

controls we have records of the incidence of cecitis in other groups of normal rats of approximately the same size raised on the stock diet. These findings are summarized in Table I.

Pooled serum from the rats receiving suc-

cinyI sulfathiazole was tested for its sulfonamide content which was 0.8 mg %.

Conclusion. Succinyl sulfathiazole incorporated in the stock ration completely prevented the development of ulcerative cecitis in rats.

13813

No Demonstrable Substance Causing Increased Capillary Permeability in Lymph from an Injured Area.

NORMAN E. FREEMAN AND A. E. SCHECTER. (Introduced by I. S. Ravdin.)

From the Harrison Department of Surgical Research, Schools of Medicine, University of Pennsylvania, Philadelphia.

The possibility that the hypothetical "toxic" factor responsible for traumatic shock was present in lymph was considered by Dragstedt and Mead.¹ Since they found that lymph obtained from the thoracic duct of a dog after intestinal trauma did not cause a fall in blood pressure when injected intravenously into a test animal, they concluded that no "toxic" substance was present in this lymph. It seemed possible, however, by using increased capillary permeability as a criterion of shock rather than depression of blood pressure, that the presence of a "toxic" substance in the lymph might be demonstrable.

Technic. Large, mongrel dogs were used. Under spinal anesthesia, a cannula was tied into a collecting lymphatic trunk between the femoral artery and vein. Lymph was collected by gentle intermittent pressure upon the tissues of the extremity and was stored in chilled tubes. After several control samples of lymph had been obtained, the extremity was injured either by heat or by trauma. An immediate increase in the flow of lymph was observed. Within 5 min the lymph became turbid and soon thereafter became blood tinged. Samples of lymph were collected at intervals for 3 hr. A tourniquet was then tightly applied about the traumatized extremity and 3 mg per kg of the blue

dye T-1824 were injected intravenously.

Two-tenths of a cm³ of each lymph sample was injected intracutaneously into the abdominal wall of the dog from which the lymph had been obtained. An equal amount of each sample was injected into another dog which had previously received the same amount per kg of the blue dye. At the end of 15 min the degree of staining of the area where the lymph had been injected was noted. When the lymph contained a factor

TABLE I.

Changes in Capillary Permeability Indicated by Diffusion of Blue Dye into Area Injected with Lymph Obtained from Femoral Region Before and After Trauma.

Time lymph sample obtained	Dog A "Donor"	Dog B "Recipient"
10:45	0	+
10:53	0	0
11:00	0	0
11:12	0	0
Trauma to leg		
11:18	0	++
11:37	0	+
11:50	0	0
12:50	0	++
2:00	0	++++
2:27	0	+++
Donor Serum		
Arterial	0	+++
Venous	0	+++
Recipient Serum		
Arterial	++++	0
Venous	++++	0

¹ Dragstedt, C. A., and Mead, F. B., *J. Am. Med. Assn.*, 1937, **108**, 95.

TABLE II.

Changes in Capillary Permeability Indicated by Diffusion of Dye into Area Injected with Arterial Serum, Arterial Plasma, Venous Serum and Venous Plasma Obtained from Each of the Dogs.

	Dog No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Dog No. 1						
Arterial Serum	0	++++	++++	++++	+	++++
Venous "	0	++++	++++	++++	+	++++
Arterial Plasma	0	++++	++++	++	+	0
Venous "	0	++++	++++	++	++	0
Dog No. 2						
Arterial Serum	++++	0	++++	++++	++	++++
Venous "	++++	0	++++	++++	+	++++
Arterial Plasma	++++	0	++++	++++	+	++++
Venous "	++++	0	++++	++++	+	++++
Dog No. 3						
Arterial Serum	++++	++++	0	++	+	++++
Venous "	++++	++++	0	++	+	++++
Arterial Plasma	++++	++++	0	++	+	++++
Venous "	++++	++++	0	++	+	++++
Dog No. 4						
Arterial Serum	++++	++++	++++	0	++	++++
Venous "	++++	++++	++++	0	++	++++
Arterial Plasma	++++	++++	++++	0	++	+
Venous "	++++	++++	++++	0	++	0
Dog No. 5						
Arterial Serum	++++	++++	++++	++	0	++++
Venous "	++++	++++	++++	++	0	++++
Arterial Plasma	++++	++++	++++	++	0	+
Venous "	++++	++++	++++	++	0	0
Dog No. 6						
Arterial Serum	++++	++++	++++	+++	+	0
Venous "	++++	++++	++++	+++	+	0
Arterial Plasma	++++	++++	++++	++	+	0
Venous "	++++	++++	++++	++	+	0

which caused an increase in capillary permeability, dyed plasma leaked out of the blood vessels and stained the site of injection.

