corpus luteum extracts as far as their action on the vas deferens is concerned. Indeed, there seemed to be an indication that the predigested extracts were often more stimulating to the contractions than extracts obtained from undigested gland substance.

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On the Transmissibility of the Leucemia of Fowls.*

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Among approximately 190 fowls received between November and May from a poultry dealer for postmortem examination, 4 birds had a neoplasm and 2 others exhibited the pathological changes commonly termed leucemia of the fowl. One of these, a white Leghorn hen, showed on gross examination moderately enlarged, grayish kidneys and heart and on microscopic examination, an extensive diffuse infiltration of the kidney, heart, and thyroid gland, and a nodular infiltration of the liver with mostly mononuclear cells of medium size. The character of these cells could not be determined with certainty; the numerous transitional cells to red cells suggest that they may be hemoglobin-free precursors of erythrocytes. The number of white cells in the blood stream, as seen in sections, was not increased.

Emulsions of organs of this chicken have been injected (Passage I) into the veins of 4 white Leghorn and 3 barred Rock chickens. In about two and a half months one of the injected barred Rock chickens developed a severe anemia. There were many polychromatophile erythrocytes, numerous large lymphocyte-like cells in the blood stream and transitional forms between them. On microscopic examination the capillaries of several organs, particularly those of the liver and kidney, were found to be studded with such cells, which, in all probability, are progenitors of erythrocytes. This picture corresponds to what was called by Ellerman[1] "leucostasis" and the disease may be termed with him erythroleucosis.

The blood of this bird was injected (passage II) into the vein of 6 chickens, of which one developed in about 8 weeks a disease

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[1] Ellerman, W., The Leucosis of the Fowls and Leucaemia Problems, English edition, London, 1921.

identical with that of the donor. Two other birds, one in about 6 and one in 11 weeks, showed an enormous increase of the white blood cells in the blood stream. The blood counts of the latter made with Toisson solution as diluting liquid were 530,000 to 670,000 white, and 1,550,000 to 1,800,000 red blood cells per cubic mm. The figures for hemoglobin were 35 to 38 (Sahli). The main type of cells in the blood smears stained with Wright solution alone or in combination with Giemsa stain were large mononuclear, poikilonuclear cells and myelocytes. In vital staining the majority of the mono- and poikilonuclear cells resembled myelocytes, the only marked difference being the absence of granules; there were many transitions between these cells, supporting the view of their myeloid origin (Ellerman). The most striking feature of the microscopic picture of the organs is the immense number of large mononuclear cells in the blood vessels and a widespread infiltration of the parenchymatous tissue with similar cells. These two cases may be termed, with Ellerman, myeloid leucosis. The 4 other birds of this series injected with organ emulsions of the same bird showed no symptoms of leucemia.

Two further passages are now being followed. Of 12 birds injected (passage III) about 10 weeks ago with blood or with organ emulsions of one of the fowls afflicted with myeloid leucemia, one developed myeloid leucemia and another erythroleucemia, the findings being similar to those described above.

The criticism that the transmission experiments of Ellerman and others were carried out without any control (Pappenheimer[2]) cannot be applied to the present work. The occurrence of 3 cases of myeloid leucemia and 3 cases of erythroleucemia in the above 3 passages involving 29 birds is well contrasted by the absence of these diseases, with one exception, among approximately 200 birds used mainly in experiments directed toward the transmission of lymphomatous and other tumors and the production of leucemia. One chicken, which was injected daily with benzol mixed with olive oil, showed after the 12 subcutaneous injections a severe anaemia similar to those described above. A few of the numerous immature cells of the erythrocytic series in the blood stream were in mitotic division. The interpretation of this case requires further work.

Our findings are in accord with those of Schmeisser,[3] who observed in an experimental series involving 105 birds 22 cases of

[2] Pappenheimer, A. M., Dunn, L. C., Cone, V., *Storrs Agr. Exp. Sta. Bull.*, 1926, No. 143.

[3] Schmeisser, H. C., *J. Exp. Med.*, 1915, xxii, 820.

leucemia and anemia; he does not report, however, on the possibility of a clear-cut separation of the anemias from the myeloid leucemias. Ellerman's claim that the same transmissible agent may cause myeloid as well as lymphoid leucemia is not well supported. In 5 of his 8 transmission experiments (A, B, C, F, G) of which the first 3 involve 116 birds, no such change of type was observed. Among the passages of strain D, involving 21 birds, and strain H, involving 122 birds, one case of lymphoid leucosis was observed in each strain. A transformation in the reverse direction is based on the occurrence of one case of mild myeloid leucemia and another case of multiple myeloid tumors in strain E involving about 80 birds. These data are of little significance if one considers the frequent spontaneous occurrence of leucemia, particularly the lymphoid variety, among the birds of certain flocks. Thus Hennepe finds that 7% of the total deaths are caused by leucemia and 1.8% by tumors. Hennepe's (Holland) figures are higher than any other report available from the literature. Kerr finds that the incidence of mortality due to neoplasm is 9.8%; Schneider finds 2-3% of deaths are caused by tumors, and it is commonly accepted that lymphomatous tumors constitute the most common neoplastic disease of the fowl. Thus Tyzzer and Ordway found 7 among 9, and Feldman 11 among 19 tumors composed of lymphocyte-like cells. Mathews finds myeloid neoplasms in 0.5-1.3% of the birds examined post mortem.

In attempts to obtain transmissible strains of leucemia and lymphoma a large number of birds have been injected with organ emulsions of fowls 1-2 days after death of the bird or with still older frozen and defrosted material. The absence of leucemia among the injected birds contradicts the view of Schridde and McGowan[4] that in the fowl leucemia may be produced by the mechanical stimulation of injected organ emulsions.

[4] McGowan, J. P., Pernicious Anaemia and Leucaemia and Aplastic Anaemia, New York, 1927.