

50 (1114)

The epinephric content of the blood in conditions of low blood pressure and "shock."

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The following is a brief record of experiments undertaken to determine whether in low blood pressure there is an increased activity of the adrenals.

Dr. Alfred R. Allen, who presented before this society the results of an experimental study of the condition of the Purkinje cells in low blood pressure and shock, stated in conversation with the authors that he found marked histological changes in the adrenals under similar conditions. In the present series of experiments an attempt has been made to answer the question both qualitatively and within limits, quantitatively by an examination of the blood of animals (dogs) taken from the adrenal vein, before and after a more or less prolonged condition of low blood pressure.

In order that blood from the adrenal might be obtained undiluted by the general venous blood, all veins, except the inferior mesenteric and the left adrenal, entering the vena cava for some distance on either side of the adrenal vein were ligatured. Through the inferior mesenteric a canula was inserted into the vena cava, in such a way that the flow of blood in the vena cava was unobstructed. At the time of drawing blood, the vena cava above and below the entrance of the adrenal vein was closed by clamps, having rubber protected jaws. The first blood, that in the enclosed segment of the vena cava, was discarded.

Care was taken to measure the rate of flow in order to eliminate the possibility that results obtained might be due to a greater concentration of epinephrin, because of a less rapid flow of blood through the organ, although its activity might not be increased. At the beginning of the experiment, blood to be used as control was taken from the jugular vein.

Carotid blood pressure was taken.

For the determination of epinephrin in the blood, an adapta-

tion of Hoskins's method was used. The essential part of the method is that the tone of rabbit intestine, immersed in oxygenated blood at 37 degrees C., is lowered and the rhythmic contractions more or less inhibited by the presence of epinephrin in the blood.

To determine the quantitative relation of epinephrin in the samples of blood tested, two methods were used. In one method, the tracings obtained were compared with tracings obtained on the addition of known amounts of adrenalin to control blood. In the second method, the blood giving the reaction for epinephrin was diluted with control blood until the reaction of this blood was similar to that of the compared blood.

Low blood pressures were brought about by one of these methods;

1. Handling of intestines.
2. Hemorrhage.
3. Occlusion of the thoracic inferior vena cava.

In most of the experiments, pressures of 30 to 40 mm. of mercury were obtained.

In all three types of experiments, the epinephric content of the adrenal blood was increased, provided that the pressure was sufficiently low and the condition of low pressure was maintained for a sufficient length of time. Since the blood was diluted with control blood to compensate for the difference in the rate of flow through the adrenal organ, an increased activity of these organs was indicated.

In some cases, it was necessary to dilute the experimental adrenal blood with thirty-two times its volume of jugular blood, before a tracing could be obtained similar to that of adrenal blood, drawn before low pressure was induced. In other cases the reaction was similar to the reaction given by control blood to which had been added adrenalin sufficient to make a 1 to 10,000,000 dilution.

In experiments in which samples were taken at intervals, it was shown that the marked increase of epinephric content of blood occurred only after a considerable duration of a condition of low blood pressure, varying from one to two hours.

In these experiments, the later samples indicated an increasing amount of epinephrin in the blood.

Most of the experiments in which pressure was not permitted to go below 50 or 60 mm. Hg gave negative results. A few of the handling experiments were exceptions.

These negative experiments served as controls, indicating that the anesthetizing and general operative procedure did not bring about the results obtained.

To be certain that the results were due to the presence in the blood of the secretion of the adrenal gland and not to the secretion of some other organ, for example the pituitary body, the adrenals were ligatured in such a way that while the blood from the lumbar branch of the adrenal vein was permitted to enter the vena cava, no material could pass from the adrenal organ into the circulation.

Only negative results were obtained under these circumstances.

These experiments, therefore, seem to indicate that an increased activity of the adrenals accompanies a somewhat prolonged low blood pressure condition.

51 (1115)

On the augmenting action of ergotoxine (Dale and Barger) on the gastrointestinal movements.

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About ten years ago Meltzer and Auer¹ reported animal experiments in which intravenous injection of ergot augmented strongly the spontaneous movements of the gastrointestinal canal and increased the motor responsiveness of the canal to vagus stimulation. In these experiments a fluid extract of ergot (U. S. P.) was used. At about the same time Dale and Barger succeeded in isolating from ergot an alkaloid which they named ergotoxine. In their interesting publication on that preparation a year later they ascribed the characteristic physiological effects of ergot to the presence of this alkaloid. With reference to the action upon the gastrointestinal movements they emphatically state that the effect is comparatively slight and inconstant, and believe that

¹ *Amer. Jour. of Physiol.*, XVII, 143, 1906.