

Dogs were fed a diet of known amount and composition. After a control period of one to 2 weeks, blood was removed every day for 1 to 7 days, was deprived of its plasma, and the washed cells suspended in calcium-free Locke's solution were returned to the animal. Blood and urine analyses were performed during both the control and experimental periods.

At suitable junctures in the experimental periods, the dogs were sacrificed by carbon monoxide gas and immediately autopsied. Tissues were removed and analyzed for water and chloride content. The values found on 7 dogs were compared with the average values of tissues taken from 3 dogs that had been subjected to various control procedures, and sacrificed and autopsied exactly as the hypoproteinemic animals.

Edema was found to occur consistently when the serum protein concentration was below 4.0%. The occurrence of the edema was associated with retention of sodium chloride and water, and the retained chloride and water were recovered with considerable accuracy in the tissues analyzed. Skin stored most of the water while most of the retained chloride was found in muscle. The retained water and chloride constituted an isotonic concentration in the skin and a hypertonic concentration in muscle.

Upon the basis of the data obtained, it is concluded that the edema which occurs in dogs rendered hypoproteinemic by plasmapheresis is a sodium chloride edema, the development of which is facilitated by the presence of a low serum protein concentration and exaggerated by increasing the sodium chloride intake and water intake of the animals.

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Shwartzman Phenomenon in the Rabbit Stomach.

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The Arthus phenomenon was first observed as a skin reaction and subsequently shown to occur in various internal situations with interesting and valuable results.¹ The Shwartzman phenomenon has been studied as a skin reaction in great detail,² but little attention

¹ Nordmann, M., *Physiol. Rev.*, 1931, **11**, 41.

² Shwartzman, G., *Klin. Wchnschr.*, 1930, **9**, 1925, 1974; *J. Exp. Med.*, 1931, **54**, 711.

has been given to the finer features of the lesion produced or to its manifestations in internal viscera. The observation of Frisch³ that the "reacting factor" may be given intraperitoneally gives no information as to the occurrence of the phenomenon in internal viscera.

The stomach was selected as the organ first to be studied, because of its accessibility, the fact that control areas can readily be obtained and thin sections easily prepared for detailed microscopic study. Barium sulphate starch mixture was applied as a depilatory 24 hours before operation, which was performed aseptically under ether anesthesia, and the stomach exposed by high left rectus incision. The concentrated toxic filtrate of *B. coli* was prepared according to the method of Ecker and Rimington⁴ and was shown to be sterile before use. The injection into the stomach wall of 0.2 cc. concentrated filtrate was into the submucosa, except in 1 instance where it was into the muscularis. Intracutaneous injection of 0.2 cc. concentrated filtrate was given in the lower abdominal region. Of 16 rabbits so treated, 12 were given 2.5 cc. concentrated filtrate intravenously 24 hours after the local injection. The animals were killed by fracture of the neck at periods of 3½, 5(2), 12, 24, 25(2), 72(2) hours, and 7 days (2) after intravenous injection. The 4 control animals, with local but no intravenous injections were killed at 7 and 24 hours and 7 days (2) after the local injection. After careful gross examination of stomach and skin, blocks were fixed in Zenker's fluid, embedded in paraffin and sections stained with hematoxylin and eosin.

It was found that the Schwartzman phenomenon occurs in the stomach wall and that the severity of the reaction is in general parallel to that of the skin. The peak of the reaction in the skin is reached in 4 to 5 hours after intravenous injection but in the stomach, the peak of reaction is at about 24 hours. The local injection into the stomach produces an exudative inflammation, which after the intravenous injection becomes more severe and shows hemorrhage. The hemorrhage occurs only in the animals with both injections, but in the stomach is not so severe as in the skin. The inflammation goes through organization and cicatrization. No gastric ulcers were observed.

³ Frisch, I. A., *Arch. Int. Med.*, 1930, **46**, 410.

⁴ Ecker, E. E., and Rimington, C., *J. Hyg.*, 1927, **27**, 44.