

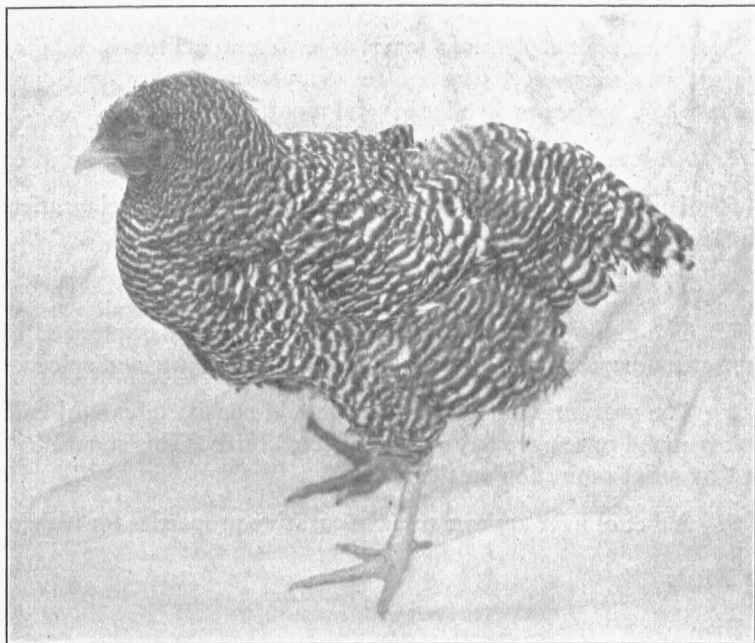
UNIVERSITY OF MISSOURI

COLLEGE OF AGRICULTURE

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BULLETIN 295

Leukemia In Fowls



Bird affected with leukemia which died four days after the photograph was taken. The liver and spleen of this bird were greatly enlarged and the typical green diarrhea was present.

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WHAT THIS BULLETIN CONTAINS

1. Leukemia of fowls is a disease of economic importance in Missouri at the present time.
2. Three per cent of all the birds examined at this Experiment Station are affected with this disease.
3. There are two common forms of leukemia; acute which kills the birds within a very short period after symptoms develop, and chronic cases in which birds may live for several months.
4. All breeds of chickens appear to be susceptible to the disease.
5. Turkeys are also reported for the first time as being affected with leukemia.
6. The cause of this disease is unknown.
7. The disease is usually of a chronic nature, characterized by a bright green diarrhea and great enlargement of the liver and spleen.
8. The prevention of this disease should consist in careful culling the year round to remove any visibly affected birds. This should be followed by strict sanitation on the farm.
9. A diet of liver appears to have curative properties for leukemia.

Leukemia In Fowls

A. J. DURANT*

Leukemia of fowls has been recognized for a number of years by scientists and investigators in poultry diseases. However, it is only within the last few years that it is becoming known as a disease of economic importance in this State. It is of frequent occurrence in Missouri at the present time as three per cent of diseased birds examined in this laboratory are affected with leukemia. Though there are certain forms which are not easily diagnosed, the more typical cases may be recognized if the usual symptoms are known.

The author has diagnosed many cases of the disease in the last fifteen years in this State, during which time it has been observed that there are two common forms of leukemia; acute, which kills the birds within a very short period after the symptoms develop, and chronic cases in which the bird may live for several months.

Gross changes in this disease are most readily recognized by changes in the liver, spleen, and sometimes the kidneys. Usually this form is diagnosed easily, but it is the acute case that is difficult to diagnose and that may sometimes be confused with certain other diseases which will be mentioned later.

All breeds of chickens appear to be susceptible to leukemia. And though the literature does not report turkeys as being susceptible to leukemia, the author has observed two typical cases in adult turkeys showing that they, too, are affected.

CAUSE

The cause of this disease is unknown but it is thought to be a filterable virus somewhat of the nature of hog cholera. When whole blood from an affected bird is injected into healthy birds it will reproduce the disease in a considerable number of cases showing that the blood contains the element which produces leukemia in a large percentage of cases. Chickens and turkeys appear to be the only birds that are susceptible to leukemia. Pigeons, guinea fowls, and other domestic birds have not been known to develop the disease. The duration of leukemia is variable and exposed birds may take two to eight weeks to develop symptoms and die.