Results. Lymph obtained from a dog's extremity before trauma produced no increase in capillary permeability when injected intracutaneously into another dog. After trauma, the lymph contained some factor which brought about increased capillary permeability as shown in Table I. However, serum from the arterial and venous blood also contained a permeability factor. When the lymph obtained from the dog after trauma was injected into the skin of his own abdominal wall, however, no increase in permeability could be shown. When serum from the arterial and venous blood of the recipient was used in the donor, a positive reaction was obtained.

These findings suggested the possibility that dogs might show a reaction to the serum of other dogs when injected intracutaneously and yet not to their own serum. Arterial and venous blood was drawn from each of 6 dogs

selected at random. Serum and plasma were obtained from each sample. Two-tenths of a cm³ of each specimen was injected intracutaneously into the skin of the abdominal wall of each dog. As can be seen from Table II none of the dogs reacted locally to its own arterial or venous plasma or serum, but they all reacted to injection of material from other dogs. Fig. 1 shows the reaction observed in dog 3. There were variations in the degree of reaction in the different dogs.

Discussion. It has been clearly shown by Field and Drinker² that lymph obtained under resting conditions contains only a small amount of protein but that the concentration of protein rises rapidly after injury to the region from which the lymph is flowing. It seems probable that the factor in the lymph of the donor responsible for the local increase in capillary permeability in the recipient was the same as that present in the circulating blood of the donor.

² Field, M. E., and Drinker, C. K., *Am. J. Physiol.*, 1931, **98**, 378.

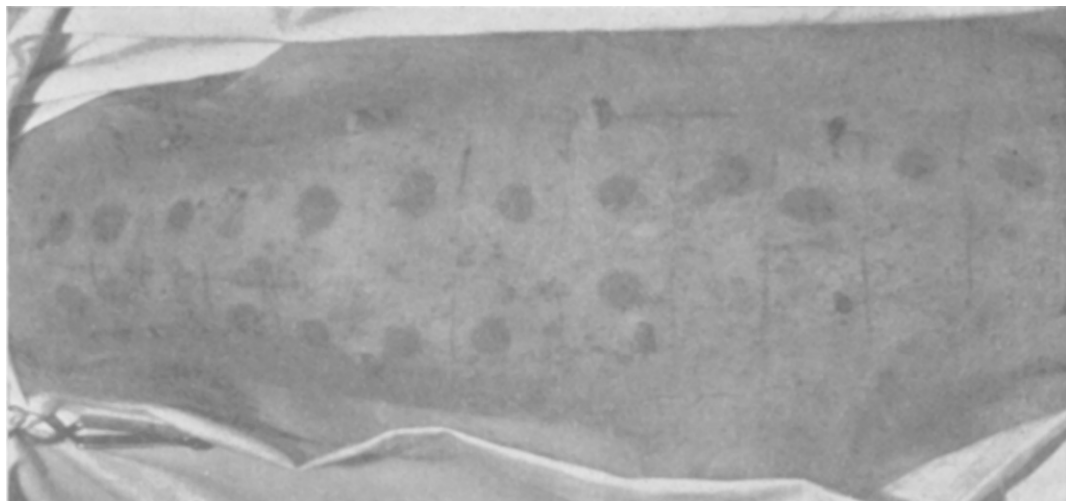


FIG. 1.

Increased capillary permeability shown by diffusion of dye into area injected with homologous arterial and venous serum and plasma. No reaction was obtained from dog's own serum or plasma as shown by absence of staining in lower 4 squares, Dog No. 3, Table II.

Menkin³ has stated that the substance found in exudates which is responsible for producing an increase in capillary permeability is also present in blood, "although biological tests indicate that it is present there in definitely smaller quantities than in an inflammatory exudate." We have not been able to demonstrate that lymph coming from a traumatized area contains a substance any more capable of producing an increase in capillary permeability than normal plasma.

Conclusions. 1. Lymph obtained from a traumatized extremity contained a substance which produced an increase in capillary permeability when injected into another dog.

2. When tested upon the dog from which the lymph was obtained, there was evidence that a toxic substance, capable of causing an increase in capillary permeability, appeared after mechanical or thermal trauma. 3. Arterial and venous serum and plasma contained a factor which increased the capillary permeability when injected intracutaneously into other dogs but not when injected into the dog from which the blood had been obtained. 4. It is likely that the presence in the lymph of a substance capable of producing an increase in capillary permeability is dependent upon the appearance, after trauma, of blood plasma in the lymph draining from the extremity.

³ Menkin, V., *J. Exp. Med.*, 1936, **64**, 485.