldehyde, which is a gas? Disinfection by a gas is called as fumigation because fumes are involved. Formaldehyde fumigation is so

common that the term fumigation in Poultry farms means formaldehyde fumigation. Formaldehyde (HCHO) is a gas sold commercially as a 40% solution (37% by weight) in water as formalin. It is also available in powder form called paraformaldehyde containing 91% of formaldehyde which when heated to 232°C liberate the gas. But, formalin fumigation is most popular.

(a) Requirements

There are four requirements that are essential in order to obtain the maximum germicidal activity from formaldehyde. If one or more of these requirements is ignored, the germicidal effect of the gas is reduced. They are as follows:

- a) **Temperature:** 24 to 38°C
- b) **Relative humidity:** $\geq 75\%$
- c) **Time:** depending on temperature, humidity, concentration and area to be disinfected
- d) **Concentration:** depends on the material to be disinfected.

(b) Method

The most popular method of formaldehyde fumigation is to mix 40% formalin onto potassium permanganate (KMnO₄) kept in an earthen pot to liberate the gas. Three aspects you have to note in this method are:

- a) earthen or porcelain pots have to be used;
- b) formalin is poured over KMnO₄ and not the other way; and
- c) one has to quickly come out of the room and close the door.

You will definitely be interested to know why earthen pot? You know that during chemical reactions, heat is produced. For example, when you add limestone to water, heat is liberated. Similarly, reaction between formalin and KMnO₄ produces heat which is useful for the release of the gas. Therefore, the KMnO₄ crystals are kept in an earthen pot deep enough to hold the volume several times that of the combined chemicals to avoid the spillage of contents during bubbling and splashing that take place during the process.

Again, you may raise a question, why formalin is added to KMnO₄ but not *vice versa*? You know the answer now; exactly the same for using earthen pot. For the same reason (excess heat generated), KMnO₄ must not be added to formalin, but the crystals must be kept first in the earthen pot and formalin is poured onto it. Due to heat generation and bubbling, the contents may splash on to the worker.

It is easy to explain why one has to come away quickly and close the door. The formaldehyde gas instantaneously released is harmful to the eyes of the worker.

(c) Quantity of chemicals

Two parts by volume of formalin to one part by weight of KMnO₄ are used. Usually, 40 ml of 40% formalin and 20 g of KMnO₄ for every 2.83 m³ (100 c ft) is known as 1X concentration. For the same area, if the quantities of the chemicals are doubled, it is called 2X and so on. After the reaction, if the residue is purple, the quantity of formalin added is more. When proper quantities are used, a dry, brown powder will be left.

(d) Stopping the reaction after a period of time

In the event that the fumigation must be stopped after a period of time, it can be done, by opening the doors and curtains on the side walls. However, it can be done fast by sprinkling the fumigated floor area with ammonium hydroxide (NH_4OH). The quantity of NH_4OH required is equal to one-half of the quantity of formalin used for fumigation.

(e) Concentration recommended

Formaldehyde fumigation is employed at different concentration and time for different purposes. The following table summarizes the most common uses:

Table 5.3: Formaldehyde Fumigation

Parameters	Concentration	Duration (minutes)
Chicks in hatcher	1X	3
Eggs	3X	20
Equipment	3X	20
Hatching eggs	2X	20
Houses, vehicles	5X	30
Wash room, chick room etc.	3X	30

5.4.3 Sanitation

Sanitation refers to a state wherein there is no threat to the birds' health. It mainly involves regular cleaning of the building, feeders, drinkers etc.

(i) Poultry House

The following procedures are recommended for a complete sanitation of floor houses which include deep litter, all slat and slat and litter houses:

- 1) Litter should be removed and shifted as far away as possible; say a minimum of 100 m away from the shed.
- 2) Floor then has to be swept thoroughly.
- 3) Lighting fixtures, fan blades, if any, must also be cleaned. Burnt-out light bulbs have to be replaced and all other bulbs cleaned.
- 4) Drinkers, feeders and any other equipment used should be scraped, scrubbed and cleaned.
- 5) The sills of the house (present over the doors) should be scraped and cleaned. All material outside the house should be removed.
- 6) Ceiling, walls, feeders, drinkers and other equipments should be thoroughly be disinfected with a good disinfectant used at the rate recommended by the manufacturer.
- 7) Cleaning should begin at the back and then move toward the front of the building, spraying the ceiling first, then the walls, and finally the floor.
- 8) When the floor is dry, 10 cm of dry, absorbent litter should be spread.
- 9) An approved insecticide should be used on the top of the new litter, if insects are a problem.