SYMPTOMS

While birds may die suddenly from an acute attack, manifestations of leukemia are usually of a chronic character. There is observed a dull,

*The author wishes to acknowledge the assistance of Mr. H. C. McDougle, research assistant, who prepared the microphotographs in the illustrations.

depressed appearance and noticeable weakness accompanied by difficult breathing which, in the later stages, amounts to gasping for breath. In many cases, the abdomen droops. This is due to the great enlargement of the liver which presses on the other organs causing a drooping or enlargement of the abdomen. The weight of the bird may continue to be normal up until the last. This is due to the fact that the abnormal growth of the liver compensates for the loss in weight of the rest of the body, and though birds that die with a chronic form of leukemia may be thin, their weight at the same time may approach normal because of the enlarged organs. In many cases the comb, wattles, and bare parts of the body are pale or even have a yellowish appearance due to the jaundice produced by the diseased condition of the liver.

The blood, when drawn, presents a pale red color and fails to clot readily, while normal fowls' blood clots very rapidly. Chronic leukemia, in a large majority of cases, is characterized by a bright green diarrhea upon which considerable dependence may be placed for a diagnosis of this disease. The green diarrhea, however, is seldom observed in the acute form of leukemia.

POST MORTEM CHANGES OBSERVED IN THE DISEASE

The carcass of a bird dead from leukemia has a bloodless appearance. Usually the liver and spleen show the most marked changes, though the kidneys are affected in a considerable number of these cases.

The liver may be slightly enlarged, congested, and sprinkled with minute whitish points, or it may be markedly enlarged and congested. Frequently, where there is a great enlargement of the liver, it has a mottled appearance and has a firm consistency and on section the tissue appears bloodless (see Fig. 2). In the more acute form, the liver may appear much darker, soft and pulpy.

The spleen generally shows changes in conformity with the liver (see Fig. 2). It may be only slightly congested or it may be greatly enlarged and congested showing the mottled appearance which is often characteristic of the changes occurring in the liver. It varies in consistency from soft and pulpy to a fine, compact mass. It is not uncommon to observe cases in which the spleen is from five to ten times the size of a normal organ. There is no other disease of a like nature which causes such enlargement of the spleen, so that considerable dependence may be placed upon this change in size for a diagnosis of leukemia. Where enlargement of the spleen is great, in cases of tuberculosis, the large tubercles are always present which help to differentiate the two diseases.

When the kidneys are involved, they become greatly enlarged and vary in color from a pale brown to almost white, depending somewhat

