Miscellaneous Diseases of Poultry

BY HUBERT BUNYEA

This article discusses various diseases and injuries to which poultry are subject, including paratyphoid infection; fowl typhoid; fowl cholera; thrush; aspergillosis; favus; epidemic tremor; avian tuberculosis; poisoning; and bumblefoot, sod disease, and other forms of lameness. The author ends with a set of general recommendations for keeping poultry healthy.

Paratyphoid Infection

Fowls are susceptible to numerous infections attributable to some member of the paratyphoid group of organisms, of the genus Salmonella. Among the principal avian paratyphoid infections are those caused by S. anatum in ducks and by S. aertrycke in chickens, ducklings, pigeons, and other species (typhimurium). S. enteritidis infection of chicks and ducks is prevalent in Europe but not common in the United States.

Paratyphoid infection is characterized by inflammation of the intestines (enteritis), lack of appetite (inappetence), unthriftiness, and diarrhea. The mortality rate is variable. This is essentially a disease of young birds. In adult birds it seldom occurs in acute form, but it may occur with low-grade symptoms, either sporadically or as an epizootic (corresponding to an epidemic of a human disease). In pigeons it is characterized by symptoms of inflammation of the lining of the stomach and intestines (gastroenteritis) and by the formation of abscesses around the joints (periarticular abscesses), especially the wing joints (paratyphoid arthritis), which interfere.

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seriously with flying. The abscesses tend to recover without surgical treatment, and flying may be resumed.

The frequency with which the *Salmonella* organism is recovered from ovaries indicates that the infection is probably in some instances transmitted through the egg. Infection may also occur in other organs of the body and be disseminated in the droppings.

Paratyphoid infections are difficult to control. The use of blood tests similar to the test successfully used for diagnosis and control of pullorum disease has not been found practical. The use of hygienic measures in the hatching and rearing of the young is of paramount importance in controlling the disease. Sometimes, however, it is extremely difficult to apply such measures; in pigeon husbandry, for example, the squabs must be fed and reared by the adult pigeons. If it is noted that certain adult birds are particularly unsuccessful in rearing their young on account of paratyphoid infection, such birds should not be used for breeding, or, if they are especially valuable, their eggs might be hatched and the squabs reared by healthy foster parents.

Eggs and poultry affected by paratyphoid infections should not be used as food. In Europe food poisoning has occurred in numerous instances from meringues, mayonnaise, custards, and other articles containing uncooked or partially cooked duck eggs. In the United States one or two instances of such poisoning have served to emphasize the advisability of thoroughly cooking duck eggs originating from flocks known to be or suspected of being affected with paratyphoid infections. The flesh of squabs harboring paratyphoid infection, if incompletely cooked, may also be the cause of food poisoning of human beings.

**FOWL TYPHOID**

Fowl typhoid occurs sporadically in almost every part of the United States. It attacks chickens, turkeys, pigeons, and other domestic species. Being a form of bacteriemic infection caused by *Shigella gallinarum*, it somewhat resembles fowl cholera in its symptoms and course. Mortality is not so high as in fowl cholera, however, and in general the condition is not of major importance, particularly in chickens. The decline of the disease among chickens probably results, at least in part, from the fact that typhoid carriers are detected by the blood test for pullorum disease and are removed along with the pullorum carriers. Typhoid in turkeys is increasing in importance.

In the absence of a remedy or a dependable vaccine for typhoid, the condition must be controlled largely through the application of sanitary measures. No reliable statistics are available concerning mortality among poultry due to various causes, but this disease is not now an important factor in poultry raising.

