

yield of cheese in our cheese-room was low, and it was found that the milk contained a comparatively low percentage of casein at that time. So far as we know, there was no special reason why the milk should have tested low in casein at that particular time.

The average casein tests of the vats of milk in the cheese-room were lowest, and fairly uniform for the months of April (2.3), May (2.28) and July (2.31). The highest vat tests were for June (2.46), September (2.45) and October (2.61). All the testimony seems to agree that the June milk is comparatively high in casein.

6. The cheese experiments confirm previous conclusions, viz., that the yield of cheese is not in proportion to the fat in the milk. The pounds of cheese per pound of casein in the milk was fairly uniform throughout the season, the extreme variation by months being 3.87 to 4.1. The variation in the percentage of casein in the milk of these experiments was from 2.28 in May, to 2.61 in October.

7. The addition of the factor 2, to the percentage of fat in the milk, makes a fairly reliable basis for distributing proceeds of sales at cheese-ries. At present, we do not think daily or weekly testing of milk for casein is practicable in factory work, but a Hart casein tester, along with the Babcock tester, ought to be part of the equipment in every cheese factory, to be used as required.

Green Feed to Supplement Pastures.

It will pay any dairyman or stockman in good hard cash to provide now, if he has not already done so, against a possible shortage of pasture in midsummer. The ideal supplement for scant pasture is about ten feet of silage, along with a field of alfalfa. Both together is better than either alone, although, unless one has a large herd, he may require to feed only silage while silage is being used to avoid spoiling or deterioration of the exposed layer from day to day. If he cannot have both, he may choose silage in preference to alfalfa, on account of the greater convenience in feeding, although the latter is better to keep up the milk flow, and better for the well-being of the cattle. It is perhaps just as well not to feed silage the year round, on account of the acid it contains. Where one has neither alfalfa nor silage, he should sow now from one to five acres of peas and oats, in several successive sowings, near the buildings, to be cut green for feeding before the new corn crop comes on. Three bushels of oats to one of peas, will turn off a lot of feed, and, if not all required for feeding green, the surplus may be cured as hay, or allowed to ripen its grain.

POULTRY.

Tuberculosis in Poultry.

Correspondence received by poultry authorities and by the agricultural press would seem to indicate that tuberculosis is becoming increasingly prevalent among farm flocks of poultry. A great many descriptions of symptoms, submitted to our Questions and Answers Department, have pointed to this serious disease, and Prof. Graham, of the Ontario Agr. College, states that he receives an average of a letter a week from farmers describing disease in their flocks, the symptoms of which answer to those of tuberculosis. In 1908, the Bacteriologist of the O. A. C. had nineteen tuberculous fowls sent to his laboratory for examination from various parts of Ontario. This, although not a large number, is an increase of 53 per cent. over any previous year, and one more than the total number sent in during the previous four years. The increase may be partly due to increased vigilance of poultry-owners, and greater readiness to avail themselves of scientific diagnosis; but, allowing for this, there seems no reason to doubt that the disease is widespread and increasing. As a means of acquainting our poultry readers with infection, course, symptoms and preventive treatment for this disease, we present herewith a synopsis of the illustrated article in the 1908 report of the O. A. C. Bacteriologist, Prof. Edwards.

NATURE OF AVIAN TUBERCULOSIS ATTACK

Tuberculosis may exist extensively among fowls, especially in large flocks, but seldom kills enough birds at one time to draw particular attention of the owner to the trouble. Many farmers say they have been losing a bird or two occasionally for a year or more, and that the loss is gradually increasing. But it is not always so gradual. Within the last few months two farmers have sent tubercular fowls, and each stated that he had lost about a hundred from the same disease within two years. A third had lost about one a week for over a year. Tuberculosis of birds is confined mostly to chickens, although other fowl may contract the disease. Two interesting cases were examined in the O. A. C. labo-

ratory in wild geese which had been kept some time in captivity. Both were badly affected, and from these we transmitted the disease to chickens. Pheasants, turkeys and pigeons may be affected. Authorities differ as to the susceptibility of ducks. Singing birds in captivity are said to be highly susceptible.

SYMPTOMS.

Diagnosis is not easy. There is no noticeable symptom of tubercular infection shown by live birds until the disease has progressed far enough to cause emaciation, which is nearly always present, and in advanced cases extreme. The comb, wattles and the skin about the head usually become pale. Emaciation is usually accompanied by lameness, and there is nearly always a persistent diarrhoea, the faeces appearing yellowish or greenish-white. In the latter stages of the dis-

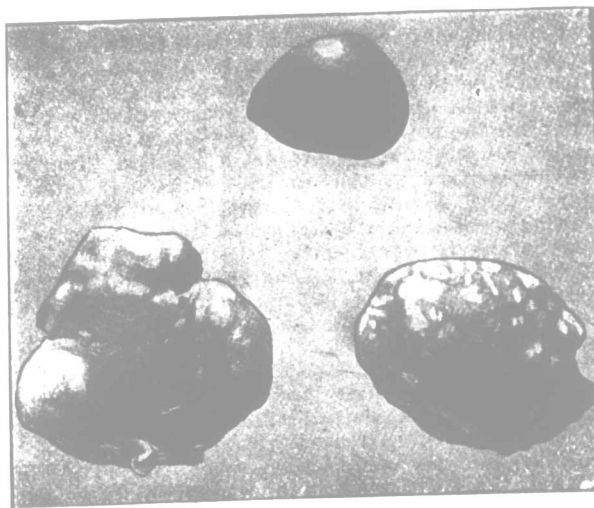


Liver of Hen that Died of Tuberculosis.

ease the feathers become ruffled, and the fowls weak, more or less mopy, and move about little. The eyes are bright in most cases until death is near. Appetite is good throughout sickness, and ravenous until a few days before death. It is often difficult for amateurs to distinguish the symptoms of tuberculosis from those of some other diseases.

