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Hemopoietic Effect of Nuclear Extractives From Kidney, Pancreas and Spleen in Experimental Hemolytic and of Human Pernicious Anemia.*

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Previously reported[1, 2, 3] experiments on the effect of nuclear extracts in anemias have led us to an extension of the source of material elsewhere than to fowl's blood and beef liver. The present report will deal with the hemopoietic effect of extracts obtained by the methods of Hammarsten and of Kossel-Neumann from kidney, pancreas and spleen on experimental rabbits, and with the effect of similarly obtained extracts from liver and spleen on pernicious anemia in human patients.

Experimental anemia was produced in rabbits by repeated injections of water intravenously. Six control animals were run without further treatment, after a degree of anemia corresponding to that of the treated animals had been produced. One of the controls died, apparently as a result of the water injection. Averages for the 5 remaining show an increase from 3,638,000 to 6,040,000 erythrocytes per cm. in 26 days. This result corresponds closely with that from a previous series[3] of controls similarly treated. The reticulocytes did not increase beyond 3%.

A second series of rabbits was treated with extract from beef kidney. Two of these animals were treated without having been made anemic. They showed an increase from 5,850,000 to 6,580,000 and from 5,670,000 to 6,876,000 erythrocytes per c. mm., respectively, in 6 days. On the 6th day the reticulocytes numbered 12% in each case. The erythrocyte count continued to increase to a high point of 7,620,000 and 7,680,000 per c. mm., respectively, in 21 days. The hemoglobin showed corresponding increases. Two anemic rabbits treated with extract from kidney showed an increase

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1 Larsell, O., Nokes, H. T., and Phillips, B. I., *Arch. Path. and Lab. Med.*, 1926, ii, 698.

2 Larsell, O., Jones, N. W., Nokes, H. T., and Phillips, B. I., *J. Am. Med. Assn.*, 1927, lxxxix, 682.

3 Larsell, O., Jones, N. W., Phillips, B. I., and Nokes, H. T., *J. Am. Med. Assn.*, 1928, xc, 75.

in erythrocyte count from 3,640,000 to 6,980,000 and from 3,600,000 to 6,580,000 per c. mm., respectively, in 12 days. The hemoglobin increased from 58% to 112% in one case and from 52% to 115% in the second rabbit during the same period. The high point in reticulocyte percentage was 12% and 10%, respectively, in each case on the 5th day.

A third series of 6 anemic rabbits was treated with extract from beef pancreas. One choked to death as a result of forcible feeding of capsules containing the extract. The remaining 5 animals showed a return from an average low count of 3,620,000 erythrocytes per c. mm. to 6,012,000 per c. mm. in 15 3/5 days. The highest reticulocyte percentage noted was 6% on the 10th day after beginning treatment. A 4th series of 6 rabbits, treated with extract from beef spleen, showed increase from a low average of 2,978,000 erythrocytes per c. mm. to an average of 5,850,000 in 10½ days. The average high point in reticulocyte percentage was 48% on the 5th day. Some of the animals showed the high point in reticulocytes earlier than the 5th day and some as late as the 9th day. In all cases the pancreas and spleen extract treatment brought about a marked increase in hemoglobin percentage also. In rabbits treated with pancreas extract the hemoglobin increase was from a low average of 57% to 102% in 10 days. The animals treated with spleen extract showed an increase from a low average of 50% to 98% in 8 days.

Pernicious Anemia. Twenty human patients on whom a diagnosis of pernicious anemia had been made after the usual tests have been treated to date with the extract produced by the method used by us from liver, and 3 cases have been treated with the spleen extract. The majority of these patients have responded favorably to the treatment, but in varying degree. One case from each group may be described briefly. Patient W. L. was placed under treatment with our extract from liver, showing at the beginning of treatment an erythrocyte count of 1,728,000 per c. mm., hemoglobin 41% (Haskins-Sahli), color index 1.13, volume index 1.23, and with clinical symptoms of pernicious anemia. He was given 6 gm. daily of the extract. Four days after treatment began the reticulocyte percentage had increased to 8%, on the 5th day to 10%, on the 9th day to 21%, and on the 11th day to 24%. Following this there was a gradual decline in reticulocytes, until after 41 days there were only 2% of these corpuscles. In the meantime the erythrocyte count had increased to 5,120,000 per c. mm. in the 41 days, the hemoglobin to 104% (Haskins-Sahli), and the color index was reduced to 1.06. Marked clinical improvement began about the 11th day of treatment.

A second patient, J. McC., had a history of periodic attacks of anemia for 3 years. When the present treatment was begun he had an erythrocyte count of 2,160,000 per c. mm., hemoglobin 56% (Haskins-Sahli), color index 1.15, and reticulocytes 1.4%. He was given 9 gm. daily of nuclear extract from spleen. In 3 days the reticulocytes increased to 20%, in 6 days to 34%. Fourteen days after treatment was begun the reticulocytes had dropped again to 12%, and after 24 days to 4%, at which level they remained 31 days after treatment was begun. In the meantime the hemoglobin had increased from 55% to 100%, and the erythrocytes from 2,048,000 to 4,500,000 per c. mm., in the 31 day period.

In connection with the results obtained by Leake and Evans,[4] by McCann,[5] and by the Minot-Murphy treatment, these cases appear of interest.

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The Digestion of Oils by Amoeba dubia.

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The following account deals with experiments consisting of injection of various oils in one of the large free-living amoebae *(Amoeba dubia)*.[1] Injection was accomplished with a Chambers micro-manipulator. The experimental amoebae were from a race which has been cultivated by one of the authors for 4 years. Thus a minimum of variability has been ensured in the amoeba protoplasm concerned. Selected individuals were isolated and injected in the usual hanging drop. They were transferred singly to depression culture dishes. The diameter of the injected oil drop was measured by a calibrated ocular micrometer. These measurements were taken daily until droplet was either extruded or completely digested. Where extruded it was invariably located in the culture medium and measured for decrease in volume. Both experimental and control animals were placed in non-toxic distilled water from the same source as that used for the mass culture of the amoebae.

Nine representative oils were used: animal, vegetable and mineral, which were chosen with reference to their suitability for this type of

[4] Leake, C. D., and Evans, J. S., *Am. J. Med. Sc.*, 1924, clxviii, 819.

[5] McCann, W. S., PROC. SOC. EXP. BIOL. AND MED., 1928, xxv, 255.

[1] Schaeffer, A. A., *Arch. f. Protistenk.*, 1916, xxxvii, 204.