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*3 A bacteriemic infection is one characterized by the presence of living bacteria in the blood stream.*
FOWL CHOLERA

Fowl cholera is an infectious disease caused by the organism *Pasteurella avicida*. It affects all domesticated fowl but is most serious in chickens. It is manifested by intestinal disturbances, depression, and a high mortality. The disease assumes both the acute and chronic forms. Chronic cases may become carriers and perpetuate the infection from season to season. Outside the body of the carrier, the infection is easily destroyed by sanitary measures and by the natural elements. In the absence of any dependable means of immunizing susceptible birds or curing sick ones, sanitation has been the principal defense against fowl cholera for many years. A whole-blood agglutination test has recently been developed which detects fowl cholera carriers, thus making it possible to remove the source of perpetuation of the infection. It is thought that the application of this test during a chronic outbreak or at the subsidence of an acute outbreak will permit the detection of the carrier birds and that their removal will break the cycle of the infection in the flock. The test has not yet gained wide acceptance, however, and has had only limited trials.

Fowl cholera is not limited in its occurrence to any particular geographical location. It is probably most prevalent in the Middle West, and it is a serious problem at poultry-fattening plants and among feeder poultry in transit by railroad to eastern markets but not in the industry generally. No figures are available as to the losses caused by this disease.

MYCOSIS

Mycosis is a disease caused by fungus growths. Fungi attack the skin, respiratory tract, and digestive tract of chickens. The most serious type of mycosis is that which affects the digestive tract. Known as thrush or moniliasis and caused by the fungus *Saccharomyces albicans*, it affects chickens, pigeons, turkeys, and geese. Gray or white patches form on the mucous membranes of the gastric tract and sometimes enlarge and run together. A discharge runs from the mouth. Loss of appetite, weakness, and emaciation ensue and there is a progressive diarrhea, with green droppings. Mortality runs high in the affected birds, and production is curtailed in those that survive.

Medicinal treatment in the form of mild antiseptics may be applied to visible lesions, but the disease, if deep-seated, is beyond the reach of drugs. Clean houses, clean drinking fountains, feed that is free from molds, and dry litter all aid in the prevention or control of the disease. It is not of major economic importance and probably does not occur to any great extent in well-managed establishments.

Preparatory to medicinal treatment, the accessible thrush deposits in the mouth and larynx of the affected bird should be removed with forceps, after which the ulcers should be painted with a mixture of 4 parts of glycerin and 1 part of tincture of iodine. Thrush of the crop may be treated by washing out the crop with a 2-percent solution of boric acid, using a fountain syringe.
Mycosis of the Air Passages (Aspergillosis)

Mycosis of the air passages may occur in any species of fowl but is particularly prevalent among waterfowl and zoo birds. It is caused by the green mold Aspergillus fumigatus and sometimes by the black mold A. niger.

The disease assumes the form of chronic progressive dyspnea (labored breathing) attended with unthriftiness and emaciation. Mucous rales—a gurgling sound in the breathing—occur when the bird exhales. These and the usual mouth-breathing (gasping) symptoms may be mistaken for evidences of avian diphtheria, laryngotracheitis, bronchitis, or coryza. Aspergillosis, however, may be differentiated at autopsy by the appearance of white or dirty-yellowish nodules (small lumps) in the trachea, lungs, or air sacs. In advanced cases these lesions may coalesce into elevated dirty deposits consisting of mold growths in the air passages. Aspergillosis in brooder chicks (brooder pneumonia) may be confused with pullorum disease, which sometimes affects the lungs of baby chicks, producing dyspneic and pneumatic manifestations. Aspergillosis of young chicks is rapidly and invariably fatal. In older birds the condition assumes the more chronic form, but there are no recoveries. Medicinal treatment or vaccination is of no known value in combating the condition. The only procedure that can be recommended as having any prospect of controlling aspergillosis is the practice of strict sanitation. Moldy feeds and moldy litter must be removed; floors, nests, dropping boards, and feed and water containers should be cleaned and disinfected; and clean litter and unspoiled feed should be provided.

Feed bags that have become damp and moldy are a possible source of the disease and should be destroyed. Feed should be purchased in new bags and stored in such a way that molds and dampness cannot occur. The feeding of wet mashes necessitates scrupulous care in the daily cleansing of the feed receptacles. Left-over wet mash should be discarded beyond the reach of the flock.

