Pacific Coast Section

University of California Hospital, December 4, 1935.

8425 P

Hypochromic Anemia in Gastrectomized Dogs. Effect of Beef, Iron, Liver Extract on Hemoglobin.*

STACY R. METTIER, FREDERICK KELLOGG† AND KATHERINE PURVIANCE.

From the Division of Medicine, University of California Medical School, San Francisco

We[1] have previously reported that patients with achlorhydria and hypochromic anemia fail to show increased hemoglobin formation upon the daily ingestion of a diet rich in food iron. However, with the feeding of a similar meal previously digested *in vitro* with hydrochloric acid and pepsin, satisfactory hemoglobin production did occur. In addition, a group of patients with a similar type of anemia responded to large doses of iron. It was concluded from these studies that chronic idiopathic hypochromic anemia was presumably due to a deficiency of iron wherein gastric dysfunction led to a failure in utilization of organic (dietary) iron.

Another group of experiments[2] completed in our laboratory show that in dogs gastrectomy greatly decreased the ability to form hemoglobin from beef protein. The results of such an experiment are recorded in Fig. 1. It is to be noted that the average daily output of hemoglobin was about 0.86 gm. while the dogs were on the standard bread ration, but was increased to 2.26 gm. when 250 gm. of beef were added to the diet. Following gastrectomy the hemoglobin was reduced to an average daily output of 0.4 gm. and 0.21 gm., on the standard bread diet and beef diet respectively.

The present study was undertaken to determine the effects of pre-

*Supported by a grant from the Christine Breon Fund for Medical Research.

† Research Fellow of the American College of Physicians.

1 Mettier, S. R., Kellogg, F., and Rinehart, J. F., *Am. J. Med. Sci.*, 1933, **186**, 694.

2 Kellogg, F., Mettier, S. R., and Purviance, K., unpublished.

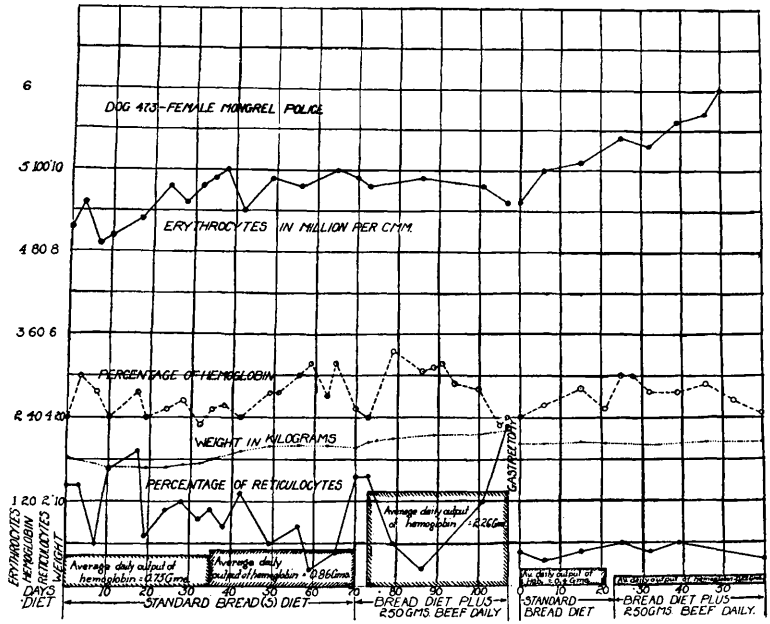

FIG. 1.

Effect of standard bread (S) and of beef on hemoglobin production before and after gastrectomy.

digested beef, of iron, and of liver extract on hemoglobin production in the same series of gastrectomized dogs.

The animals used in this study were maintained in a condition of basal production of hemoglobin by bleedings frequent enough to keep a hemoglobin level of from 6 to 9 gm. per 100 cc. of blood. The hemoglobin output over a given period of time was estimated by calculating the amount of hemoglobin removed at each bleeding, according to the method of Whipple. Total blood volume determinations were made by the method of Keith and Rowntree as modified by Hooper, Smith, Belt and Whipple.[3]

The standard bread ration of Whipple supplemented by salmon was used as the basal diet. The predigested meal consisted of from 250 to 750 gm. of beef digested *in vitro,* administered daily.

Tube feeding was resorted to because of the dogs' reluctance to eat voluntarily the predigested meal. Frequently a considerable amount of the meal was regurgitated. It is to be noted in Table I that hemoglobin formation was not augmented by this type of therapy. This we believe was due largely to the failure of the animals to retain the entire meal.

[3] Hooper, C. W., Smith, H. P., Belt, A. E., and Whipple, G. H., *Am. J. Physiol.,* 1920, **51**, 205.

TABLE I.
Effect of Standard Bread (S), of Predigested Beef, of Iron and Ammonium Citrate and of Liver Extract on Hemoglobin Production in Gastrectomized Dogs.

Dog No.	No. of days	Hemoglobin Output gm. per day	Diet and Type of Therapy
473	20	0.20	Bread (S)
	20	0.24	750 gm. predigested beef
	20	1.73	Bread (S) + 1 gm. iron and ammonium citrate daily
	24	0.60	Liver extract, 5 cc. 3 times a week*
394	20	0.04	Bread (S)
	20	2.77	Bread (S) + 1 gm. of iron and ammonium citrate daily
	20	0.04	Bread (S) + 5 cc. liver extract daily
393	20	0.10	Bread (S)
	20	0.11	250 gm. of predigested beef
	20	1.85	Bread (S) + 1 gm. of iron and ammonium citrate daily
	20	0.19	Bread (S) + 5 cc. liver extract daily

*The authors wish to thank Eli Lilly and Company for their generous contribution of Liver Extract 343 (N.N.R.).

The daily administration of one gram of iron and ammonium citrate had a marked effect on hemoglobin regeneration. Prior to therapy the hemoglobin output in each case was less than 0.25 gm. daily, whereas after iron therapy it was 1.73, 2.77 and 1.85 gm. respectively. The results of this study of iron therapy compare favorably with those reported by Dragstedt[4] and his associates.

The anemia, as shown in Table I, did not respond to liver extract specific for pernicious anemia.

8426 P

Curare-Actions of Erythrina Americana.

A. J. LEHMAN. (Introduced by P. J. Hanzlik.)

From the Department of Pharmacology, Stanford University School of Medicine, San Francisco.

The great scarcity of active curare prompted an investigation of *Erythrina americana,* which has been reported by Altamirano,[1]

[4] Dragstedt, C. A., Bradley, J. D., and Mead, F. B., PROC. SOC. EXP. BIOL. AND MED., 1935, **33**, 58.

[1] Altamirano, *cit.*, U. S. Dispensatory, 1918, 20th Ed., p. 1375; Altamirano, 1876, and Altamirano and Dominguez, *Gaceta Medica,* 1888, *cit.*, Arzac-Behnken, loc. cit.