

## 9015 P

**Creatine, Potassium and Phosphorus Content of Cardiac and Voluntary Muscle.\***

GEORGE H. MANGUN AND VICTOR C. MYERS.

*From the Department of Biochemistry, School of Medicine, Western Reserve University.*

The study of the creatine content of human voluntary and left and right ventricular cardiac muscle, carried out by Seecof, Linegar and Myers,<sup>1</sup> has been extended to include determinations of potassium and phosphorus. It is evident from the studies of Fiske and Subbarow<sup>2</sup> and others that in resting muscle creatine exists largely as phosphocreatine. It is likewise evident that this compound must be bound to some base, and this would appear to be largely, if not wholly, potassium.

At about the time we began our original study on the creatine of heart muscle, Calhoun, Cullen, Clarke and Harrison<sup>3</sup> pointed out that a diminished potassium content of heart muscle was invariably present in failing ventricles and suggested that this change may have been a contributing cause of such failure. Linegar and Myers<sup>4</sup> noted that the creatine concentration also drops in heart failure and would appear to parallel very closely the observations of the Vanderbilt investigators on potassium. It was then suggested that this drop in potassium and creatine may represent 2 phases of the same process.

Studies have now been carried out on 72 human autopsy cases in which potassium and phosphorus have been estimated in addition to the creatine. Since the cases were complicated by wide variations in diagnosis, it seemed advantageous to group them according to heart weights, excluding cases with nitrogen retention, which may cause elevated creatine values. The data studied were compiled from 44 hearts ranging in weight from 200 to 825 gm., comparable changes being found in both left and right ventricular muscle.

It was noted that as the heart weight progressively increases there was a diminution in the concentration of the 3 constituents, creatine,

---

\* Aided by a grant from the Josiah Macy, Jr., Foundation.

<sup>1</sup> Seecof, D. P., Linegar, C. R., and Myers, V. C., *Arch. Int. Med.*, 1934, **53**, 574.

<sup>2</sup> Fiske, C. H., and Subbarow, Y., *J. Biol. Chem.*, 1929, **81**, 629.

<sup>3</sup> Calhoun, J. A., Cullen, G. E., Clarke, G., and Harrison, T. R., *J. Clin. Invest.*, 1930, **9**, 393.

<sup>4</sup> Linegar, C. R., and Myers, V. C., *Proc. Soc. Exp. Biol. and Med.*, 1935, **32**, 1016.

potassium and phosphorus, the ratio of the average decrease being 3:2:1 respectively. This same sequence was found in the majority of cases, although in some, all 3 constituents decreased in the same proportion, due possibly to dilution of the muscle elements as a result of pathological change. This is not the rule, however, and if it may be assumed that in resting muscle creatine exists as the dipotassium salt of phosphocreatine, this would help to explain the ratios found in the loss in concentration since they correspond roughly with the intramolecular ratios found in this hypothetical compound. The loss of potassium and phosphorus is somewhat greater than that required by this hypothesis, but it is to be expected since the amount of creatine is quite insufficient to combine with all the potassium and phosphorus present in heart muscle.

## 9016 C

**Effect of Oxygen on *Bacterium necrophorum* in the Isolated Colon Segment of a Dog.**

FRANCIS O. FRY AND G. M. DACK.

*From the Department of Hygiene and Bacteriology, University of Chicago.*

Oxygen has been employed in the experimental treatment of ulcerative colitis.<sup>1, 2</sup> In view of the almost constant association of *Bact. necrophorum* with this disease,<sup>3, 4, 5</sup> and the sensitivity of this organism to oxygen,<sup>6</sup> it seemed advisable to study the effect of oxygen on cultures introduced into the colon.

For these experiments a dog was used which had been operated upon and an isolated colonic segment prepared. This loop included about 7-8 cm. of terminal ileum, the open end of which was brought out through a stab-wound in the abdomen, providing an entrance to the colonic segment. The loop consisted of cæcum, the ascending and one-half of the transverse colon. The transverse colon was divided, the proximal opening closed with a purse string suture, and the distal open end anastomosed end to side to the small bowel to reestablish the flow of faecal current. The only exit of material

<sup>1</sup> Felsen, Joseph, *Arch. Int. Med.*, 1931, **48**, 786.

<sup>2</sup> Golob, Meyer, *J. Am. Med. Assn.*, 1936, **106**, 1725.

<sup>3</sup> Dack, G. M., Heinz, T. E., and Dragstedt, L. R., *Arch. Surg.*, 1935, **31**, 225.

<sup>4</sup> Dack, G. M., Dragstedt, L. R., and Heinz, T. E., *J. A. M. A.*, 1936, **106**, 7.

<sup>5</sup> Dack, G. M., Dragstedt, L. R., and Heinz, T. E. In press.

<sup>6</sup> Beveridge, *J. Path.*, 1934, **38**, 467.