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## The Circulation Time of the Blood in Dogs before and during the Digestion of Food

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A PHYSICAL APPARATUS FOR THE DETERMINATION OF THE CIRCULATION TIME OF THE BLOOD IN DOGS

E. C. McCRACKEN

A radical departure from previous apparatus for the determination of blood circulation time is described in detail. The ensemble consists of an ionization chamber (Geiger Counter), a high-voltage (to 2500 volts) power supply, a three-stage amplifying system, and an output circuit for recording the discharges which occur when radiations enter the chamber. A separate electrical circuit is utilized to measure the time interval between the injection of the radioactive material (radium C) in the jugular vein of the dog and its arrival in that part of the femoral artery lying in the adductor canal. The technique of separating radium C from radium emanation is described as is also that of shielding the ionization chamber from extraneous radiations. The record obtained during an experimental test is interpreted as to accuracy and physiological significance and the advantages and disadvantages of the method are outlined.

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THE CIRCULATION TIME OF THE BLOOD IN DOGS BEFORE AND DURING THE DIGESTION OF FOOD

E. C. McCRACKEN

The circulation time of the blood in dogs was investigated by an ensemble of physical apparatus consisting of an ionization chamber, a high-voltage power supply, a three-stage amplifying system, and an output circuit for recording and timing discharges which occur in the ionization chamber when radiations such as gamma and beta rays enter. Radium C was injected into the jugular vein of the dog and its arrival in that portion of the femoral artery lying in the adductor canal was detected by the discharges occurring in the

ionization chamber which was placed directly above the artery. An average circulation time between these two points in the vascular system was determined for the dogs under normal standard conditions just prior to a regular time of feeding and again at various periods during the digestive cycle after various types of meals. It was found that the circulation time at the "height" of digestion (as evidenced by the maximum pulse rate for a given test and by actual determination of the maximum volume rate of blood flow by a modified Rein thermo-stromuhr method) was decreased twenty-five to thirty per cent and that the decreases in the circulation time were coincident with proportionate increases in the volume rate of flow of the blood through the femoral artery.

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## THE EFFECTS OF SOME PHYSICAL AND CHEMICAL FACTORS IN THE CIRCULATION TIME OF THE BLOOD IN DOGS

E. C. McCracken

After the determination<sup>1</sup> of an average circulation time of the blood between the jugular vein and the femoral artery in a dog, the effect of such factors as exercise, fasting, high-temperature and low-temperature environments, ether and sodium amytal anesthetics; the intravenous injection of such drugs as histamine, nicotine, adrenalin, cobefrin, thyroxin, pituitrin, pitressin, and pitocin was studied. It was found that the average normal circulation time of blood in a dog is independent of such factors as age and size but is closely related to the pulse rate, the number of heart beats per circulation time being 13 to 16. The physiological mechanism of the dog maintains this ratio constant when the circulation time is changed under the influence of a normal physical factor but is unable to maintain the ratio constant after the administration of a drug or when under the influence of an anesthetic. The range of possible circulation times is large. In a typical case, the average normal circulation time was 16.5 seconds; the shortest circulation time was 8.5 seconds obtained under light surgical ether anesthesia conditions, and the longest circulation time was approximately 120

<sup>1</sup> Method described in another paper presented at this meeting.