

# ELECTROLYTE CONCENTRATIONS IN THE ISOLATED RABBIT'S HEART PERFUSED WITH A DONOR RABBIT

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A decrease in the  $K^+$  concentration and increase in the  $Na^+$  concentration were observed in the myocardium of the isolated heart kept in a state of anoxia for 60 min. In the isolated heart recovering its functional activity after perfusion with the aid of a donor the  $K^+$  concentration in the myocardium fell still more. Administration of large quantities of glucose by frequent injection of small doses into the blood stream during perfusion aggravated the electrolyte imbalance caused by anoxia. Adrenalin, if injected into the systemic circulation (0.025 mg/100 g body weight), did not change the electrolyte composition of the donor's myocardium, but considerably lowered the  $K^+$  level in the myocardium of the isolated heart.

The object of this investigation was to study the concentration of  $Na^+$  and  $K^+$  ions in the myocardium of the left ventricle of the isolated, denervated rabbit's heart when its functional activity was restored after a state of prolonged anoxia by perfusion with the aid of a donor rabbit. The aim of one series of experiments was to detect the effect of glucose on the  $Na^+$  and  $K^+$  levels in the isolated heart when perfused after a state of anoxia. The object of another series of experiments was to compare the effect of adrenalin on the electrolyte composition of the myocardium of the donor rabbit and of the isolated, perfused heart, since catecholamines are known to alter the electrolyte composition of the myocardium [1-3].

## EXPERIMENTAL METHOD

The isolated rabbit heart was connected to the circulatory system of a donor rabbit through the carotid artery (connected to the left ventricle of the isolated heart) and jugular vein (connected to the right ventricle of the isolated heart).

In control experiments the isolated heart was connected to the circulatory system of the donor soon after isolation. In the experiments to study the effect of prolonged anoxia on the electrolyte composition of the isolated perfused heart, the circulation in the heart was stopped for 1 h at room temperature, and the heart was then connected to the donor's circulation. When the effect of glucose on the electrolyte balance of the isolated perfused heart was investigated, a 40% glucose solution was injected into the systemic circulation during perfusion in repeated small doses (20 doses each of 0.75 ml during 1 h). Altogether 15 ml of 40% glucose solution was given together with 4 units of insulin.

The volume velocity of perfusion of the isolated heart averaged 10-12 ml/min, the heart rate was 120-140/min, and the arterial pressure was 90-110 mm Hg.

In the series of experiments to investigate the effect of adrenalin on the  $Na^+$  and  $K^+$  concentrations in the myocardium of the isolated heart and the heart of the donor rabbit, 0.1% adrenalin solution was injected into the systemic circulation by repeated small doses throughout the period of perfusion at a mean rate of 17  $\mu$ g/min. The total dose of adrenalin injected was 1 mg. The rate of perfusion in these experiments was 12-14 ml/min, the rate of contraction of the isolated heart was 160-170 beats/min, and the arterial pressure in the perfusion system under the influence of adrenalin was 150-160 mm Hg.

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In the concentrations used adrenalin did not affect the electrolyte composition of the myocardium of the intact donor although it considerably reduced the level of intracellular  $K^+$  in the myocardium of the isolated heart.

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