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Destruction of Yeast in the Normal Human Stomach.

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Twelve gm. portions of bakers' yeast were fed to normal men with water or with various test meals. The stomachs were emptied after varying periods of time and counts of live yeast cells made by plating on malt agar. Microscopic counts of cells in gastric contents were also made. As no yeast cells are disintegrated in the period of normal gastric digestion, the percentage of yeast cells killed could be calculated from the 2 counts and the approximate proportion of yeast cells passing through the stomach alive under different conditions estimated.

When yeast was administered with each of the following the percentage of live cells getting through the stomach was approximately as follows: Water 60 cc., 95%. Water 250 cc., 90%. Orange juice 100 cc., 75%. Orange juice 250 cc., 55%. Yeast alone, 75%. Oatmeal gruel 500 cc., 95%. Milk 100 cc., 80%. Meat 100 gm., 50%.

Yeast went through the stomach most rapidly when taken with about 60 cc. of water (85% in 15 minutes), and most slowly when taken with meat (80% in 1½ hours).

In vitro experiments on human gastric juice indicated that the hydrochloric acid of the gastric juice was chiefly responsible for the destruction observed.

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Ventriculin in the Treatment of Pernicious Anemia Patients on Meat Free Diet.

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After the demonstration by Castle[1] that the stomach of normal persons secretes a substance which can develop a blood maturing principle from meat, and the subsequent demonstration of ventricu-

[1] Castle, W. B., *Brit. Med. J.*, 1929, 1, 1120.

lin as a hematopoietic stimulant by Sturgis and Isaacs,[2] it occurred to us that the action of ventriculin might be dependent in part on a muscle meat diet. The following 5 cases were therefore put on a meat free, high caloric diet 3 days before ventriculin was started, and kept on this diet during the experiment.

All 5 cases gave the classical history, physical findings, and blood picture of pernicious anemia. Standard tests were used throughout. The Sahli Hemoglobinometic was used for hemoglobin determinations. The presence of achlorhydria was determined by the histamine test. Platelets were counted by the indirect method.

Case I.—L. A., a man aged 49 years, entered the hospital after symptoms of 4 years' standing. He had had no previous treatment. Laboratory tests showed a hemoglobin of 35%. His initial red blood cell count was 1,260,000 per cubic millimeter; white cells, 5,250; platelets, 90,000. The reticulocyte count varied from 0.5% to 1% on 4 successive days. As we were interested in the potency of suprarenal extract as a hematopoietic stimulant, the patient was given 6 capsules of suprarenal extract daily before beginning the treatment with ventriculin. On the fourth day there was a beginning rise in reticulocytes, and on the ninth day a maximum of 9% was reached. There was a slight rise in the blood cells of 300,000, with a decrease on the sixth day after the reticulocyte peak which had now dropped to the original level of 1%. Suprarenal extract was then discontinued and the patient was given 3 vials (60 gm.) of ventriculin daily. On the second day the reticulocytes again numbered 9%, reaching a peak of 25.5% on the sixth day. There was a steady rise in the red blood cells and hemoglobin, with increase of platelets until on the twenty-third day the hemoglobin was 68% and the red blood cell count 3,600,000.

The clinical picture had improved steadily during this time, and the patient was discharged on treatment. At the end of 3 months the patient had a hemoglobin at 84%, red blood cell count 4,680,000, and he was looking for work.

Case II.—E. I., a woman aged 44 years, was admitted with symptoms of 3 years' duration. She had been on inadequate liver therapy, having been told to take the broth from a half pound of liver daily. The patient had repeated spells of syncope on examination and had been unable to retain food for several weeks. Initial hemoglobin was 30%, red blood count 1,300,000, white cell count

[2] Sturgis, C. C., and Isaacs, R., *J. Am. Med. Assn.*, 1929, **93**.