Caution: Insecticides and disinfectants should not be mixed for application.

(ii) Feeders and drinkers

Feeders and drinkers used must also be cleaned as follows:

- 1) All feed should be removed from feeding system. Waterline should be closed and water from drinkers should be removed into a bucket.
- 2) Any mould ring present in the feeders should be scraped and removed.
- 3) Any algal growth in drinker parts (found as greenish patches, or slimy material) should be scrubbed.
- 4) The pan of the feeders and drinkers should be removed and sprayed with a 5 per cent solution of sodium hypochlorite.
- 5) Entire set up should be sun-dried and should be re-assembled before use.

(iii) Water

If bore well is the source of water for the farm, it can be treated with sodium hypochlorite (bleaching powder) dumped directly into the well. Water is then run through all the lines until chlorine can be smelled at the end of each line. The water is allowed to stay in the lines for a minimum period of 24 hours.

If the well cannot be treated, the waterlines in the empty building can be treated through the “medicator”, an attachment at the beginning of the waterline to dispense medicines to the birds. After adding bleaching powder, drain plug at the end of each line is removed or last drinker is temporarily disconnected and plugged after the water with sanitizer starts coming out. You can imagine with the help of science studied in your school that water flows out due to gravity. Thus, the entire waterline gets sanitized. It is left as it is for at least 5 to 6 hours and then drained again.

If water is through an overhead tank, as in most cases, 3 to 5 g stabilized bleaching powder (35% chlorine) per 1000 litres can be added. Water is ready for use after about one hour. This method is the cheapest of all methods.

5.4.4 Traffic Control

This includes human traffic control, such as locking the doors and restricting all visitors, or allowing entry to certain authorized and necessary personnel only after they have put on properly sanitized footwear, dress and head-dress. Hands must be sanitized before entering a poultry building or leaving the farm.

Traffic control is also required for animals such as rats, mice, wild birds and predators. You are already aware that protection from predators is difficult in extensive and semi-extensive system of rearing. Grass and bushes all round the building has to be trimmed. This helps in the detection of burrowing rodents (rats, bandicoots etc.).

Only clean plastic crates should be used especially when transported over long distances. This is because plastic equipment is easy to clean and disinfect. You should always keep in mind that disease producing organisms can survive even outside the animals for a period of hours to months.

Within the farm, movement should be from the youngest to the oldest birds and from healthy to the diseased birds’ area. Separate footwear and dress is compulsory for the attendant working on healthy and isolated flocks. Footwear should be disinfected at each site.

Each building should have a footbath in front of every door. It is actually located on the side-walk usually measuring 60 cm × 45 cm and 5 cm deep. Every day the footbath should be cleaned and filled with fresh disinfectant which can be phenol solution or powdered lime etc.

Drinkers and feeders have to be disinfected as often as possible; preferably every day. Disinfection of houses and equipments has to be planned as and when house becomes empty or at least once a year. At the same time, rodent and pest control procedures can also be taken-up.

Dead birds must be disposed off promptly by burning, burying, composting etc.

Check Your Progress 3

Note: a) Use the space given below for your answers.

b) Check your answers with those given at the end of the unit.

1) What are the recommended uses of disinfection?

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2) Discuss formaldehyde fumigation.

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3) Define sanitation.

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5.5 MEDICATION AND VACCINATION

You will agree that just because one is vaccinated against a disease, he or she can be careless regarding cleanliness and hygiene. Vaccines cannot be a substitute for proper animal management. Therefore, appropriate bio-security measures should be followed. However, if a disease outbreak occurs, the vaccination program needs to be adequate and effective to limit resulting losses. Thoroughly understanding causes of vaccine failure will help prevent future problems.

