7357 P

Effect of Parathormone on the Neuromuscular System. *

ERNST GELLHORN.

From the Department of Physiology, University of Illinois, College of Medicine.

The present paper deals with an analysis of the action of parathormone on the neuromuscular system which may be considered the main seat of the tetany syndrome (MacCallum and Vogel[1]) The hind legs of pithed *Ranae esculentae* were perfused with phosphate buffered Ringer and the sciatic nerve stimulated with rhythmic condensor discharges as described previously.[2] After a state of relative fatigue had been reached in which the height of contraction remains equal over a long period of time, the perfusion fluid was exchanged for one containing parathormone, Lilly or Parke Davis, in concentrations from 1:1000 to 1:100. In all solutions the pH was carefully adjusted to that of Ringer. The phenol content proved to be without effect as control experiments indicated. In several hundred experiments parathormone invariably causes an increase in the height of contractions up to about 200% in the strongest concentrations. The effects are reversible when the solution is again exchanged for ordinary Ringer and the effects are due to the parathormone content of the extract for the following reasons:

1. Extracts of the parathyroid which according to the blood calcium test show the same number of units per cc. but contain solids of varying concentrations show an equal effect on the muscle even when the concentration of the solids varies 100%.

2. Boiling for one hour destroys neither the action of parathormone on the blood calcium (Collip and Thomson[3]) nor our reaction.

3. Destruction of the hormone content of the extract by boiling with 10% HCl for one hour abolished the described reaction on the muscle, as it does the blood calcium effect according to Collip.

The point of attack in our reaction is the neuromuscular junction. If, on account of the perfusion with curare 1:50,000 in Ringer, the neuromuscular junction is blocked, parathormone is without effect on the muscular contraction (direct stimulation). If, how-

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[1] MacCallum, W. Gand, and Vogel, K. M., *J. Exp. Med.*, 1913, **18**, 618.

[2] Gellhorn, E., *Am. J. Physiol.*, 1933, **105**, 353.

[3] Thomson, D. L., and Collip, J. B., *Physiol. Rev.*, 1932, **12**, 309.

ever, the curare is washed out with Ringer's the effect reappears *pari passu* with the gradual reestablishment of the neuromuscular junction as indicated by the increasing height of the muscular contraction in indirect stimulation. The reaction is fine enough to serve in the assay of parathormone in conjunction with the ordinary blood calcium method. The parathormone effect is weakened by reducing the $CaCl_2$ content of the perfusion fluid. $CaCl_2$ can be replaced partially by $SrCl_2$. $CaCl_2$ also evokes an increase in the height of contraction in the perfusion preparation. Therefore, the question was examined as to whether parathormone influences the calcium effect. It was found that parathormone in a concentration which in itself did not influence the height of contraction increased the effect of calcium considerably. The height of contraction is considerably more increased by $CaCl_2$ in the presence of ineffective parathormone concentrations than in its absence. Such an effect of parathormone seems to be absent in the heart.

7358 P

Effect of Ethanol upon Fermentative Activity of Zymin.

H. E. STAVELY, L. M. CHRISTENSEN AND ELLIS I. FULMER.

From the Department of Chemistry, Iowa State College.

In studies on the effect of the composition of the medium upon the cell-free alcohol fermentation by zymin, it was soon evident that the zymin is very sensitive to relatively low concentrations of

TABLE I.

Relative rates of CO_2 production by yeast (from data of Rahn) and by zymin in the presence of varying concentrations of ethanol. Figures in () read from graph.

% Ethanol	Yeast	Zymin	% Ethanol	Yeast
0	100	100	4.93	60
0.38	(97)	89	5.48	55
0.94	(93)	75	7.40	38
1.31	(90)	61	9.55	24
1.37	87	(62)	9.70	29
1.86	(85)	50	9.86	27
2.59	(80)	43	11.9	16
2.74	77	(38)	12.1	13
3.65	(71)	28	13.1	14
4.11	65	(28)	13.3	15
4.70	(63)	28	14.3	12
4.77	70	—		