The sick birds should be segregated or, better still, destroyed so they cannot spread the infection. Those that die should be burned or otherwise disposed of properly.

Mycosis of the Skin (Favus, White Comb, Avian Mycotic Dermatitis)

Favus is caused by the fungus Lophophyton gallinae, which is readily transmitted from bird to bird and is also said to be infectious to human beings. It is manifested by the formation of grayish-white growths or crusts on the unfeathered head parts of the affected bird. If it spreads to the feathered part, the feathers break off, and the disease becomes increasingly difficult to control. Birds so affected had better be destroyed. When only the unfeathered parts of the body are affected, the daily application of tincture of iodine to the lesions has been recommended. Greater success has been reported,
however, from applying formalized petrolatum, which is prepared by adding 5 percent (by weight) of commercial formalin to melted petrolatum and shaking these together in a tightly closed container until the petrolatum has congealed. One application of formalized petrolatum is said to have effected a cure in nearly all cases treated. **Rubber gloves should be worn during its preparation and administration.**

**INFECTIONOUS AVIAN ENCEPHALOMYELITIS**

Infectious avian encephalomyelitis (epidemic tremor) occurs in chicks 1 to 2 days up to 2 to 3 weeks old. Fifty percent or more of the chicks in a flock may be affected. Many are likely to recover, but others may continue to manifest some tremor symptoms for a time.

The practice usually recommended is to finish surviving chicks quickly for early marketing as broilers or fryers. Under favorable living conditions, the recovered and slowly convalescing birds may mature and may become normally productive of eggs and healthy chicks. They may, however, turn out to be carriers of the infection, which they may transmit to their offspring.

The disease does not usually affect every hatch but may disappear during the hatching season only to return unexpectedly, recurring sporadically from to time with varying degrees of severity.

The disease is disseminated through contact among the brood. It may also be spread through contact in the incubator, and there is some scientific evidence to indicate that infection may be handed down from parent to offspring through the egg. In this way epidemic tremor may be broadcast to remote areas through the dispersal of an infected or exposed hatch of chicks. Fortunately some strains of chickens appear to possess more resistance to the disease than others.

**AVIAN TUBERCULOSIS**

Tuberculosis is a chronic infectious disease which affects practically all species of domesticated birds and many species of wild birds in captivity. It is manifested by the formation of nodules in various organs, such as the liver, spleen, kidneys, and heart muscle, and along the mesentery and intestinal tract. The seriousness of the tuberculosis problem in connection with poultry, the distribution of the disease, the use of the tuberculin test, and the preventive measures are discussed in the article on Tuberculosis, page 246. It is necessary here to add only a few points to that discussion.

The clinical diagnosis of avian tuberculosis is difficult because many of the symptoms, such as emaciation, dejection, articular lameness of legs or wings, paleness, and diarrhea, are common to other conditions. However, the occurrence of numerous cases showing one or more of such symptoms, along with a history of occasional mortality in the flock, strongly suggests tuberculosis infection. An early symptom is emaciation of the breast muscles, and this progresses to the point where no flesh separates the skin and bone. The bird continues to eat well, and the temperature remains normal until the approach of
death, when it becomes subnormal. Autopsies of such birds show an almost complete absence of body or visceral fat.

The lameness occurring in an advanced stage of the disease is occasioned by purulent swellings of the affected articulations or joints. These swellings may rupture and exude a cheesy pus. The head parts are strikingly pale, withered, and dry. Listlessness and weakness are progressive. A greenish or yellowish diarrhea develops and aggravates the weakened condition of the birds. The feathers assume a ruffled, unkempt appearance as a result of the bird's weakness and neglect in preening itself.

Tuberculous lesions found in the carcass include large or small tumorlike masses within the liver, spleen, kidney, ovaries, peritoneum, intestinal tract, joints, and elsewhere. The occurrence of such lesions is not, however, conclusive as a diagnosis of tuberculosis. The final proof is the microscopic demonstration of the presence of the organism of the disease.