Similarly, medication is not a compulsory procedure in a farm. However, there are certain important aspects of medication you should be aware of. Therefore, some basic facts about vaccine, vaccination and medication have been detailed here.

5.5.1 Medication

You know that in human beings, small children are given special care, additional vitamins, minerals etc. so that they grow well. Similarly, medication starts on the very day chicks arrive because, chicks would have been subjected to transport over sufficiently long distance. Therefore, glucose, anti-stress factors, growth promoters etc. are being given by farmers. Of these, anti-stress factors appear to be a reasonable requirement. They consist of B-complex vitamins which are given through water. Usefulness of all these depends on the sanitation and management of the birds. If management is good, the administration of these is only a waste of money.

Therefore, there is no replacement for good management. Most of the medicines do not taste nice; therefore, birds show hesitation in drinking water mixed with medicines. This is particularly true for medicines used to get rid of worms in the intestines (deworming medicines). Same happens in case of children as well. But, we somehow force the medicine to the children by one or the other methods. But, in case of birds, the best method is to make them feel thirsty and then give medicated water! Water is withdrawn for 3 to 6 hours (shorter period during hot weather) and then medicated water is given with the following precautions:

- 1) More number of smaller drinkers are used.
- 2) All drinkers are placed as quickly as possible into the pen.
- 3) Drinker space can be increased only while medicated water is given.

Several commercial preparations are available containing combinations of B-complex vitamins, minerals, growth promoters etc. and it is not possible to enlist all of them. Hence, it is advised to consult the local Veterinarian or Department of Animal Husbandry for guidelines. It is highly recommended to have a ready stock of vitamins and antibiotics for emergencies.

Note: Certain medicines will be added in the feed itself. For example, drugs to prevent coccidiosis. Some other drugs may have to be injected. For example, Gentamicin when there is severe outbreak of *E.coli* infection.

5.5.2 Vaccines

Human and animal body is peculiar in the sense that when an outside protein (organic compound containing nitrogen) enters the body, it reacts to protect the body and produces several symptoms outside and we recognize it as a specific disease. There are different types of vaccines available in the market for different diseases.

- Disease causing organisms is killed and used as vaccine to produce protection (killed vaccine).
- Disease causing organisms is made to enter several times repeatedly into another species of animal which is normally not the one it affects, so that it becomes very less infective (attenuated) to the original species (live attenuated vaccine).
- Disease causing organisms can be directly used on a species in which it does not produce disease under normal circumstances (live vaccine).

5.5.3 Precautions during vaccination

Whatever may be type of vaccine; there are certain precautions one has to undertake to make the vaccination most effective.

- Vaccines should be purchased from a reliable source. Batch number, date of manufacture and supplier's details have to be recorded.
- Expired vaccines should neither be purchased nor used.
- If premixed vaccine has to be transported, it must be done in a flask filled with ice water and used as quickly as possible; preferably, within two to three hours.
- Vaccines are normally stored at the temperature of 2-8°C. They should neither be frozen nor be kept above 8°C. While transportation also, the same temperature range is ideal.

- Vaccines should not be exposed to sunlight.
- Vaccination should be carried out during cooler part of the day; temperature above 30°C may affect vaccine efficiency.
- Sick birds should not be vaccinated.
- Careless spillage of vaccine must be avoided, especially with live vaccines which can cause the disease.
- Vaccine should be administered depending on manufacturer's recommendations.
- When a vial (small container having vaccine) is opened, complete contents must be used. The vaccine should be opened and mixed just before administering the vaccine.
- The vaccinating equipment must be sterile and chemical disinfectants must not be used for sterilization.
- Vaccine ready for use (reconstituted vaccine) must be kept in an ice-bath during the period of vaccination. It is advisable to use the reconstituted vaccine within 2 hours of its preparation.
- Empty vials, left-over vaccines and other material containing the vaccine must be burnt and destroyed.
- The birds must be provided with adequate heat, feed, water and ventilation depending on the requirements.
- The vaccine and the diluent (liquid supplied in which vaccine is to be mixed) must be properly stored as per the manufacturer's recommendations and administered through the route specified at an appropriate age.
- All birds must be vaccinated.

