

Effect of Carbon Arc Irradiation and Adrenal Cortical Preparations on Capillary Permeability.*

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In studies concerning the cause of the reduction in blood pressure following carbon arc irradiation, it was of interest to obtain an estimate of the extent and degree of changes in capillary permeability produced by the irradiation. For this purpose Menken's trypan blue test¹ was used on rabbits.

The animals were divided into 2 groups of 10 each. Group I served as normal controls; Group II were irradiated over the abdominal area. The abdomen of all the rabbits was shaved at approximately the same time. One hour later Group II was exposed to the carbon arc lamp for 30 to 40 minutes at a distance of one meter. Four hours later all animals received intravenously 8 to 10 cc of 1% solution of trypan blue in normal saline. Two hours after injecting the dye the animals were carefully examined over the irradiated area of the abdomen, then killed, and the viscera compared with reference to the degree of staining by the dye.

The results showed striking differences. The skin and abdominal viscera of control animals presented a blue tinged appearance with the exception of the liver which appeared normal in color. The irradiated animals showed an extreme blue coloration of the skin and viscera many times more marked than that of the controls. The livers of these animals also showed coloration in contrast to

the normally appearing livers of Group I. There was usually a collection of blue stained fluid (about 5 cc) in the abdominal cavity. Photographs in color were taken of a typical series to provide a permanent and objective record of the differences.

It would seem that irradiation of the rabbit with the dosage used in these experiments produces changes in the vascular system of the skin and abdominal organs which allow an increased amount of injected dye to escape from the blood stream and infiltrate the tissues.

Since the blood pressure reductions by the carbon arc can be prevented in the dog by administration of adrenal cortical substances² it seemed desirable to determine whether these substances also prevent the increase in capillary permeability. A third group of 10 animals was added to the experiments. These were first treated with 10 mg of desoxycorticosterone acetate or 5 cc of cortin intramuscularly immediately before, during, or immediately after the irradiation. The dye injection then followed in the same manner as for the animals of Group II. Upon examination after injection of trypan blue, the tissues of these animals receiving cortical substances before irradiation showed changes indistinguishable from the control group. Apparently the effects of irradiation upon the capillaries of tissues, both immediate and distant to the exposed area, are prevented or markedly diminished by previous administration of adrenal cortical extract or desoxycorticosterone acetate. These results indicate that the adrenal cortical hormones are capable, under certain conditions, of preventing the increased permeability occurring in the minute vessels by the action of substances released from tissue undergoing inflammatory changes.

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¹ Menkin, V., *Dynamics of Inflammation*, Macmillan Company, New York, 1940, pp. 18-23.

² Laurens, H., and Graham, J. S., *Med. Rec.*, 1941, **154**, 146.

This is in agreement with the findings of Menken³ who studied the effect of the adrenal cortical substances on the accumulation of trypan blue in local lesions produced by the

injection of leukotoxine or inflammatory exudate.

³ Menken, V., PROC. SOC. EXP. BIOL. AND MED., 1942, **51**, 39.

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Factors Controlling Lens Regeneration from the Dorsal Iris in the Adult *Triturus viridescens* Eye.*

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When the adult eye of *Triturus viridescens* is transplanted^{1,2} or its blood supply is temporarily lost³ the lens degenerates along with most of the retina. In these cases a new lens is developed from the dorsal pupillary margin of the iris such as follows simple lensectomy.^{3,4} This phenomenon of lens replacement is largely, if not exclusively, confined in the vertebrates to the *Triturus* group of salamanders^{5,6,7} where the lens appears to be less resistant to injury than in other forms.^{5,8} An extensive study is being made by the author in search for the factors which govern this phenomenon. Some of the findings can be summarized at this time.

Slight injuries to the fully developed lens in the adult eye of *Triturus viridescens* cause it to degenerate. Injuries to the dorsal iris produced by mechanical stretching and inci-

sions radiating from the pupillary margin neither prevent nor favor lens regeneration. Such injuries heal readily. Only the presence of the normal lens prevents a new one from forming. This was shown by means of a successful pipette method of removing and reimplanting the lens in the adult eye without injury.

If a piece of the dorsal iris from a normal eye or from one lensectomized 6 or 7 days earlier is transplanted to a freshly lensectomized host eye, a new lens will develop from the graft. If, however, such grafts are placed in an eye possessing a normal lens, the latter sharply inhibits lens regeneration in all cases. Even in those grafts where the implanted iris was allowed to initiate early preparation⁷ for lens regeneration through delay before transplantation, only a rare case showed at best a feeble, short-lived attempt to progress further before it was permanently arrested. The presence of the normal lens of the host eye apparently exerts an early effect upon the lens-forming capacity of the implanted iris.

Varying the time from the day of operation to 25 days after lensectomy in both host and donor eyes, combinations were obtained which tested the effects of older and younger regenerating lenses on each other in the same environment. The experiments proved that the presence of a regenerating lens from an iris up to 25 days after lensectomy does not inhibit nor prevent the regeneration of a lens from other dorsal iris tissue in its environment. Under some circumstances as many

* Aided by grants from the John and Mary R. Markle Foundation and the Fluid Research Fund of Yale University.

¹ Stone, L. S., and Zaur, I. S., *J. Exp. Zool.*, 1940, **85**, 243.

² Stone, L. S., and Farthing, T. E., *J. Exp. Zool.*, 1942, **91**, 265.

³ Stone, L. S., and Chace, R. R., *Anat. Rec.*, 1941, **79**, 333.

⁴ Ogawa, C., *J. Exp. Zool.*, 1921, **33**, 395.

⁵ Stone, L. S., and Sapir, P., *J. Exp. Zool.*, 1940, **85**, 71.

⁶ Stone, L. S., and Dinnean, F. L., *J. Exp. Zool.*, 1940, **83**, 95.

⁷ Dinnean, F. L., *J. Exp. Zool.*, 1942, **90**, 461.

⁸ Stone, L. S., and Cole, C. H., *Yale J. Biol. and Med.*, 1943, **15**, 735.