The tuberculin test is, in general, reliable and it is useful within certain limits. The cost of the test and the labor of applying it, although moderate, must be taken into consideration, especially when planning to test flocks of no more than average value. Whether or not the tuberculin test is applied, it is important to obtain a diagnosis when the disease is suspected.

Since avian tuberculosis is not amenable to medicinal treatment, the only method of control is the slaughter of all reactors to tuberculin or all clinically suspicious cases of the disease. Where the infection appears to have taken a firm hold, it is frequently desirable to destroy the entire flock; although, if the birds are of exceptional breeding value, it may be advisable in rare cases to preserve them long enough to obtain a few hatching eggs to perpetuate the strain. Such eggs must be hatched and the resulting chicks reared under the most hygienic conditions.

After an outbreak of tuberculosis, strict sanitary measures, including disinfection, should be taken, as discussed in another part of this article, page 1009. Only after the premises have been completely freed of the infection will it be safe to introduce new stock from healthy sources.

The practice of disposing of all birds when they are about 16 or 18 months of age tends to reduce to a minimum the chances of having dangerous cases of tuberculosis on the place, since it is known that as a rule the disease develops very slowly in the growing bird.

COMMON FORMS OF POISONING OF POULTRY

Limber-Neck (Botulism)

The toxic disease known as limber-neck, or botulism, of chickens is characterized primarily by the dysphagia (difficult swallowing) caused by paralysis of the pharynx, lack of appetite, and a paralysis of the neck muscles which makes it impossible for the bird to raise or control its head.

Botulism is caused by eating feed or other material which has been contaminated with the organism Clostridium botulinum and on
which this germ has multiplied and elaborated its toxic byproducts. Decomposed flesh and the maggots of flies which have bred on it are considered probable sources of botulinus poisoning. Ducks frequenting the western marshlands have died in great numbers from botulism. (See Diseases of Wildlife and Their Relation to Domestic Livestock, p. 1225.)

Early symptoms of botulism include lassitude, drowsiness, and leg weakness. The fowl first loses the ability to stand on its feet and then the power to hold up its head. It finally assumes a posture of extreme prostration from which it cannot be aroused. The feathers become loose and are easily shed if the bird is handled. The severity of the symptoms depends on the amount of the toxin swallowed. The paralysis may affect the eyes to the extent of preventing the contraction of the pupils, and may also cause a relaxation of the bowels, resulting in diarrhea.

The course of the disease is fairly rapid, death usually occurring a few hours after the appearance of symptoms.

By the time symptoms are noted, it is usually too late for effective treatment. Birds exposed to the toxin but not yet affected may be given a drench of Epsom salts solution, 1 pound of Epsom salts being used for each 100 birds treated, or about 1 teaspoonful of the crystals, dissolved in water, for each bird. The solution may be introduced into the crop by means of a funnel or fountain syringe to insure complete dosage and prompt action. Botulinus antitoxin, types A and C, may be given intraperitoneally—injected into the lining of the abdomen. (Type B botulinus toxin does not affect poultry.) The cost of the treatment is prohibitive, however, except for birds of unusual value.

The crops of affected or exposed birds may be emptied and flushed out with fluids or evacuated by surgical incision if the value of the birds justifies such procedure.

When an outbreak of limber-neck occurs, an effort should be made to locate the cause. Decomposed flesh, dead animals and fowls, etc., which may be accessible to poultry, should be burned or buried. Spoiled canned goods used as feed are a prolific source of limber-neck among poultry.

**Chemical Poisoning**

Poultry are susceptible to chemical poisoning, but they exhibit a tolerance for relatively large doses of some poisonous substances. It is not wise, however, to leave rat poisons containing arsenic, phosphorus, barium carbonate, or other poisonous substances within reach of poultry, or to allow poultry access to orchards, cabbage patches, or other farm areas that have recently been sprayed or dusted with arsenical preparations.

