4.16; while the Japanese ape showed 5.0 gm. and a Sphinx baboon 4.05 gm. of heart per kilo of body weight. The squirrels averaged about 5.89 gm., the puma 4.63 gm., raccoon 4.22 gm., tapir 3.71 gm., and the sloths averaged 3.96 gm. The sloth thus takes the lowest position in the wild animal scale and the average is almost as low as that presented by the rabbit, which in the domesticated type is as low as 2.36 gm. per kilo of body weight. This series, incomplete though it is, tends to add weight to the idea that there is some fundamental relationship between the activity of the individual mammal and its heart weight, body weight ratio. The more sluggish the animal the relatively small the heart and the less the ratio. The size of the animal is perhaps a factor in some instances, in that in general in the large animals the body weight runs into hundreds of kilos and there is a tendency to have smaller hearts, in proportion to these great weights.

5106

Observations on the Effect of Dog's Gastric Juice in Pernicious Anemia.

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This experiment was undertaken to determine the effects of large amounts of dog's gastric juice on a patient suffering with pernicious anemia. Castle and Townsend[1] previously had shown that 300 cc. of human gastric juice administered daily for a 10-day period did not improve the patient symptomatically nor produce any change in the blood picture. Because the amount of gastric juice secreted each 24 hours by man is far in excess of the 300 cc. used, it was thought worth while to repeat the procedure with larger doses.

For this experimental work pure, crystal clear dog's gastric juice was used. This was procured in large quantities from Dragstedt[2] at whose suggestion the experiment was performed. He had obtained the juice in a previous work by creating a pouch of the entire stomach of the dog in such a way as to avoid injury of the fibers of the vagus or of the blood supply. The analysis of the product

[1] Castle and Townsend, *Am. J. Med. Sci.*, 1928, clxxviii, 693.

[2] Dragstedt, L. R., and Ellis, C. E., PROC. SOC. EXP. BIOL. AND MED., 1929, xxvi, 305.

showed a free HCl of 0.45%; total HCl, 0.5%; total chlorides, 0.55%, and pepsin 150 units.

The patient used in this experiment was Mr. S., Unit No. 18523, age 59, admitted to the Billings Hospital on January 20th, 1930, complaining of shortness of breath after slight exertion of 9 months' duration, numbness and tingling of his hands and feet, moderately severe nocturia and slight nausea following meals for a month preceding admission. These symptoms were associated with a progressive weakness during the past 5 months.

The physical examination revealed the following essential features: White male, apparently 65 years of age, with facial evidence of marked loss of weight, decided lemon-yellow tint of the skin and sclera and with only a slight impairment of the gait. There was a slight dyspnea on exertion but no cyanosis. The tongue margins were smooth with an atrophy of the central papillae. The chest was normal. The heart was not enlarged. There was a soft systolic "hemic" murmur heard at the apex and over the carotids. The systolic blood pressure was 140, the diastolic 80 mm. of mercury. The spleen and kidneys were not palpable. The prostate was firm and slightly nodular.

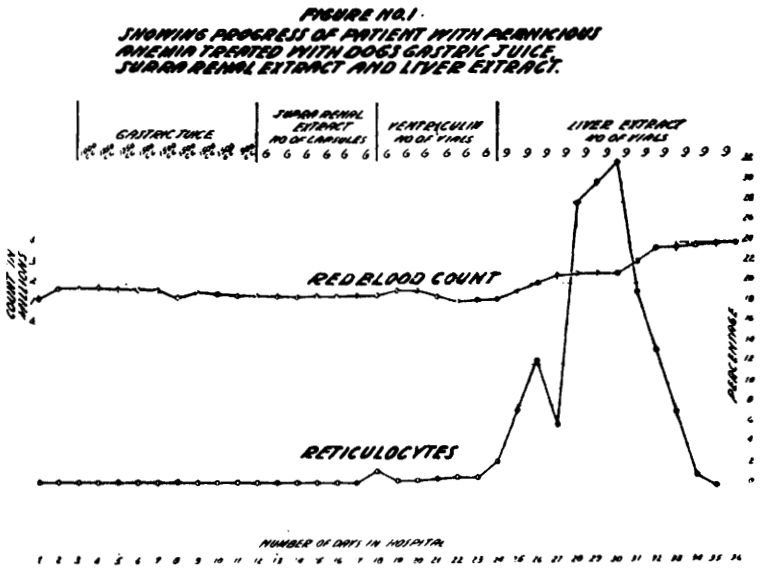
Neurologic examination showed all cranial nerves to be normal. The coordination power and tone of the muscles in the arms were normal. The vibratory sense was definitely decreased in the legs. The knee jerks were equal and normal. The sense of position, tactile and pain sense was normal in the legs. The Rhomberg was negative. The gait showed a slightly broadened base.