5.5.4 Precautions for Vaccines given through Water

The main aim is that each bird should drink a minimum of one dose of vaccine solution. This is the simplest method of vaccination for a large number of birds within a short time and without handling any bird. Water vaccine is generally offered in water basins suitably placed on the litter floor.

- Vaccines administered through drinking water should be opened under water into which it is to be mixed; because, vaccines are normally vacuum-sealed and when opened in the air, there may draw contaminated air into the container.
- Tap-water with chlorine or other disinfectants must not be used because they lower the potency of the vaccine.
- Metal containers must be avoided because reactions of the surface of the metal, if any, can produce chemicals that affect potency of the vaccine.
- Antibiotics must be removed from water before and after administering bacterial vaccines, in particular.
- Vaccine should be reconstituted in a sufficient volume of water as recommended by the manufacturer.
- To stimulate drinking, water should be withdrawn for 3 to 6 hours before administering the vaccine so that the birds become thirsty. During hot-weather, the withdrawal period can be reduced.

- Adequate drinker space has to be provided to allow free and easy access to the vaccine solution.
- Water consumption during the first three weeks of a chick’s life is not regular. Thus walking through the house during the vaccination and chasing up inactive chicks, especially along the sides of the house, is recommended.

5.5.5 Vaccines for Broilers and Layers

The broilers are grown to a maximum of 6 to 8 weeks. Therefore, they are given vaccines against only those diseases which can affect them during the first 8 weeks of age. They are as follows:

Table 5.4: Vaccination Schedule for Broilers

Age (days)	Vaccination Details		
	Disease	Vaccine	Route
5 th – 7 th	RD	LaSota or F ₁	Ocular or Nasal or Water or Spray
14 th – 16 th	IBD	Georgia strain	
28			

The layers are reared till they are of 18 months of age. Therefore, they do require many vaccines and each of the vaccines may have to be repeated several times. The following table gives the vaccination schedule for layers:

Table 5.5: Vaccination Schedule for Layers

Age (days)	Disease	Route
5 th	RD + IB	Ocular or nasal
5 th to 7 th	RD (Killed)*	S/c (neck)
14 th	IBD	Ocular or nasal
24 th	IBD	Ocular or nasal or water
28 th to 30 th	RD + IB	Ocular or nasal or water
5 th to 6 th week	Coryza*	S/c (neck)
7 th week	Fowl pox	S/c (wing stab)
9 th to 10 th week	RD (R ₂ B)	S/c (wing web)
12 th week	IB	Ocular or nasal or water
13 th to 14 th week	Coryza*	S/c (neck)
17 th week	RD (R ₂ B)	S/c (neck)
Layer House	RD	Every 3 months - drinking water
* Not compulsory RD: Ranikhet Disease IB: Infectious Bronchitis Ocular: A drop into the eye Nasal: A drop into the nostril S/c: Below the skin		

Check Your Progress 4

Note: a) Use the space given below for your answers.

b) Check your answers with those given at the end of the unit.

1) Define All-in-all-out system.

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2) Define Bio-security.

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3) Define Fumigation.

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Activity 3

Visit a nearby poultry farm. Collect information on the different types of medicines used for different diseases. Collect the vaccination schedule of broilers and layer and give your opinion on the vaccination schedule being followed in the farm you visited.

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5.6 LET US SUM UP

The poultry, like any other animal and human beings, also can get diseases. Many infections from bacteria, virus, parasites, fungi and other causes have been identified. Some of the diseases are common to both broilers and layers; for example, *E.coli* infections, coryza, MG (all bacterial), Ranikhet, Infectious bursal disease, influenza (all viral), coccidiosis (parasitic), brooder pneumonia, aflatoxicosis (all fungal) and fatty liver kidney syndrome, ascites, sudden death syndrome, breast blisters etc. (miscellaneous). However, layers are grown for a total of 18 months; hence, they can get infections like Pullorum (bacterial), lymphoid leucosis, infectious bronchitis, Egg drop syndrome, pox (all viral), ecto- and endo- parasites (parasitic), and prolapse, cage layer fatigue, hemorrhagic syndrome, bumble foot etc. Similarly, broilers due to their heavy weights are more likely to get leg problems. Many of the commonly occurring diseases can be prevented by a suitable vaccination program. Proper care has to be exercised while handling, diluting, administering vaccine and after vaccination as well so that all birds are properly protected. Medicines whenever necessary can be given to birds, particularly through water.

