intramuscular injection of the extract derived from 100 gm. of dog liver, without a secondary increase of reticulocytes during the administration of similar amounts of hog liver extract.

These observations demonstrate that the liver of the dog contains thermostable material effective in pernicious anemia, although in lesser quantities than does hog liver. As far as we have been able to ascertain, practically all other mammalian livers thus far assayed, have contained the same relative concentration of effective material. The hog, ox, sheep, horse and deer, however, are all essentially herbivorous animals, whereas the dog belongs to the carnivora. A partial deficiency of either the dietary or the gastric factors could theoretically account for the diminished quantity of potent substance in the liver of the dog. Judging from their state of nutrition, the diet of these animals appeared to be satisfactory and, therefore, presumably contained adequate amounts of the factor associated with the vitamin B complex. On the other hand, the contradictory observations[11, 12] cited above, upon the content of intrinsic factor of the dog's stomach, suggest an explanation for the decreased potency of the dog liver. It is possible that a decreased amount of intrinsic factor is present in the gastric juice of the dog and that this results in a decreased amount of thermostable effective material in the liver.

Conclusions. 1. Extracts made from normal dog livers produce on intramuscular injection typical remissions in patients with Addisonian pernicious anemia. 2. The content of potent material in canine liver appears to be only about one-fifth that of hog liver. 3. This fact may possibly be correlated with the contradictory findings concerning the amount of the specific intrinsic factor in canine gastric juice.

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Treatment of Pellagra by Means of Parenteral Liver Extract.

TOM D. SPIES. (Introduced by J. T. Wearn.)

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Goldberger and Sebrell[1] found that liver extract fed to dogs in large amounts either prevented or retarded the development of

[1] Goldberger, J., and Sebrell, W. H., *J. Am. Med. Assn.*, 1932, **99**, 95.

blacktongue (a disease which they consider analogous to pellagra of human beings). Boggs and Padgett[2] stressed the curative value of liver (not liver extract) in pellagra and Smith and Ruffin[3] stated that large amounts of liver extract by mouth were efficacious in treating the disease. Ramsdell and Magness[4] in a preliminary study on the effects of intramuscular liver extract on the course of pellagrins, gave small daily doses and at the same time allowed the patients a highly nutritious diet. They felt that the intramuscular administration of liver extract resulted in clinical improvement but stated the patients were not given a basic diet. Since many pellagrins have severe oral lesions and refuse to eat, it seemed worthwhile to determine the therapeutic efficacy of intravenous liver extract under controlled experimental conditions.

Six patients with the classical skin and oral lesions of pellagra were selected for the first part of the experiment. Each patient was placed on a pellagra-producing diet until the stomatitis and glossitis became worse. Then 80 cc. of liver extract* were administered intravenously in 4 divided doses in the subsequent 20 hours without any change in the basic diet. Four other patients were controlled in an identical manner and intramuscular liver extract* was injected in 3 divided doses of 10 cc. each.

The tongue and oral mucous membranes, which had become worse on the basic diet, appeared less red and swollen within 24 hours after the first parenteral treatment of liver extract. Seventy-two hours after the injection, either intravenous or intramuscular, the lesions were healed.

It has been shown in this experiment that the stomatitis and glossitis of 6 pellagrins responded to intravenous liver extract and that the oral lesions of 4 other pellagrins were likewise healed by intramuscular liver extract. It is suggested that liver extract be used as a parenteral therapeutic agent whenever a severe pellagrin has difficulty in ingesting or assimilating adequate amounts of a highly nutritious diet.

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[2] Boggs, T. R., and Padgett, P., *Bull. Johns Hopkins Hosp.*, 1932, **50**, 21.

[3] Smith, D. T., and Ruffin, J. M., *J. Clin. Invest.*, 1933, **12**, 963.

[4] Ramsdell, R. L., and Magness, W. H., *Am. J. Med. Sciences*, 1933, **185**, 568.

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