Arsenic is sometimes employed for poisoning locusts or grasshoppers. Poultry eating a number of such poisoned insects or a quantity of the bait may be poisoned by the arsenic. Chickens sometimes gain access to poison bait containing strychnin intended for poisoning crows or hawks, with disastrous results.
Kamala and nicotine sulfate, sometimes used for ridding poultry of parasites, are dangerous unless used in accordance with directions. Kamala may cause a serious bowel disturbance, with a resultant loss of egg production as well as a decrease in egg weight. Small doses of a well-diluted solution of nicotine sulfate have proved fatal to young chickens.

Other toxic material frequently left within reach of poultry includes fish brine, ice-cream salt, calcium carbide slack from acetylene gas tanks, and similar substances. Spent fireworks are dangerous around poultry premises. Instances are on record of children detonating “devil-chasers” in the driveway of the farm home and leaving them there, with the result that early the next morning pullets picked up the sharp gravel from the fireworks in the driveway and within a short time died of phosphorus poisoning.

Satisfactory treatments of poultry for the various kinds of chemical poisoning mentioned are not known.

**Rose Chafer Poisoning**

Rose chafers are found in great numbers on grapevines, rose bushes, and other shrubbery during the spring. Young chickens eat these beetles readily and are fatally poisoned by a relatively small number of them. Some birds may recover from a slight attack of the poisoning. Drowsiness and weakness are the first symptoms, followed by prostration and convulsions. The head is thrown back, and the bird utters shrill cries.

No treatment is effective after the poison has begun to act. Birds that have been exposed to the danger may be given Epsom salts or castor oil to hasten the elimination of any beetles swallowed. Young chicks should be restrained from visiting areas infested with rose chafers.

**Lameness in Poultry**

Poultry may acquire leg lameness and sometimes wing lameness from a variety of causes, environmental, nutritional, infectious, and parasitic.

**Lameness Due to Environmental Conditions**

**Injuries**

Young chicks sometimes get their feet or hock joints caught in the meshes of wire-cloth battery-brooder floors. As a precaution against such accidents it is well to use wire cloth of sufficiently close mesh so that the legs or feet of chicks are not likely to become ensnared.

Fowls of any age living where the winters are cold may freeze their toes and feet. If sufficiently frost-bitten, the toes will become swollen and sore, then gangrenous, and finally drop off, leaving the foot tender and crippled. There is no cure for seriously frosted feet. The obvious preventive measure is to confine the fowls to comfortable living quarters with warm, dry floors and plenty of litter.
Bumblefoot

Bumblefoot is a swelling of the feet of poultry caused by an accumulation of a cheesy exudate, or discharge. Various explanations have been offered for its occurrence. It has long been believed that injury caused by jumping from high roosts to hard floors was responsible for this condition, but its occurrence where roosts are low and floors are well bedded with litter throws doubt upon that theory. It is probable that, through briar wounds and otherwise, infection gains entry into the tissues of the foot and sets up the production of pus in the underlying tissues, causing the bird great pain as well as lameness.

*Staphylococcus aureus*, the yellow-pus organism, has frequently been isolated from bumblefoot lesions and is considered the probable cause in some cases. An acid-fast organism resembling *Mycobacterium tuberculosis avium* has been demonstrated microscopically to be present in this condition, but its significance as a causative factor has not been established.

The treatment of bumblefoot should include all possible provisions for relieving the suffering of the affected birds. Low roosts and well-bedded floors are helpful. The abscesses may be evacuated by removing the scabs from the pad of the foot and the between-the-toes spaces and extracting the cheesy pus by pressure and the use of forceps. In advanced cases it may be necessary to lance the foot to remove the pus completely. The cavity may then be irrigated with some mild but effective antiseptic, such as 5-percent phenol or full-strength hydrogen peroxide solution, after which the cavity may be packed with pads of cotton soaked in a similar solution and bandaged with gauze and adhesive tape to keep the wound clean. The treatment should be repeated at 2- to 3-day intervals until evidence of healing appears.

