

oxygen uptake of developing embryos in the presence of methylene blue is slightly greater in the light than in the dark. This increase is observed also in the case of diapause embryos (curve C) and may be attributed to the photodynamic action of methylene blue.⁷ With dinitrophenol no such effect is noted. It is apparent from the curves of Fig. 2 that CO inhibits the methylene blue-stimulated respiration in diapause and developing embryos as well as the normal oxygen uptake of developing embryos (Fig. 1). Moreover, the inhibition is made reversible by light.

It has been pointed out by DeMeio and Barron⁸ and confirmed by Krahl and Clowes,⁹ and by Bodine and Boell¹⁰ that DNP stimulates respiration by functioning through the normal oxidase-dehydrogenase systems of the cell. Thus any interference with the activity of the oxidase involved (as for example by KCN or CO) would restrict to a considerable extent the increased oxygen uptake induced by DNP. In grasshopper embryos methylene blue stimulation and DNP stimulation both appear to be similarly limited by CO. This fact, then, suggests that they both function through, although not necessarily in the same way, a CO sensitive mechanism whose affinity for CO is greatly reduced in the light.

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Analysis of the Acid-soluble Phosphates of Muscle Following the Injection of Glucose Plus Insulin.

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The following observations have been made in regard to changes in inorganic phosphate of plasma.¹ 1. Injection of insulin, while causing a lowering of plasma phosphate in normal rabbits, had little or no effect on plasma phosphate in adrenalectomized rabbits. 2. Injection of epinephrine was equally effective in normal and adrena-

⁷ Blum, H. F., *Cold Spring Harbor Symp. Quant. Biol.*, 1935, **3**, 318.

⁸ DeMeio, R. H., and Barron, E. S. G., *Proc. Soc. Exp. Biol. and Med.*, 1934, **32**, 36.

⁹ Krahl, M. E., and Clowes, G. H. A., *J. Biol. Chem.*, 1935, **111**, 355.

¹⁰ Bodine, J. H., and Boell, E. J., *Proc. Soc. Exp. Biol. and Med.*, 1936 (in press).

¹ Cori, C. F., and Cori, G. T., *Arch. Exp. Path. Pharm.*, 1933, **172**, 249.

lectomized rabbits in causing a decrease in plasma phosphate. 3. Injection of glucose plus insulin—in contrast to insulin alone—resulted in a definite fall in plasma phosphate in adrenalectomized rabbits.

As pointed out previously,¹ two mechanisms appear to be in operation. One is associated with hypoglycemia and reflex discharge of epinephrine and is seen in fasting animals after insulin injections, epinephrine causing an accumulation of hexosemonophosphate in muscle at the expense of inorganic phosphate.^{2, 3} After adrenalectomy this mechanism is no longer in operation and insulin alone, in the absence of an abundant supply of glucose, causes little or no change in blood inorganic phosphate, an observation which has recently been confirmed by Pijoan and Quigley⁴ on adrenalectomized dogs. The second mechanism, the nature of which has not been explained, may possibly be associated with glycogen storage in the tissues.⁵ It is seen in both normal and adrenalectomized animals after glucose administration, to which an insulin injection may be added, should the endogenous supply not be sufficient to cause a rapid disappearance of the injected glucose.¹ That the latter condition is essential is shown by the observation that glucose has hardly any effect on blood inorganic phosphate in depancreatized dogs.⁶

It seemed possible that during the rapid disappearance of glucose one of the known acid-soluble phosphate compounds may temporarily accumulate in the tissues and thereby cause a decrease in inorganic phosphate. The hexosemonophosphate content of muscle did not change after glucose administration,² but the other phosphate compounds, known to occur in muscle, had not yet been analyzed under these conditions. This was done in the present experiments.

In Table I are recorded experiments on cats. Enough glucose was administered in each case to prevent the development of hypoglycemia due to the injection of insulin. At a time at which the inorganic phosphate of plasma had fallen considerably below the initial value, the hexosemonophosphate content of muscle remained substantially unchanged (confirming similar experiments on unanesthetized rats² in which, however, blood inorganic phosphate had not been determined). Hydrolysis curves in N HCl (see second part of Table I), before and after injection of glucose plus insulin,

² Cori, C. F., and Cori, G. T., *J. Biol. Chem.*, 1931-32, **94**, 581.

³ Cori, G. T., and Cori, C. F., *J. Biol. Chem.*, 1936, **116**, 119.