4,400, platelets 75,000 and reticulocytes 4%. The differential film was typical of pernicious anemia with a marked right shift in the

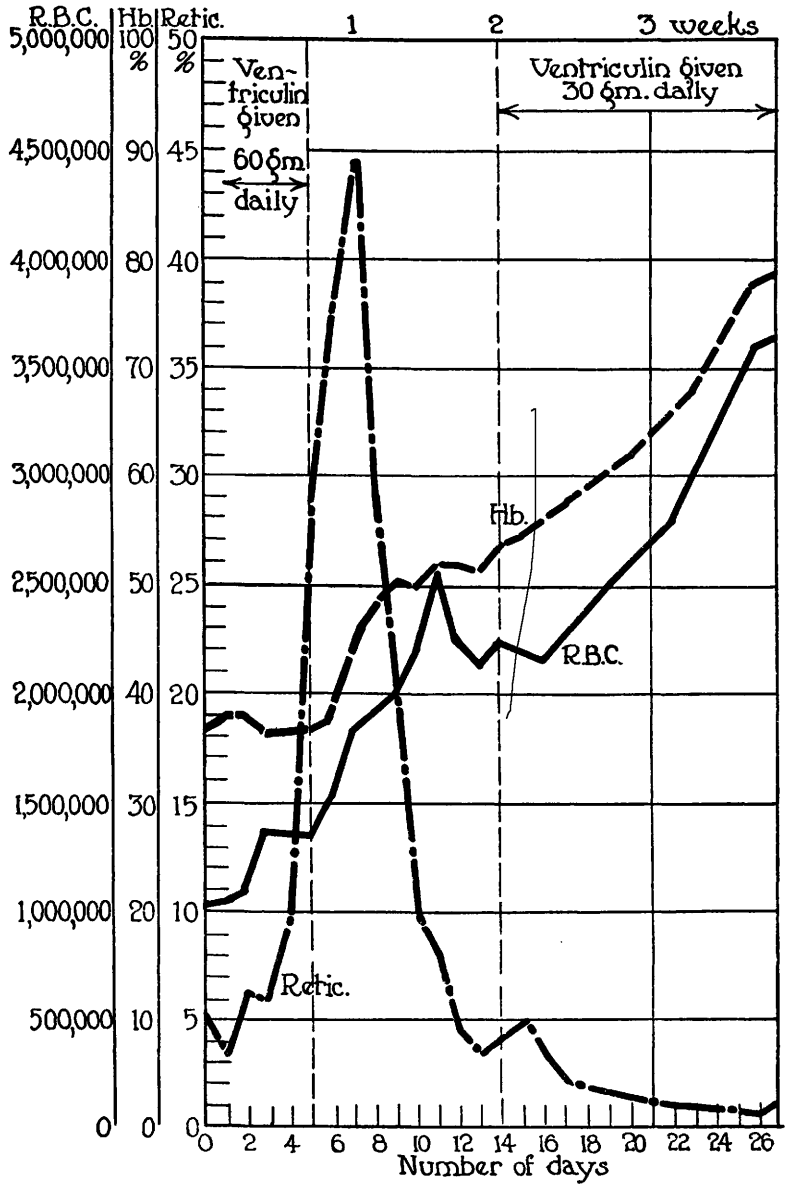

FIG. 1. CASE III.

Initial reticulocyte count 4-5%. 60 gm. of ventriculin given for 5 days. Maximum rise of reticulocytes to 44.5% after 6 days with rise in red blood cells and hemoglobin. On the 11th day the red blood cell count began to drop and reticulocytes were 4.5%. 40 gm. of ventriculin were again given daily with marked rise in red blood count and hemoglobin.

polymorphonuclear cells. Ventriculin was started after the 3 day meat free diet was begun. Owing to nausea and vomiting only 10 gm. (1 vial) was retained the first day. The next day 4 vials were given and most of it retained. The third day all 4 vials were retained and there was a slight rise in the reticulocytes. On the fifth day there was a 29% reticulocyte count, reaching a peak of 48.8% at the end of the sixth day. The reticulocyte count dropped abruptly with subsequent rise in hemoglobin and red blood cells to 70% and 3,480,000 respectively. There were great showers of platelets and a sharp rise in the white blood cells from 4,400 to 8,000.