A type of bumblefoot caused by a deficiency of vitamin A has been described.

Sod Disease

Sod disease is a vesicular dermatitis (an inflammation of the skin characterized by small swellings filled with fluid) of young chicks and occasionally older fowls ranging in early summer on unbroken prairie land. Blisters and swelling of the feet, culminating in scabs, eventually cause lameness. Parts of or even whole toes may slough off. Recovered birds may develop misshapen toes. The eyelids may stick together, and the birds may be unable to find their feed.

The disease is economically important not only because of rather high mortality in young birds but also because of the permanent disability caused by chronic foot trouble in recovered cases.

No cause or cure for the disease is known, but it can be easily prevented by excluding the birds from unplowed prairie land.

Lameness Due to Faulty Nutrition

Nutritional diseases of poultry are discussed in detail in another part of this report. The types of lameness that may be classified...
as of nutritional origin include articular gout, polineuritis, rickets, slipped tendon (perosis), nutritional encephalomalacia, and nutritional paralysis and curled-toe disease.

One of the forms of gout consists of swollen and painful joints of the legs or wings caused by the depositing of urates in the articular regions, rendering movement difficult and increasing the danger of starvation. Although the cause of gout is not clear in all cases, it is believed at times to be due to a prolonged feeding of high protein rations. Lack of exercise and factors affecting the proper function of the kidneys are also possibly involved in the origin and development of gout.

The swollen joints, if opened at autopsy, are found to contain a yellowish exudate consisting of waste matter from the kidneys. Similar chalky deposits may be found in the kidneys, which are usually pale and swollen. The surface of the heart, liver, spleen, and mesentery may also present a pearly, chalklike appearance due to urate deposits (salts of uric acid), and may reveal a marked absence of visceral fat.

From the dietetic standpoint, the occurrence of gout in a flock suggests the advisability of a reduction of protein to a level of not more than 10 percent of the total ration and an increase in the proportion of bulky green feeds. The entire flock may be put on a saline purge consisting in the administration of a solution containing one-third of a teaspoonful of Epsom salts crystals per hen. The painful swellings in the vicinity of articulations may be lanced and the urates evacuated, after which the incision may be dressed with a healing ointment such as zinc oxide ointment and bandaged to keep out contamination.

LAMENESS DUE TO INFECTIONS

The principal form of lameness due to infection is fowl paralysis. The disease is discussed at length elsewhere in this book (p. 944).

Paratyphoid arthritis occurring specifically in pigeons infected with Salmonella typhimurium is discussed in connection with paratyphoid infections.

Lameness from Fowl Cholera

Like avian tuberculosis, fowl cholera tends to form localized foci of infection. Common locations are in the articular regions of the legs or wings.

Outbreaks of the chronic form of fowl cholera may be characterized by a number of cases of lameness in the flock. An examination of the lame birds may disclose a soft or doughy lump on the joint of the affected member. The abscess will be found to be filled with pus as a result of localization of the cholera infection at that point. The presence of the active infection in these lesions may be demonstrated by laboratory procedures.

No treatment for lameness from fowl cholera infection can be recommended. Birds so affected are a menace and should be destroyed.
**Staphylococcic Arthritis**

In addition to being a cause of bumblefoot, the pus-producing organism *Staphylococcus aureus*, through infection of the joints, causes a number of other conditions resulting in lameness of the feet, legs, or wings of various species of birds.

Staphylococcic arthritis occurs in chickens, ducks, geese, turkeys, pigeons, pheasants, and possibly other species. The common symptoms in all species are lameness and swelling of the affected joints. Autopsy findings may vary from local abscesses to the erosion of articular surfaces of the bones and pus in the tendon sheaths and bones. Mortality is relatively high.

