

case the pressure in the arteriolar limb was 30 and the venous limb was 10. In neither of these cases was any edema present.

In one case of glomerulonephritis with a strong nephrotic tendency with edema, ascites and hydrothorax, without any heart failure but with a colloid osmotic pressure of approximately 9 mm. Hg., the capillary pressures were 30 mm. Hg. in the arterial limb and 22 mm. Hg. close to the middle of the loop. The pressure in the venous end of the capillary loop was not measured but the pressure in the median basilic vein was 3.7 mm. Hg. This shows that with normal hydrostatic pressures in capillary loops but with a lowered colloid osmotic pressure, it is possible to get edema, despite the fact that the capillaries in this case were extremely small. A diminution in the diameter of the capillary did not prevent edema formation when the colloid osmotic pressure was lower than the mean pressure along the capillary.

9701 P

Venous Pressure as a Factor in Determining Collateral Circulation in the Heart.

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In tying off the left descending coronary artery of the dog, it was noted by LaBree¹ that the apex was rarely infarcted if the veins were tied at the same time as the artery. Gross² showed that there was a markedly increased opening up of collateral circulation if the coronary artery of a dog was ligated after first ligating the coronary sinus. Many clinicians have noted that angina pectoris symptoms and the symptoms of coronary thrombosis are apt to be less severe in cases with severe right heart failure, *i. e.*, with a high venous pressure. With these observations in mind, we decided to ligate the left circumflex artery both with and without previous ligation of the accompanying veins and also after the production of a high pressure in the coronary sinus, one approximating the venous pressure in the coronary sinus during severe heart failure.

¹ Personal communication.

² Gross, Louis S., Blum, Lester, *PROC. SOC. EXP. BIOL. AND MED.*, 1935, **32**, 1578.

We made use of the heart-lung preparation of Starling except that the heart and the lungs were removed from the thorax of the dog and placed on a tray for greater ease of experimental approach to the coronary vessels. In 3 hearts the circumflex veins were tied first. The veins appeared to be distended and after a few moments arterial blood could be seen coming into the smaller veins. A few minutes later the circumflex artery was ligated but no infarction occurred. In one heart the main branch of the circumflex artery was tied at the same time that the veins were tied, leaving only a small branch of the artery free. Under these circumstances there was a small amount of infarction of the posterior surface of the heart. When the small free branch of the circumflex artery was tied, this infarction became complete. In 3 hearts the circumflex artery was tied without previous or concomitant ligation of the accompanying veins and in all 3 cases there was infarction of the posterior wall of the heart.

In order to produce a high venous pressure in the coronary sinus, a Morawitz cannula was passed through an opening in the right auricle into the coronary sinus where it was securely fastened. A piece of rubber tubing was connected to the Morawitz cannula from which blood flowed into a container. The height of the distal end of the rubber tubing from which the blood flowed above the right auricle determined the pressure in the coronary sinus. In one heart a pressure of 24 cm. of blood was determined in the coronary sinus by raising the outlet of the Morawitz cannula to this height above the sinus. The circumflex coronary artery was then tied and no infarction occurred. Then the pressure in the coronary sinus was reduced to that normally present and immediately infarction in the posterior surface of the left ventricle occurred. When the pressure in the coronary sinus was again raised, the infarction did not disappear. In another heart a Morawitz cannula was inserted into the coronary sinus and the pressure in the sinus raised to 20 cm. of blood. The circumflex coronary artery was then tied and an infarct resulted on the posterior surface of the heart. In another heart the pressure in the coronary sinus was raised to 32 cm. of blood by raising the height of the distal end of the rubber tubing. A ligature was then tied securely about the circumflex artery. No infarction resulted.

These experiments show that raising the pressure in the coronary veins leads to the opening up of collateral circulation. They also show that it is not necessary to ligate the veins in order to increase the collateral circulation in the area supplied by the circumflex artery

but that raising the venous pressure to about 24 cm. of blood will, at least sometimes, open up sufficient collateral circulation to prevent infarction.

9702 P

Relation Between B.M.R. and S.D.A. of Proteins.

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The specific dynamic action of proteins and certain amino acids has been reported to be greater than normal in conditions where a reduced basal metabolic rate prevails, *viz.*, in undernutrition¹ and fasting.² On the basis of data obtained in routine class experiments on unselected subjects, this same inverse relationship between specific dynamic action and basal metabolic rate seems to apply to persons in a presumably normal nutritional state. The subjects were 13 male and 9 female university students selected at random from a class of 40. They came to the laboratory in the early morning in a post-absorptive state and underwent the following routine:

	Min.
Rest	30
Metabolism Test†	10
Protein Meal‡	35-50
Rest	30
Metabolism Test	5
Rest	25
Metabolism Test	5
Rest	25
Metabolism Test	5

Table I gives the oxygen consumption before the protein meal and at 30, 60, and 90 minutes after. The subjects are listed in order of their relative basal rates. A comparison of the greatest percent of increase recorded at any test period with the basal rates reveals a consistently high negative relationship between the S.D.A.'s and B.M.R.'s. We have made rank-order comparisons of the data

* Acknowledgment is made to Mary L. Smull for assistance in the experiments.

¹ Mason, E. H., *J. Clin. Invest.*, 1927, **4**, 353.

² Wilhelmj, C. M., and Mann, F. C., *Am. J. Physiol.*, 1930, **93**, 69.

† Sanborn closed circuit machine.

‡ The subjects continued to recline while they were fed an amount of cooked lean beef equivalent to 200 gm. per square meter of body surface.