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Interruption of Perfusion of Isolated Rabbit Heart upon Reaction of Coronary Flow.

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We have not found described the effect of interruption of the perfusion of the isolated mammalian heart upon the reaction of the coronary flow immediately subsequent to resumption. This very simple experiment may be used to demonstrate one of the most fundamental chemical properties of muscle, increased acid production under conditions of inadequate oxygen supply.

This increased acidity is demonstrable with the isolated rabbit heart, perfused with Ringer-Locke¹ solution. In some instances we have altered the formula, using CaCl_2 , 0.012% instead of 0.024%, or varying the NaHCO_3 strength; the former change appears immaterial to the result, but reduction in NaHCO_3 strength makes the reaction very distinct.

In order that the perfusion fluid may wash the heart of blood and clear the tissue of accumulated diffusible acid products in unusual amount, perfusion is carried out for 20 or 30 minutes, when the beat has usually become fairly regular, and the fluid escaping from the heart nearly constant in reaction from minute to minute. The perfusion is then stopped by clamping off the tube leading from the Ringer reservoir, or by lowering of the perfusion pressure from the usual adequate value of 50 to 70 cm. of Ringer to about 4 cm. The latter procedure may readily be carried out with the apparatus used by us² by providing a rubber tube connection of adequate length for the Ringer reservoir.

With zero or inadequate perfusion pressure so caused, the heart not infrequently shows at first a period of increased force of beat, but soon becomes irregular and finally stops at the end of usually 8 to 20 minutes. If the perfusion is now resumed with the former pressure, the fluid escaping from the heart is more acid than before for a period of 1 to 5 minutes or even longer, and not infrequently also temporarily increased in amount.

The temporary pH change may be made as great as 2.00 re-

¹ Locke, F. S., and Rosenheim, O., *J. Physiol.*, 1907, **36**, 204.

² Dawson, W. T., *J. Lab. and Clin. Med.*, 1925, **10**, 853. Liddell, E. G. T., and Sherrington, Sir Charles, *Practical Mammalian Physiology*, Clarendon Press, Oxford, 1929.

duction by using about 0.004% NaHCO_3 in the Ringer; with ordinary concentrations (about 0.015%) it is about 0.40 and readily seen with phenol red or bromthymol blue as indicator. The temporary increase in coronary flow may be as great as 100%, or more, and may be very constantly obtained by using an arbitrary 6 minute interruption of perfusion. The perfusate is best collected at one minute intervals, and the pH determined at once. Brown's³ method is convenient.

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Iron Deficiency in the White Rat and the White Mouse.

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This work is a development of the view that pellagra may be an iron-deficiency disease.¹ We have studied the physiological effects of iron restriction in white rats and white mice. The diets low in iron have been of 2 types: (a) A synthetic diet of casein, sucrose, butter fat, lard, a salt mixture which is iron-poor but assumed to be otherwise balanced,² vitamin B concentrate (Harris) and viosterol. (b) A diet of natural foodstuffs such as banana, orange juice, sucrose, freshly separated egg white, cream, and a salt mixture very low in iron but assumed to be balanced for the other elements, viosterol, vitamin B concentrate (Harris) and agar. These diets furnish protein of good quality in adequate amount, sufficient fat and carbohydrate and an abundance of vitamins A, B, D and G. All of our rats grew well.

Six series of from 6 to 8 rats each, and one series of 10 mice, raised in the laboratory and appearing vigorous and healthy at weaning age—about 21 days—were used. The young rats weighed at least 35 gm.

The results obtained have been entirely uniform, all rats and mice kept on these iron-poor diets developed the following symptoms:

If the young rats have not had access to rich sources of iron between the time that they open their eyes and the time of starting the experiment, the first symptoms of falling hair may appear as

³ Brown, J. Howard, *J. Lab. and Clin. Med.*, 1924, **9**, 239.

¹ Bliss, S., *Science*, 1930, **72**, 577.

² Cowgill, G. R., *J. Biol. Chem.*, 1923, **56**, 725.