It is obvious that within the age limits of the experiment, there is an extraordinarily close correspondence between the growth of the blood and plasma, and that of the body weight as a whole. This is borne out by the constancy in the relation between blood weight (calculated by multiplying volume by specific gravity factor 1.06), and the body weight.

Conclusions. 1. The disease described as nutritional encephalomalacia of chicks is not associated with significant alterations in cell plasma ratio, plasma or blood volume. 2. During the early growth period of the chick, the growth of the plasma and blood follow closely the growth of body weight. The blood and plasma volume per kilo, aside from individual variations, remain constant throughout the early growth period.

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The Central Nervous System in Relation to the Digestive Functions.

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In this communication a comparison is made between certain secretory, motor and vascular phenomena produced by pilocarpine administered into the cerebral ventricles of monkeys, and the corresponding responses to the drug when given subcutaneously.

A series of 15 green monkeys *(Lasiopyga callithricus)* has been used. On 6 of them, fractional gastric analyses have been made following the administration by stomach tube of 100 cc. of a farina test-meal. Several experiments have been conducted on each animal to demonstrate the action of the drug pilocarpine (hydrochloride), when administered at various times in the course of digestion of the test-meal. The drug has been given in varying doses subcutaneously and by the intraventricular route.

The intraventricular injection of pilocarpine, in doses of 5-10 mg. per kilo of body weight, invariably caused a sudden and complete cessation of the gastric secretion of free HCl, at whatever stage in the digestion the drug was given. The samples obtained after pilocarpine injection consistently failed to show any free HCl acid.

The total acidity curve usually paralleled the 'free acid' curve but at a higher level. After intraventricular injection of pilocar-

pine, the total acid generally fell *pari passu* with the 'free' acid. This fact, together with the lessened volume of recoverable gastric contents, indicates that the phenomenon is not merely one of neutralization by mucus or regurgitated bile. In one monkey with a low type of acid curve the level of total acidity merely ceased to rise. The 'free' acid in this case fell to zero.

If a subcutaneous injection of histamine (1-2 mg. per kilo) was given in the achlorhydric phase following intraventricular pilocarpine administration, the "acid tide"—both 'free' and 'combined'—was rapidly restored and reached a high level.

Subcutaneous injection of pilocarpine did not produce these striking effects upon the gastric secretion. Doses of 20-30 mg. per kilo (*i. e.,* 4 or 5 times as large as the intraventricular dose) failed to prevent the "acid tide" and did not produce achlorhydria, although there was some lowering of the curves. Smaller doses were without effect.

The increase in motility of the stomach was evidenced by the short emptying time after pilocarpine administration, in doses of 5-10 mg. per kilo, whether it was given by the subcutaneous or intraventricular route. In the latter case the difference was quantitative, both in its general and specific effects, and manifested itself in a more rapid onset and greater intensity of symptoms. There were seldom more than one or 2 full 10 cc. samples after the intraventricular pilocarpine injections. These were usually laden with mucus and often bile-stained. This suggests that the pylorus under these conditions opens and permits the contracting stomach to eject its contents almost *en masse* into the duodenum.

Cardiospasm was an almost constant sequel of intraventricular pilocarpine injections as evinced by difficulty in passing the tube. The appearance of blood streaks in the subsequent sample was in many of these cases an indication of attendant trauma.

The other alimentary phenomena included retching and sometimes vomiting. Defecation was the rule, and the stools were often loose and copious indicating an increased motility of the whole gastrointestinal tract. Although mucus was frequently visible in the feces, gross blood was not apparent.

The general effects of pilocarpine injections, whether intraventricular or subcutaneous, include: (1) salivation, lacrimation, rhinorrhoea, and bronchorrhoea, with much mucus secretion; (2) sweating, especially of the palms, soles and scalp; (3) a warm flushed skin preceding the sweating, but thereafter a moist, cold, and clammy skin; (4) some pilo-erection; (5) a fall in rectal tem-

perature of 2°-3° C.; (6) a temporary reduction in pulse rate, perhaps to 70 or 80, as compared with the normal values which ran between 120 at rest and 180-200 (or more) during excitement and struggling. Sometimes the drop in pulse rate was not very marked or was very transient. In other cases it was striking and maintained. Usually the rate subsequently increased and often became irregular. Occasionally there were extrasystoles. The pulse, whether fast or slow was full and bounding; (7) a blood pressure (femoral) sometimes showing a definite fall and subsequently a slight rise coincident with the pulse variations; (8) markedly constricted pupils which failed to react; (9) considerable prostration, apathy, nausea, and anorexia.

After a moderate dose of pilocarpine the effects would begin to wear off in less than an hour. The animal became more active (and less tractable) and evinced thirst and later hunger, and was normal again in a few hours.

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Comparative Frequency of Peptic Ulcers After Deprivation of Bile and Pancreatic Juice.

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Berg and Jobling[1] reported the occurrence of peptic ulcers in dogs following the deprivation of bile. These findings were corroborated by Kim and Ivy[2] and Bollman and Mann.[3] The incidence of ulcers was approximately 60%.

During the past few years, in connection with other investigations, we have examined a number of animals deprived of their pancreatic secretions by means of fistulas, ligation of the pancreatic ducts, and pancreatectomy, and have been impressed by the infrequent occurrence of peptic ulcers in these animals compared to dogs in which bile was excluded. On the other hand, Elman and Hartmann[4] found ulcers in the duodenum in all of the animals of a series of 6 dogs

[1] Berg, B. N., and Jobling, J. W., *Arch. Surg.*, 1930, **20**, 997.

[2] Kim, M. S., and Ivy, A. C., *J. Am. Med. Assn.*, 1931, **97**, 1511.

[3] Bollman, I., and Mann, F. C., *Arch. Surg.*, 1932, **24**, 126.

[4] Elman, R., and Hartmann, A. F., *Arch. Surg.* 1931, **23**, 1030.