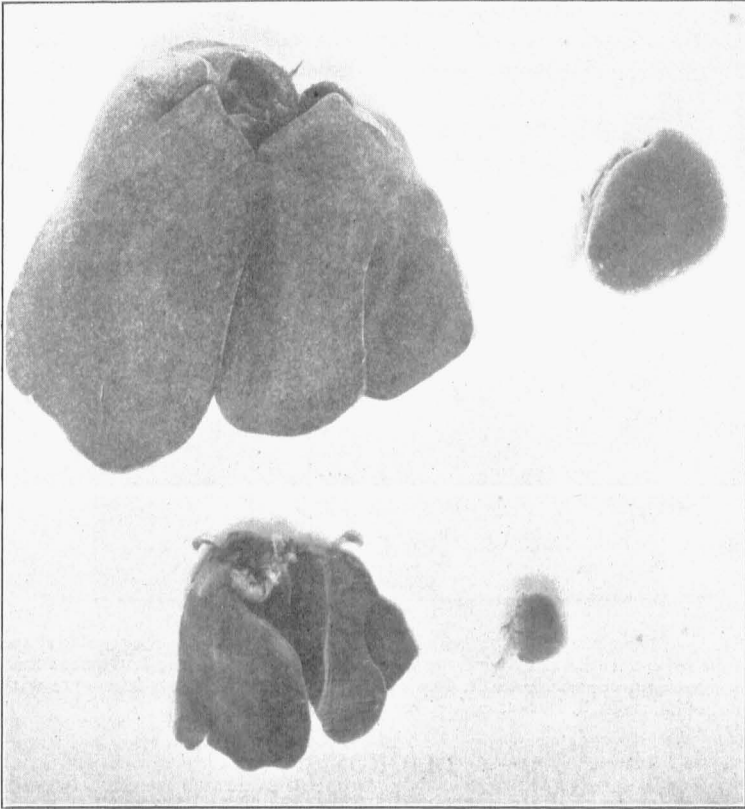


Fig. 2.—A photographic comparison of the liver and spleen of a leukemic fowl (top) and of a normal fowl. The liver and spleen from the leukemic fowl are greatly enlarged and have the typical mottled appearance that is common in the chronic forms of the disease.

on the extent of involvement. Sometimes one or more lobes of the kidneys will be involved and the other portion more normal.

There are other more obscure post mortem changes not easily recognized and which may be difficult to distinguish from chronic cholera, certain anemias, and other forms of sarcomas.

The blood picture of a typical case of leukemia is diagnostic of this disease but it is only in the hands of experts that such a means of diagnosis may be utilized. It is not the proper place, in a paper of this nature, to describe the blood changes in leukemia except to say that leukemia, cholera, and anemia of fowls may be clearly differentiated by microscopic examinations of the blood of affected fowls in certain stages of the

disease. The accompanying photographs (see Figs. 3 & 4), showing the blood of a normal bird and of a bird affected with leukemia, illustrate clearly that the disease produces definite changes in the blood.

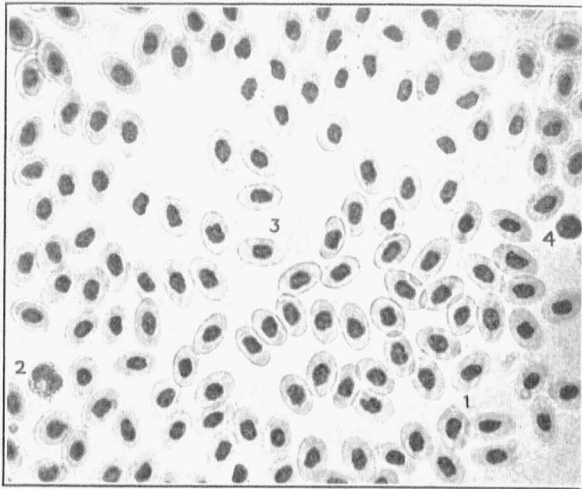


Fig. 3.—Microphotograph of the normal blood of a fowl. Note the regular shape of the red corpuscles and their large number as compared to the leukemic blood picture on the opposite page. 1. Red cell. 2. Polymorphonuclear leucocyte with eosinophilic rods. 3. Basket cell. 4. Lymphocyte.

DIAGNOSIS

In order to make a correct diagnosis of this disease in a flock, it should be remembered that it is usually (not always) a slow chronic disease that takes off two or three birds a week or perhaps one or two a month. In most cases it affects adults, though the author has observed cases in chickens three or four months of age. The chronic form is usually indicated by the thin condition of the fowl, the bright green diarrhea which soils the feathers below the vent, the pale or yellowish appearance of the bare parts of the body, and the enlargement of the liver and spleen.

The acute form of this disease is difficult to diagnose, due chiefly to the fact that it resembles the chronic forms of cholera and anemia in fowls. In a certain percentage of the cases it is necessary to have a laboratory diagnosis made by examination of the blood in order to assure one that the disease is a true leukemia.

PREVENTION

Leukemia in fowls is an unknown disease probably caused by a virus and for that reason the mode of transmission from diseased to healthy fowls is not well understood. Prevention, therefore, must be based on

general sanitary principles of disease control and not on the nature and mode of spread of the disease.