⁴ Pijoan, M., and Quigley, T. B., *PROC. SOC. EXP. BIOL. AND MED.*, 1936-37, **85**, 131.

⁵ Cori, C. F., *Physiol., Rev.*, 1931, **9**, 143.

⁶ Bolliger, H., and Hartman, F. W., *J. Biol. Chem.*, 1925, **64**, 91.

TABLE I.
Effect of Injection of Glucose Plus Insulin on Acid-Soluble Phosphate of Muscle in Amytalized Cats. All values are given in mg. %.

Exp. No.	Before injection										1 to 2 hrs. after injection										
	Plasma					Muscle					Plasma					Muscle					
	Inorg. P	Sugar	Lactic acid	Hexose	P found	Inorg. P	Sugar	Lactic acid	Hexose	P found	Inorg. P	Sugar	Lactic acid	Hexose	P found	Inorg. P	Sugar	Lactic acid	Hexose	P found	Total P
1	4.8	134	21	25		3.9	243				2.3					2.5					
2	3.8	148	21	27	4	2.0	108	52	25	4	2.0	108	52	25	4	2.0	108	52	25	4	4
3	5.2	139	20	32	5	3.4	280	38	33	6	2.8	204	31	36	6	2.3	366				6
4	6.9	147	15	33	5	2.8	204	31	36	6	2.3	366				2.5	201				6
5	4.7	103																			
6	5.4	165																			

Exp. No.	Inorg. P	Phospho- creatine P	Hydrolysis in N-HCl						Total P	Inorg. P	Phospho- creatine P	Hydrolysis in N-HCl						Total P
			0	10	30	180 min.	0	10				30	180 min.					
3			107	152	154	163	169				106	148	150	165	170			
4			104	142	146	166*	169				108	147	153	171*	173			
5		76†	105							74†	109							
6	18‡	82	100				177	22†	83	105				179				

* Hydrolyzed for 18 hr.
 † Method of Fiske and Subbarrow
 ‡ Method of Sacks and Sacks.

TABLE II.
 Effect of Injection of Glucose Plus Insulin on Acid-Soluble Phosphate of Muscle in Amytalized Rats. All values are given in mg. %.

Inorg. P	Before injection				40 minutes after glucose plus insulin				Plasma P
	Phospho- creatine P	P after hydrolysis in N-HCl		Inorg. P	Phospho- creatine P	Hydrolysis in N-HCl		Total P	
		0	10 min.			0	10 min.		
25	69	94	134	25	67	92	136	173	5.4*
26	64	90	131	23	59	82	126	167	3.9
25	69	94	133	26	66	92	132	169	3.9
28	67	95	135	24	68	92	133	175	4.2

*No injection.

did not give an indication of a change in the distribution of the various acid-soluble phosphate compounds of muscle. Since the zero value of the hydrolysis curves represents the sum of inorganic and phosphocreatine P, there remained the possibility of an increase in phosphocreatine at the expense of inorganic phosphate. In 2 experiments on cats (Table I) and 3 experiments on rats (Table II) an increase in phosphocreatine P could not be detected though there was, at least in 2 experiments, a decrease in inorganic phosphate.

Summary. The decrease in the inorganic phosphate content of plasma following the injection of glucose plus insulin is not accompanied by a detectable increase in the hexosemonophosphate, adenosinetriphosphate or creatine phosphate content of muscle.

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Changes in Renal Blood Flow in Relation to Changes in Pressure in Urine Formation.

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In conjunction with certain experiments on the mechanism of chloride reabsorption by the tubules of the kidney of the dog in a heart-lung perfusion system as described by Verney and Starling,¹ we have had occasion to observe some interesting relations between renal blood flow, perfusion pressure, chloride concentration and total chloride excreted in the urine.

Winton² has pointed out that the rate of blood flow through the kidney is a factor of secondary importance, as compared with the glomerular filtration pressure, in determining the character and quantity of urinary secretion. Numerous observations have indicated to us an indubitable relation, nevertheless, between renal blood flow and urinary secretion, particularly in the case of spontaneous changes in the former.

Figure 1 shows graphically the results of a type of experiment in which concomitant with a rising renal blood flow, from 110 to 210 cc. per minute, while the perfusion pressure was kept substantially constant for 35 minutes, there was an increase in urine flow from

¹ Verney, E. B., and Starling, E. H., *J. Physiol.*, 1922, **56**, 353.

² Winton, F. R., *J. Physiol.*, 1931, **73**, 151.