5.7 GLOSSARY

- Air-borne** : Carried or contained in air.
- All-in-all-out system** : A flock schedule wherein all chicks come at once and all are sold at once.
- Appetite** : Urge to eat.
- Ascites** : Accumulation of fluid in abdomen.
- Bio-security** : Security or protection of animals in a farm from diseases and preventing spread of diseases.

Carrier	: A bird that serves as a host for a pathogen and can transmit it to others, but is immune to it.
Curing	: Recovery from disease
Diarrhoea	: Loose motion or watery faeces.
Diluent	: Fluid supplied with the vaccine to mix and dilute before use.
Disinfection	: Getting rid of infection if present.
Dropping Pit	: Space provided under the cages without flooring.
Ectoparasite	: A parasite on the body.
Egg-borne	: Contained or carried in or on eggs.
Endoparasite	: A parasite inside the body.
Enteritis	: Infection of intestines.
Fogger	: Equipment which can spray a fine mist of water drops.
Fumigation	: Production of fumes or gas.
Humidity	: amount of moisture in air.
Hydropericardium	: Fluid filled around heart.
Immunity	: Protection against disease.
Inappetance	: No interest to eat.
Litter-borne	: Carried or contained in or on litter.
Microorganism	: A very small organism not visible to the naked eye.
Microscope	: A special instrument to see microorganisms.
Mortality	: Death or number of deaths.
Omphalitis	: Infection of naval.
Oocyst	: Egg of endoparasite (protozoan) coccidia.
Pneumonia	: Infection of lungs.
Post-mortem	: After death.
Potency	: Ability to produce disease.
Prolapse	: Coming out of egg forming organ and/or intestines.
Quarantine	: Isolation of sick from the healthy ones.
Sanitation	: A state wherein there is no threat to the birds' health.
Syndrome	: Group of symptoms.
Synovial Membrane	: Membrane protecting a joint.
Vaccine	: Modified microorganism which can produce protection against itself.
Vial	: A small container with vaccine.

5.8 SUGGESTED FURTHER READING

Ensminger, M.B. 1993. *Poultry Science*, 3rd Edition. International Book Distributing Company, Lucknow, India.

North, M.O. and Bell, D.D. 1990. *Commercial Chicken Production Manual*. AVI Publication, Van Nostrand Reinhold, New York, USA.

Sreenivasaiah, P.V. 2006. *Scientific Poultry Production*, 3rd Edition. International Book Distributing Company, Lucknow, India.

5.9 REFERENCES

Sreenivasaiah, P.V. and Venugopal, S. 2008. *Small-Scale Broiler Production*. International Book Distributing Company, Lucknow, India.

Sreenivasaiah, P.V. and Venugopal, S. 2008. *Small-Scale Layer Production*. International Book Distributing Company, Lucknow, India.

5.10 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1

- 1) Improved growth rate in broilers has resulted in greater strain on legs. Therefore, in the beginning, there will be some sort of bending of tibia which, later on, corrects itself when the growth rate falls. However, many diseases and disorders manifest with impaired walking or refusal to walk. Cause of each of the leg disorders is not very easy to be defined. However, some of them which could be due to nutrition are:

Leg disorders	
Disorder	Cause(s)
Chondrodystrophy (enlarged hock)	Deficiency of manganese, choline, niacin, folic acid, zinc and pyridoxine
Rickets	Deficiency of Vitamin D
Tibial dyschongroplasia (focal osteodystrophy)	Excessive pressure due to faulty walking style
Spondylolisthesis (Kinky back)	Genetic
Plantar pododermatitis	Genetic