Treatment is palliative, giving relief only, and consists in providing comfortable housing conditions, with feed and water easily accessible to the sick birds. Separation of the affected individuals contributes to their comfort and may help to check the spread of the disease. Sanitation about the premises, including cleanliness of feed and water supply, should not be overlooked. No medicinal treatment can be recommended.

**Lameness from Parasitic Infestation**

Chickens, turkeys, pheasants, partridges, and caged birds are susceptible to infestation by a parasitic itch mite (*Ovemidioptes mutans*), which causes the condition known as scaly leg, discussed in the article on Poultry Mites, page 1058.

**KEEPING POULTRY HEALTHY**

Proper location of the poultry house will do much toward keeping a flock healthy. The poultry quarters should be on light, preferably sandy, well-drained soil and should be provided with some trees or shelters for shade. The house should face opposite the direction from which storms ordinarily come.

Clean, comfortable, well-ventilated and spacious poultry houses, abundant and nourishing feeds, and clean water in clean receptacles help keep fowls in good physical condition; when these things are provided, no medicine is needed to keep poultry well and productive. Without such provisions, no medicinal treatment will insure the maintenance of health.

In brooder houses, young fowls require some warmth under the hovers, but only enough not to become chilled. Too much heat is probably as unfavorable as too little. Ventilation is essential, when coal or oil heat is used, since chicks in poorly ventilated brooder houses may be killed by an accumulation of carbon monoxide gas. The floor space should not be crowded, and as the chicks grow they should from time to time be given additional room. By degrees, depending on the advance of milder weather and the state of development of the birds, artificial heat should be gradually diminished.

Feed hoppers and water fountains of a size and shape to provide space for fowls of any age should be supplied; otherwise, some birds will monopolize the privileges, and others, perhaps small and unthrifty to start with, will be crowded out.
Growing stock may be reared to maturity on open range provided sufficient area is available so that the houses or range shelters may be moved at frequent intervals. Sufficient ground around the shelter may be enclosed so that the birds may range for a week or more. Grass sod makes an excellent range for young poultry, but the location should be changed before the sod is bare or the ground polluted. As the birds grow, additional space becomes necessary, and this can be provided by taking out the males at about 8 weeks of age.

When the breeders are taken off the range, weaklings and unthrifty birds should be rigidly culled out. The laying houses, including floors, dropping boards, and nests, should be in good condition and thoroughly cleaned and disinfected, aired out, and thoroughly dried, and the floors should be covered with clean litter for the new occupants. Provision should be made for correct ventilation. Feed and water receptacles should be clean and in good working condition. Large laying flocks had best be divided into smaller breeding units, not only from the standpoint of matings and as good husbandry practice, but also as an aid to proper hygiene. Pullets off the range should be housed separately from old hens. Under no circumstances should birds of different species be housed together.

The windows of laying houses should be covered with mesh wire to keep out free-flying birds. Fly screening is even better, since flies and mosquitoes are carriers of poultry-disease infections. The doors also should be screened. Poultry hucksters, feed and remedy salesmen, and other transients should be positively excluded from poultry houses and their vicinity. In disease-ridden localities it is good policy to refrain from showing neighbors or visitors around poultry premises or, if this cannot be tactfully avoided, to provide them with clean overshoes. Where poultry diseases exist in one part of the establishment or in neighboring flocks, it is suggested that at the door of the poultry houses cocomats be set in shallow concrete depressions and be kept soaked with a diluted cresol compound solution, carbolic acid, or stock dip. Persons entering the houses may thus easily wipe and disinfect the soles of their footwear at one operation. The lye solutions recommended elsewhere in this article for disinfecting purposes might be injurious to shoes.

New birds purchased for breeding or show purposes, as well as birds returning from poultry exhibitions or egg-laying contests, should be kept under quarantine for observation for a period of 2 to 4 weeks before being placed with the flock. Should there be evidence of disease during this period, competent advice should be sought concerning the disposal of such birds or others exposed to them.

