

isotonic solution containing NaCl, sodium lactate and phosphate buffer (pH 7.3). One portion was precipitated immediately by the ZnSO₄ method of Somogyi.⁷ Two other samples, one containing 0.005% methylene blue, were incubated in stoppered 300 cc. Erlenmeyer flasks. During incubation the flasks were rocked mechanically by motor to maintain uniform aeration. The short periods of incubation preclude errors from bacterial growth. Sugar ("true sugar") was determined on zinc filtrates, using a modified Shaffer-Hartmann reagent (unpublished No. 30 by Shaffer and Somogyi) which permits accurate determinations at very low sugar concentrations. Lactic acid was determined on copper-lime filtrates by the oxidation method.⁸

TABLE I.

Description	Sugar in 100 cc. corpuscle suspension.		Lactic acid in 100 cc. corpuscle suspension.	
	Present mg.	Change mg.	Present mg.	Change mg.
Control (not incubated)	8	—	158	—
Control (incubated 3 hrs. 37° C.)	0	—8	167	+9
Incubated with methylene blue	5	—3	131	—27

The data given in the table illustrate the results obtained. Without methylene blue there is no evidence of loss of lactate, but rather in increase equal to the loss of glucose. In presence of the dye 20 to 35 mg. % of lactate disappears. Although the amount lost is not as great as with unwashed corpuscles the results are well beyond analytical errors and have been obtained in a series of such experiments.

4563

Anatomical Evidence for Existence of Enteric Reflex Arcs Following Degeneration of Extrinsic Nerves.

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Dogs were subjected to an operation in which a large mesenteric artery and the nerves accompanying it were divided in order to

⁷ Somogyi, M., *Proc. Soc. Exp. Biol. and Med.*, 1929, xxvi, 353.

⁸ Friedemann, Cotonio and Shaffer, *J. Biol. Chem.*, 1927, lxxiii, 335.

insure complete elimination of the extrinsic nerves to a segment of the intestine. The animals were kept alive from 15 to 60 days after the operation to allow ample time for degeneration of all extrinsic nerves. All of the material used in this study was prepared by the pyridine silver method.

Following degeneration of the extrinsic fibers, the intercellular plexus was greatly reduced, but a fine intercellular plexus in relation to the ganglion cells remained. The fibers which make up this plexus are of much smaller caliber than the extrinsic fibers which make up the greater part of the normal intercellular plexus. The large dendrites of the local ganglion cells which, according to Johnson¹ are the only processes remaining in the ganglia after degeneration of the extrinsic nerves were also observed. These are so much larger than the other fibers of the intercellular plexus that they cannot be confused with the latter.

An axon could be traced from its cell of origin to its termination on a neighboring cell in quite a number of cases. These fibers together with those which extend for some distance in either the myenteric or submucous plexus, or run from one of these plexuses into the other, make up the fine intercellular plexus which is present after degeneration of the extrinsic fibers.

A rich plexus composed of very fine varicose fibers lies directly beneath the intestinal epithelium. Fibers from this plexus ramify between the epithelial cells and form a network around their basal parts, where they terminate in fine terminal branches.² Fibers can be traced from this plexus to the submucous plexus. Degeneration of the extrinsic nerve fibers did not entirely destroy the fine subepithelial plexus. The fibers which remained are of the same caliber as those of the fine intercellular plexus. Fibers could be traced, after degeneration of the extrinsic fibers, to their termination in relation to both goblet cells and the other epithelial cells. The fibers supplying the goblet cells were interpreted as secretory; those supplying the other epithelial cells were interpreted as sensory or afferent. Since all extrinsic fibers had degenerated, it must be assumed that these fibers arise from cells in the enteric plexuses.

In view of the fact that degeneration of the extrinsic fibers destroys only a portion of the subepithelial plexus, leaving fiber terminations in relation to both secretory and other epithelial cells, and that synaptic relationships between enteric neurons have been demonstrated, the conclusion seems to be warranted that both afferent and

¹ Johnson, S. E., *J. Comp. Neur.*, 1925, xxxviii

² Hill, C. J., *Trans. Royal Soc. London*, 1927, cexv,

fferent fibers are present and that reflex arcs exist within the wall of the intestine.

4564

Influence of Serum From Pernicious Anemic Persons Treated by Liver on Growth of Seedlings.

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The nature of the therapeutical effect produced by liver in cases of pernicious anemia is still under discussion, and we desired to establish whether the toxicity of blood of such patients undergoes any changes under treatment by liver, in order to determine the character of its influence on the blood.

We used the toxic blood of patients suffering from pernicious anemia, which impeded abruptly the growth of seedlings of *Lupinus albus* in the Shive nutritive solution, Macht.¹ We used the methods suggested by Macht, except that for the germination of *Lupinus albus* seedlings we used boiled sawdust instead of sphagnum moss.

We determined the phytotoxic index in 7 cases of pernicious anemia treated with liver during 7 to 12 months with excellent effect. Whereas before the treatment the patients all showed severe symptoms of typical pernicious anemia, after the above periods they were all entirely efficient, clinically healthy, and the picture of blood did not show any deviations from the norm. They did not stop taking liver, and yet we discovered in all cases very pronounced phytotoxicity of serum, such as Macht found in cases of untreated pernicious anemia studied by him, afterwards confirmed in our further experiments.

The phytotoxic index varied in 6 cases from 46 to 50%, and in one case was as high as 54%. The latter case showed a propensity to spontaneous remission even before the beginning of liver treatment. In 2 untreated cases the index was 46 and 47%, and in one case after a week's treatment it was 46%. Finally, in one case, after 7 weeks' treatment by liver the index went up from 46 to 51%. Besides this last mentioned case, we have at present none at our disposal in which the variations of index could be determined dur-

¹ Macht, *J. Pharmacol. and Exp. Therap.*, 1926, **xxix**, 461.