- 2) *E.coli* infection can lead to one or many of the following in broilers:
- Swelling and infection of the navel region – called omphalitis or mushy chick disease.
 - Infection of heart and lungs when infection is through air (called as “Airborne”) – called as air-sac infection or air sacculitis.
 - Infection of many internal organs like liver, kidneys, heart etc. when the bacteria has entered through blood (septic or septicemia).
 - Watery or yellowish faecal matter when bacteria have entered through feed and water – called enteritis.
- 3) In chicken and turkey, a bursa (a closed cavity) lined with synovial membrane normally exists over the anterior (front) projection of the keel (breast) bone. Causes of injury to this bursa include poor feathering, hard flooring and leg

weakness, which is associated with increased sitting. Breast buttons are changes in a similar location that have a hard crust on the surface and a core of dead skin and nodule-like reaction. Unlike breast blisters, they are likely to be chemical burns due to prolonged contact of poorly feathered skin with wet litter containing ammonia or toxins. Therefore, proper litter-management with balanced diet is the only way to avoid breast blisters or buttons.

Check Your Progress 2

- 1) **Egg Drop Syndrome:** This viral disease is mainly from hatchery; bird to bird transmission is slow and intermittent, especially in caged birds. The first sign is loss of colour in coloured eggs followed quickly by production of thin- and soft-shelled eggs or shell-less eggs. The thin-shelled eggs often have a rubbed, sand paper-like texture or a granular roughening of the shell at one end. There will be a sudden drop in egg production if infection has occurred in late production. Small eggs and eggs with poor interior quality are produced. There may be delayed sexual maturity.
- 2) **Lymphoid leukosis:** The disease is viral and lymphoid leukosis viruses (LLVs) are transmitted through hatching eggs and also bird to bird, by direct or, to a lesser extent, by indirect contact. Depending on the virus involved, various conditions are encountered; most common is Lymphoid leucosis. Its occurrence is usually highest at about sexual maturity. No specific sign is noticed although pale and cyanotic (bluish) combs, emaciation (loss of body condition) and lack of interest to eat (inappetence) may be noticed. Abdomen is often enlarged and on palpation reveals enlargement of liver, bursa of Fabricius, and/or kidneys.
- 3) **Pullorum disease:** Caused by bacteria *S. pullorum*. Spreads primarily through hatching eggs; cannibalism (pecking at) of infected birds, egg eating, wound infection and contaminated feed. Newly hatched chicks from infected eggs will be about to die (moribund) and few may even be dead. They exhibit somnolence (sleepiness), weakness, inappetance (no interest to eat), shrill cry while defecating and chalky white diarrhoea; peak mortality (death) occurs during 2nd or 3rd week. Recovered birds are carriers and spread infection to healthy flock. In adult birds, no distinct signs are seen on most occasions, reduction in egg production is also highly variable. In rare cases, sudden infection results in depression, anorexia (not eating), diarrhoea and dehydration. Deaths due to the disease may go up to 100% if no care is taken.

Check Your Progress 3

- 1) The recommended uses of disinfectants are given in a table.

Disinfectant	Recommended Use
Alcohols (like spirit)	Small utensils
Aldehydes like formaldehyde	Fumigation
Halogens like chlorine in bleaching powder	Water systems, foot baths
Oxidizing agents like hydrogen peroxide	Small utensils
Phenols	General house use
Quaternary ammonias	Feeding systems
Note: Each has to be used at levels recommended on the label by the manufacturer.	

- 2) Disinfection by a gas is called as fumigation because fumes are involved. Formaldehyde fumigation is so common that the term fumigation in Poultry farms means formaldehyde fumigation. Formaldehyde (HCHO) is a gas sold

commercially as a 40% solution (37% by weight) in water as formalin. It is also available in powder form called paraformaldehyde containing 91% of formaldehyde which the heated to 232°C liberate the gas. But formalin fumigation is most popular.

- 3) Sanitation refers to a state wherein there is no threat to the birds' health. It mainly involves regular cleaning of the building, feeders, drinkers, deep litter, floor, lighting fixtures, etc.

Check Your Progress 4

- 1) All-in-all-out system: A flock schedule in which all chicks are brought once and all are sold at once is called all-in-all-out-system.
- 2) Bio-security : means security or protection of animals in a farm from diseases and preventing spread of diseases.
- 3) Fumigation : Disinfection by a gas is called as fumigation.