tion Hospital were studied, but all showed rich throat cultures of hemolytic streptococcus. Filtrates from the two cultures of non-hemolytic streptococcus were thermolabile, gave positive skin reactions in the arms of two Dick-positive subjects and these reactions were neutralized by Dick anti-toxin.

Of the three cases of hemolytic streptococcus infectoin, not scarlet fever, there was bacteriemia arising from mastoiditis in two instances, and from infected hemorrhoids in the other. In one of the cases of mastoiditis, a young adult, there was no history of previous scarlet fever.

In these three cases filtrates made from strains isolated from blood cultures were thermolabile, gave positive skin tests in two Dick-positive subjects, and the tests were prevented by Dick anti-toxin.

The meaning of these observations can be determined only when anti-toxin serum is produced in suitable animals, using the filtrates above, and the value of such anti-toxin tested in scarlet fever.

This is a preliminary report.

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Lactic Acid Formation in Muscle Extracts.

H. A. DAVENPORT AND MARGHERITA COTONIO.
(Introduced by P. A. Shaffer.)

From the Department of Biochemistry, Washington University School of Medicine.

Embden and Haymann[1] demonstrated that the addition of glycogen and sodium fluoride to freshly prepared muscle press-juice caused a very marked decrease in the inorganic phosphate which was present in the extract. Sugars were inactive in the reaction. The disappearance of the inorganic phosphate was interpreted as an esterification process in which hexose phosphate (lactacidogen) was formed. Meyerhof[2] showed that there is a production of lactic acid during the course of glycogen degradation by muscle extracts, and that the phosphates appear to take an active part in the changes involved. Fluoride caused a decrease in the production of lactic acid as well as a disappearance of the inorganic phosphates.

The fate of the added glycogen with reference to the amount of

total hydrolysable carbohydrate present in the working mixtures at the end of the incubation seems not to have been studied.

In our experiments we have endeavored to balance the carbohydrate loss against the lactic acid gain, and, at the same time, form some conception of the amount of carbohydrate that took part in the esterification with phosphoric acid. Simultaneous determinations of lactic acid, free sugar, total carbohydrate, and inorganic phosphate were made at 0, 30, 60, 120, and 240 minute intervals on aliquot portions of mixtures of muscle extract and glycogen solution.

The extract was prepared from chopped rabbit muscle by mixing two parts of ice cold distilled water with one part of muscle and straining through muslin after allowing the mixture to stand one-half hour at 0°. The animals were anesthetized with amytal, to prevent the rise of lactic acid in the muscle, by abolishing the death struggles, and killed by bleeding. The extract was used immediately after its preparation.

TABLE I.

Exp. No.	Substances added	1. Lactic acid gain, mg.	2. H_3PO_4 change mg.	3. Carbohydrate loss, mg.	4. Carbohydrate loss as mm. glucose	5. ½ L. A. gain + H_3PO_4 loss, mm.	6. X
1.	None, control	4.5	+2	3	0.016	0.005	—
	Glycogen	11.2	—7	21	.117	.132	1.3
	Phosphate	5.0	+1	3	.016	.018	—
	Glycogen and phosphate	13.7	—11	33	.183	.188	1.0
2.	None	1.2	0	1	.005	.007	—
	Glycogen	10.6	—7	18	.100	.129	1.7
	Glyc. and Phos.	17.8	0	17	.094	.099	—
3.	None	5.0	+1.6	4	.022	.012	—
	Glycogen	14.8	—10	32	.178	.183	1.0
	NaF	—0.6	—1.5	0	0	.012	—
	Glyc. and NaF	0.4	—21	25	.139	.216	1.5

Table I shows the changes which had occurred in 15 cc. of muscle extract after 4 hours incubation at room temperature. The free sugar is included in the total carbohydrate.

A comparison of columns 4 and 5 shows that the carbohydrate loss parallels the algebraic sum of the lactic acid gain and inorganic phosphate loss. The esterification of carbohydrate would account for the phosphate loss, but the carbohydrate loss can be explained only by assuming that little or no reducing sugar is re-

covered by acid hydrolysis of the ester. This is likely, for Furth and Marian[3] have shown that only one-third of the theoretical glucose reducing value is obtained by hydrolysis of yeast hexose phosphate.

If the total carbohydrate loss (C) be assumed to be due to conversion to lactic acid (LA) and to hexose phosphate (HP), then C=LA+HP, and the equation $C=LA/2+x(H_3PO_4)$ (each quantity being expressed in mMols.) should indicate the molar ratio of phosphoric acid to hexose in the hexose phosphate. Column 6 gives the values for X in the experiments in which glycogen was added to the extract. It seems significant that these values lie between 1 and 2, and a logical explanation would be that a mixture of mono and diphosphate was formed.

The results support the hypothesis that glycogen passes through a carbohydrate-phosphate complex when it is transformed into lactic acid in muscle, and confirm the observations of Embden[1] and Meyerhof.[2]

This is a preliminary report.

[1] Embden, Gus., and Haymann, Clare, *Zt. f. Physiol. Chem.*, 1924, cxxxvii, 154.
[2] Meyerhof, Otto, *Biochem. Zt.*, 1926, clxxviii, 395, 462.
[3] Furth, O., and Marian, J., *Biochem. Zt.*, 1926, clxvii, 123.

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Observations on Glyoxals, Their Determination and Behavior.

NOBORU ARIYAMA. (Introduced by P. A. Shaffer.)

From the Department of Biological Chemistry, Washington University School of Medicine.

Shaffer[1] observed that the addition of alkali cyanide in small amounts to glyoxal produces in slightly alkaline solution a very highly reducing substance, which rapidly reduces many dyes and other reagents; and he suggested that this reaction be utilized for a quantitative method for the determination of glyoxals. Among the reagents which develop color on reduction are the complex phosphotungstic acids, and of these the arseno phospho-tungstic reagent used by Benedict[2] for uric acid was found to be well suited for our purpose. Without cyanide, glyoxal or methyl glyoxal scarcely reduces this reagent, but with cyanide reduction is rapid and proportional to