Until a cure or preventive of this disease is discovered and the nature and mode of spread is understood, the recommendations for the prevention of leukemia consist in a rigid system of inspection and culling out of all birds as soon as they appear the least bit affected, regardless of what

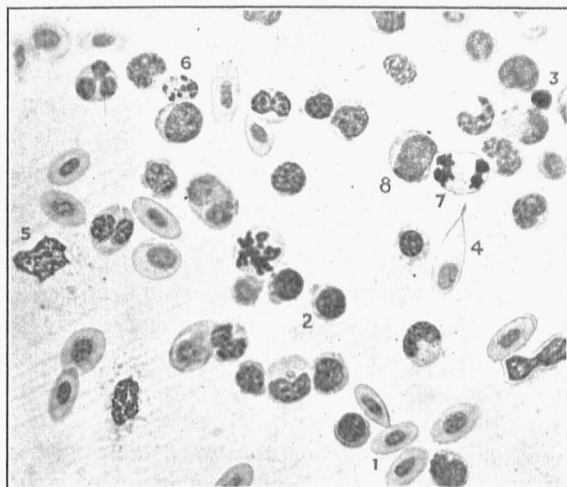


Fig. 4.—A microphotograph of the blood of a fowl affected with leukemia. It can be seen by a comparison of the microphotograph of normal blood on the opposite page that there is a great increase in the size, kind, shape, and number of the white blood corpuscles. 1 Red cell. 2. Lymphoblast. 3. Lymphocyte. 4. Red cell showing poikilocytosis. 5. Myeloblast. 6. Myelocyte. 7. Mitotic cell. 8. Large mononuclear leucocyte.

the disease affecting them may be. This culling should be carried out the year round. All birds affected should be immediately isolated from the healthy flock for treatment, or destroyed and burned or deeply buried. Where several cases develop in the course of a few days, after removal of these, the droppings and litter should be carefully removed and the quarters thoroughly disinfected. Compound Cresol or Lysol, used at the rate of a little less than a teacupful to a gallon of water, should be used as a disinfectant. All objects in the poultry house should be thoroughly soaked with this disinfectant:

The drinking water should be kept medicated with a 1-1000 solution of bluestone (copper sulphate). One ounce of copper sulphate to each eight gallons of water is the proper proportion. Keep this in the drinking water as long as there are any birds that develop leukemia in the flock. In one flock observed by the author, the losses from leukemia had reach-

ed 40 per cent annually. A rigid system of culling and sanitation reduced the losses to four per cent annually and enabled the poultryman to continue on a profitable basis, without disposing of the flock and purchasing new healthy stock. It is important in the control of the disease to see that the birds receive a liberal, well-balanced ration at all times.

TREATMENT

It has been mentioned that there is no cure for leukemia, but at the suggestion of one of his colleagues, the author has run some preliminary experiments at this Station on the feeding of raw liver to a few affected birds, with apparently pronounced curative results. It is thought that the use of liver in the diet might cure affected birds. This, however, is a problem for further investigation before a definite statement concerning the curative properties should be made.

The experiment referred to consisted in feeding raw, fresh liver as an exclusive diet for two weeks to two adult Rhode Island Reds, a male and female. The two birds, with one other, were shipped to the laboratory for diagnosis. The third bird was killed and carefully examined and a positive diagnosis of leukemia was made. All three birds showed the typical bright green diarrhea so characteristic of the chronic form of leukemia.

The two birds on the liver diet consumed their portion daily with every indication of enjoyment and showed marked improvement at the end of a week. The green droppings gradually changed to a normal color and the diarrhea disappeared within the two weeks' period.

One bird was killed four months after the treatment and carefully examined without showing any evidence of the disease. The other was killed at the end of six months, and though the liver showed numerous scars as evidence that the disease had existed, no other signs of the disease was observed and all of the organs appeared healthy.

If dried liver meal could be substituted for fresh liver, assuming that liver products cure leukemia, a practical system of feeding this product in the mash might be devised which would cure and prevent leukemia in poultry flocks. This product is not very expensive and by substituting it in the mash as a source of protein it might possibly serve in this double purpose of furnishing protein in the diet and preventing and curing leukemia in affected flocks. However, until definite information is obtainable the poultrymen should depend upon the preventive measures already suggested.