The blood picture showed the erythrocyte count to be 1,650,000, leucocytes 10,500 and Hb. 6.7 gms. per 100 cc. (Newcomer). The Price-Jones curve gave an average diameter of the red blood cell of 9.5 microns. The stained smear revealed numerous myelocytes and nucleated red blood cells, with a marked poikilocytosis and anisocytosis with a predominance of macrocytes. There was an achlorhydria as shown by the Ewald test meal, the alcohol test meal, and the response to the subcutaneous injection of 0.7 mg. of Histamine hydrochloride. The direct Van den Berg reaction was negative and the indirect was in the lower limits of normal. Repeated stool examinations were negative for gross and occult blood.

The patient was placed on a regular meat free diet and given 250 cc. of the dog's pure gastric juice 4 times daily. The dosage was given by mouth both as a drink and through a Rehfuss tube and in such relationship to meal periods as to produce the least amount of nausea possible. Nausea did occur but the patient man-

aged to retain the amounts prescribed. The dosage was increased to 350 cc. 4 times a day with the result that during the 10-day period he received approximately 12 liters of the pure gastric juice.

At the end of the interval the patient had not improved symptomatically but complained that the numbness and tingling of the hands had increased. Daily reticulocyte and erythrocyte counts failed to reveal any significant change. As is shown in Fig. 1 the hemoglobin remained constant, 6.7 gm. per 100 cc.



Following the treatment with the gastric juice, the patient was given an extract of the suprarenal gland (Koehler) in dosage of 6 capsules daily which corresponds to 30 gm. of the whole gland. The diet remained the same. At the end of 6 days no improvement was noted. It was later learned that this preparation of the extract had not been assayed.

The patient was then placed on Ventriculin, 6 vials daily, which was continued for 6 days. At the end of the interval there was a slight rise in the reticulocyte percentage. At this time we had had very little experience with Ventriculin, and the patient's condition was such that we did not feel justified in withholding liver any longer. He was immediately placed on liver extract and showed a prompt response. The reticulocyte count rose to 32% on the seventh day and the red blood count gradually increased until it was 4 million on

the twelfth day. At the time of discharge the patient still complained of slight tingling of the hands.

Conclusions. The above findings are in accord with the work of Castle and Townsend.[1] Clear dog's gastric juice in a total dosage of 12 liters given during a period of 9 days did not influence the reticulocyte or red cell count or give symptomatic relief in this case of pernicious anemia.

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A Study of the Effect of Insulin on Gastric Motility.

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In continuing the study of the mechanism of pain in gastric and duodenal ulcer a method for increasing the gastric motility was desired. Bulatoa and Carlson[1] showed that the injection of insulin into normal fasting dogs increased the motility of the stomach. Quigley, Johnson and Solomon[2] concluded from their investigations that the same held true for the stomach of normal fasting man. Clinicians have frequently observed hunger as a symptom of the so-called "insulin reaction". Hence it was assumed that the hunger so seen was due to the increased gastric motility, Carlson[3] having correlated "hunger pangs" with activity of the stomach.

This report is based on the results of 18 experiments done on 13 patients, 11 of whom had duodenal ulcer, 1 paroxysmal fibrillation, and 1 mild diabetes mellitus. The last 2 had a complete achylia to the histamine test. Kymographic records of gastric activity were made by means of the usual single balloon method connected to a water manometer, the entire system being inflated with 150 cc. of air. In a number of cases the position was checked by fluoroscopic examination. The tracings were all made with the balloon in the pyloric region of the stomach. Fasting periods ranged from 14 to 21 hours; the average time was 19 hours. The patients were instructed to register the appearance of "hunger pangs" by means of closing a switch set in series with a signal magnet.

In most instances control tracings had been obtained during previous experiments of a different nature. With those in which this

[1] Bulatoa, E., and Carlson, A. J., *Am. J. Physiol.*, 1924, lxix, 107.

[2] Quigley, J. P., Johnson, V., and Solomon, E. J., *Am. J. Physiol.*, 1929, xc, 89.

[3] Carlson, A. J., "Control of Hunger in Health and Disease," Chicago, 1916.