The occurrence of infectious disease in a flock calls for prompt and decisive action. The sick birds should be carefully separated from the healthy ones, and if possible the healthy birds should be moved to clean comfortable quarters. If this is not practicable, the sick ones must be taken out and the place promptly cleaned and disinfected as thoroughly as possible, the healthy birds during this time being temporarily moved out to a place where no diseased poultry have been. After each room is cleaned and disinfected, new dry litter should be
placed on the floor, and then the flock may be readmitted. The healthy birds should be closely observed for the possible appearance of new cases of disease.

The advisability of keeping the sick birds in separate quarters for medicinal treatment is very doubtful. It is usually better to destroy them, since sick chickens seldom respond to treatment and may only be a means of perpetuating infection on the premises. The carcasses of fowls that die from disease should be autopsied, if at all, by a competent diagnostician. In any event such carcasses should be completely burned or buried deep in the ground.

Preparatory to disinfecting poultry houses, all nesting, litter, manure, and other contaminated material and movable equipment should be removed. Dust and cobwebs should be swept from the ceilings, window sills, and ledges. Beginning with the ceiling and taking in all surfaces, the entire room from top to bottom should be thoroughly sprayed with a suitable germicidal solution. Numerous disinfecting substances are satisfactory for this operation. For general purposes a satisfactory solution may be prepared by dissolving 1 pound of commercial lye containing 94 percent of sodium hydroxide and 2½ pounds of water-slaked lime in 5½ gallons of water. It should be strained through a fine wire screen to remove particles of lime which might otherwise clog the sprayer. Any type of sprayer may be used to apply the disinfectant, but one that generates enough air pressure to drive the solution with considerable force onto the surface to be disinfected is especially effective. All surfaces should be thoroughly wet with the solution, which should also be forced into all cracks and corners. The white residue on the surface that has received the treatment will indicate spots that have been missed. The unused solution should be tightly covered to prevent deterioration. The ground around the poultry house may be disinfected with the same solution, using ½ to 1 gallon for each square yard to be disinfected. The yard must, however, be thoroughly cleaned of trash and refuse beforehand.

Because of the caustic nature of lye solutions, the following precautions should be observed: The operator should protect his person and clothing by wearing rubber boots, coat, hat, and gloves. He should also protect his eyes with goggles. Lye solutions should not be used on painted surfaces or fabric curtains. The spray apparatus should be thoroughly flushed out with clean water after use to avoid damage to leather or fabric gaskets, fabric-lined hose, etc.

A single exception is made to the recommendation of lye solution as a disinfectant. It has been found that it does not destroy the germs of tuberculosis. To combat that infection, the usual preparatory measures are taken, after which the premises and utensils are thoroughly sprayed with a material such as compound solution of creosol or a permitted saponified creosol solution in 3-percent dilution, or carbolic acid in 5-percent dilution. Some other germicides also are known to be effective against Mycobacterium tuberculosis avium.

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3 The reader is referred to Farmers’ Bulletin 926, Some Common Disinfectants, and Farmers’ Bulletin 954, The Disinfection of Stables, as well as to Disinfection and Disinfectants, in this Yearbook, p. 179.
A final suggestion concerning the prevention of diseases in poultry: It is a good idea to provide for a competent periodic inspection service on the health of the flock, including expert advice on the hygiene of the surroundings. Such service cannot be satisfactorily given by itinerant "poultry specialists," who probably have no reliable recommendation and all too frequently have something to sell. The local veterinarian, on the other hand, has qualified himself for the task of controlling poultry diseases and may be looked to with confidence to make clinical examinations, apply diagnostic tests, administer vaccines and remedies, and suggest sanitary measures calculated to cope with whatever disease problem may confront the poultryman. The staffs of many State agricultural experiment stations are also in a position to render similar services. Poultrymen would save themselves considerable financial and other losses if they would obtain competent diagnosis and advice on disease problems instead of giving undue heed to the advice of unqualified strangers or even to that of well-meaning but uninformed neighbors.