On the sixteenth day the patient went home. Two weeks later she returned with a hemoglobin of 80% and a red blood count of 3,800,000. She walked briskly and remarked that she had not felt so well in years.

Case III.—E. I., a man aged 54, was admitted with a history of only 6 months' illness. History and physical findings were typical of pernicious anemia. The patient had not been treated previously.

The hemoglobin was 37%, red cell count 1,050,000, white cell count 4,500 and platelets, 70,000. The reticulocytes varied from 2% to 5.5%. Ventriculin was given in 60 gm. doses daily. On the third day the reticulocytes numbered 10%, and on the fourth day 29%. On the fifth day when the red blood cell count had reached 1,400,000 the ventriculin was stopped. This was done to see how long the effect of the ventriculin would last. At the end of the sixth day the reticulocyte count reached the peak of 44.2%; the red cells were 2,500,000 and the hemoglobin 52% on the ninth day. Seven days after the ventriculin was discontinued the red cell count began to go down, reaching 2,100,000. The reticulocytes had fallen abruptly to 4.8%. Ventriculin was again given in doses of 30 gm. daily at this point, with a rise of reticulocytes to 6% two days later. On the twenty-sixth day after treatment the hemoglobin was 79% and red blood cell count 3,620,000; platelets were 420,000. Clinical symptoms were markedly improved.

Case IV.—A. I., a woman of 63 years of age, was admitted after a year's illness, with a remission of 3 months' duration 3 months before admission to the hospital. The patient was mentally incompetent to describe previous treatment. Initial hemoglobin was 38%, red blood cells 1,600,000, white blood cells 3,800, reticulocytes 2%. The patient was given 40 gms. of ventriculin daily. Owing to the author's enforced absence from the work, daily counts were interrupted for a week. On the seventh day the reticulocyte count was 11% and on the following day 17%. It was assumed that this

was the peak of the reticulocyte count, but this is not necessarily true. However, there was a slow but steady rise of hemoglobin and red blood cells, and on the twenty-sixth day after treatment they were 72% and 3,920,000 respectively.

Case V.—J. C., a woman aged 62, entered the hospital after an illness of 3 years' duration. There was an indefinite history of irregular liver therapy. The patient was in a highly irritable state and the marked mental improvement on treatment was spectacular. Initial hemoglobin was 49%, red blood cells 1,500,000, white blood cells 4,820 and reticulocytes 4%. The patient was given 4 vials of ventriculin daily. As there was no increase in reticulocytes on the fifth day, and as the patient was becoming very hard to manage, 6 vials were given daily with an increase of reticulocytes to 13.5% the following day. Unlike the preceding cases which showed a marked rise and fall in reticulocytes, the percentage remained between 13% and 16% for a period of 8 days, and then gradually dropped.

In 3 weeks the hemoglobin had increased to 70% and the red blood cell count to 3,490,000, and the patient was dismissed. She returned to the outpatient department in 2 weeks with a hemoglobin of 85% and a red blood cell count of 4,350,000.

Discussion.—There is little doubt even after the demonstration of only 5 cases that ventriculin does not depend on the addition of muscle meat in the diet for its stimulating action on the hematopoietic system. The reticulocyte rise was reached in most cases within the same time as it was reached in those patients who were given ventriculin with a meat diet as demonstrated by most other workers. This is particularly true of cases II and III. The stimulation effect of 240 gm. of ventriculin given over a period of 4 days would seem to be something over 8 days in one case. It would be interesting to know whether this coincides with the results of large doses of liver extract given in one or 2 doses.

Conclusion.—1. Ventriculin gives the typical hemopoietic response in the treatment of pernicious anemia patients on meat free diet.