POST-MORTEM APPEARANCE.

The liver is almost invariably affected. It is usually enlarged, and studded more or less abundantly with yellowish-white nodules, of a somewhat cheesy consistency, varying in size from a



Tuberculous Spleen.

Two tuberculous spleens from fowls dead of tuberculosis, and a spleen from a healthy fowl. (Nearly natural size.)

pin-head, or even smaller, to one-quarter inch or more in diameter. The nodules protrude more or less, and may be readily separated from the surrounding liver tissue. In this respect, the lesions vary from those of black-head, in which disease they are sunken below the surrounding tissue, are more yellow in color, and may be much larger. We have in some cases found a mixed infection with tuberculosis and black-head in the same organ. The spleen, a small, rounded, purple organ,

about half an inch in diameter, is frequently affected, and, in consequence, greatly enlarged, sometimes to three or four times the original size, and contains nodules of the same character as those in the liver. The intestines may be affected, in which case rounded masses of varying size will be found in the intestinal walls. The mesentery (the thin membrane to the border of which the intestine is attached) is occasionally dotted with nodular masses. The kidneys, lungs, spleen, ovaries, skin and bones may be affected.

GERMS DISTRIBUTED IN DROPPINGS.

Tuberculosis is caused by a minute bacterial organism, *Bacterium tuberculosis* of birds. The bacteria gain entrance to certain portions of the body, and multiply there, causing the formation of the nodules or tubercles seen on autopsy. The spread of the disease occurs when the bacteria are transferred directly or indirectly from the affected birds to the healthy ones.

If an examination is made of the tubercles occurring on the walls of the intestine, they will be found in many cases to have a cavity in the center, which communicates with the interior of the intestine. A microscopical examination of the intestinal contents at such points shows that enormous numbers of tubercle bacteria are present. The conclusion that the bacteria are liberated with the droppings is unavoidable. We have made microscopic examinations of the droppings in a number of cases, and found the tubercle bacteria present. The droppings of tubercular fowls must, therefore, be regarded as one of the most important sources of infection of the healthy stock. The common farm practice of feeding from the ground, or in low dishes or troughs, furnishes ample opportunity for the food to become fouled with feces, and one or two sick birds passing tubercle bacteria might easily serve to infect a large percentage of a flock. Although sunlight is rapidly fatal to this germ, it does not have the opportunity to act freely on all infectious material. Indoors, the bacteria may remain alive and dangerous for many weeks, and may infect the healthy birds. There is always the possibility also of carrying infected feces on the feet to food outside of the chicken house. Another dangerous practice, all too frequent, is that of leaving carcasses of birds that have died of tuberculosis to be eaten by the hogs or chickens.

CONTROL OF TUBERCULOSIS IN FOWLS.

There is no cure for tuberculosis in fowls, and attempted treatment is a waste of time and money expended for so-called remedies. The only course open is to adopt measures for eradicating the disease from flocks already infected, and for preventing future infection.

Eradication.—The quickest and most effective method of eradicating the disease is to destroy all the fowls, and thoroughly disinfect the premises. In small flocks known to be infected with tuberculosis, this measure is advisable. The fowls could be examined, and all that were found healthy could be sold, thus lessening the loss considerably. In larger flocks, or when it is desired to preserve a certain strain in breeding, less drastic measures may be adopted, with final satisfactory results. There is no known test to determine the presence of the disease until it has progressed so far as to cause lameness or emaciation. Ward, of California, has shown that tuberculin is of no value as a diagnostic agent for tuberculosis of fowls. There is good reason to believe that birds may be discharging the germs in the droppings, although the disease may not be far enough advanced to show noticeable symptoms. Hence, all individuals of the flock must be regarded as dangerous to those free from disease, and the latter should be kept separate. All fowls suspected of having the disease should be slaughtered, and the carcasses completely burned. Roosts, houses, etc., should be disinfected frequently. Inasmuch as affected birds may be continually distributing the bacteria in their feces, an occasional disinfection will be insufficient. No feed should be given the fowls on the ground. Feeding dishes or troughs should be frequently scalded with boiling water. It is not believed that this disease is transmitted through the egg. Hence, if the young chicks are placed on ground not previously inhabited by the old stock, the chances are very favorable for rearing them free from tuberculosis. Care should be observed, in purchasing new birds, that they come from flocks which are free from disease. Experience on some of the large poultry ranches of California has shown that the transfer of laying hens is an important factor in the transmission of the disease. Poultry-raisers should, as far as possible, raise their own stock.

Disinfection.—The first thing to do in putting the poultry premises in sanitary condition is to scrape the roosts, walls, floors and nests thoroughly clean. This loose rubbish, together with loose boards, etc., should be completely burned. When this has been done, the entire place should be whitewashed with lime-water—crude carbolic acid-solution, in the proportion of twenty gallons of lime water to one gallon of crude carbolic acid. Unslaked lime should be used, mixed with enough water to give it the consistency of thin