TABLE I.
Blood Sugar Levels Following Intraspinal Injections of Glucose in Dogs.

Dog No.	Blood sugar mg % after							
	0′	5′	10′	15′	30′	60′	90′	120′
1.	89	77	41	34	37	42	78	80
2.	92	86	75	35	66	74	83	90
3.	87	84	46	31	35	71	79	80
4.	91	72	50	29	38	74	83	95
5.	96	81	69	38	33	65	76	93

TABLE II.
Blood Sugar Levels Following Intraspinal Injections of Glucose in Normal Human Subjects.

Case	Blood sugar mg % after							
	0′	5′	10′	15′	30′	60′	90′	120′
P.D.	94	90	76	54	62	68	79	92
P.G.	101	92	79	57	65	73	96	97
T.R.	89	81	71	47	64	72	90	89
C.B.	99	90	88	62	64	77	95	94
O.D.	92	83	75	51	70	68	75	95

The increased level of the spinal fluid glucose depressed the blood sugar values to a minimum of 47-62 mg % within 15 minutes. These values returned to normal in 90-120 minutes. The findings in dog and man, therefore, showed an absolute parallelism.

The curves obtained look very much like those following insulin administration, with a steep fall in the first 15 minutes (the assimilation phase) followed by a gradual rise to normal (restoration phase). Thus we may infer that the increased glucose content of the cerebrospinal fluid represents a direct chemical stimulation upon the glyco-regulatory nervous centers, and that this is, in turn, followed by a series of functional changes affecting the glucose level in blood.

Summary. The experimental increase of spinal fluid glucose caused rapid changes in blood sugar values, with a severe hypoglycemia.

15853

Phosphorus Metabolism in Active and Inactive Nerves.

KARL BUCHER. (Introduced by J. H. Lawrence.)

From the Division of Medical Physics, University of California, Berkeley, Cal.

Hecker[1] showed that *in vitro* the release of P of an isolated nerve is significantly increased when the nerve is stimulated electrically, and lately Cicardo[2] has found the P-content of the cephalic venous blood increased after a period of artificial hyperactivity of the brain *in vivo*. There is some evidence however that this P-release after artificial stimulation might have nothing to do with the normal activity of the nervous matter itself, but rather with an altered metabolism as a consequence of the "unphysiological" excitatory process. This is suggested by the fact that in the metabolism as a whole a remarkable difference between

1 Hecker, E., *Hoppe Seyler's Z.*, 1923, **129**, 220.
2 Cicardo, V. H., *Am. J. Physiol.*, 1946, **145**, 542.

artificially-induced activity and natural activity has been found (Winterstein).[3] For instance, Winterstein,[3] Lebedur[4] *et al.* found that the CO_2-production of nerves during electrical stimulation was higher than that of unstimulated ones, whereas no certain difference was found when the CO_2-production of normally active nerves was compared with that of nerves made inactive by cutting both ends (Parker).[5] On the other hand, however, Gerard and Hartline[6] were able to show that under certain experimental conditions the normal activity of a nerve (optic nerve of limulus) may produce about the same change in the oxygen consumption as the activity induced by an electrical stimulus. This change consists of an increase of about 40%.

In order to obtain further information about this problem the following experiments were performed:

Rabbits of about 2 kg weight were used under light Nembutal-anesthesia (the pupils were wide open, and reacted normally to light). One eye was then covered completely with a light-tight material, the other eye was kept exposed to normal daylight and artificial electrical light. Everything which might have irritated either of the eyes was carefully avoided. This experimental procedure provided a purely physiological activity or inactivity, respectively, and since the optic nerves practically can be considered as consisting of only visual fibers, normally active and inactive nerves under exactly comparable (same individual) and physiological conditions were obtained. Then the animals received a subcutaneous injection of radioactive phosphorus (P^{32}), the amount of which is indicated in Table I. After that they were kept under the above mentioned conditions for 5, 10 or 20 hours. They were then injected with heparin, killed by suffocation and immediately perfused through the aorta with 500-700 ml of a solution containing 0.85%

TABLE I.

Date	Covered eye	P^{32} injected per mg body wt	Killed after	(a) Absolute P^{32} content per mg tissue				Intravasc. fluid	(b) Relative P^{32} content (in %)*			
				Optic nerve		Optic tract			Optic nerve		Optic tract	
				left	right	left	right		act.	inact.	act.	inact.
8/13	r.	630 x 10-15 mg	5 hr.	90 x 10-15 mg	87 x 10-15 mg	47 x 10-15 mg	53 x 10-15 mg		100	97	100	89
13	r.	630 x ,,	,,	143 x ,,	147 x ,,	73 x ,,	66 x ,,	33 x 10-15 mg	100	103	100	111
9/18	l.	530 x ,,	,,	106 x ,,	106 x ,,	56 x ,,	63 x ,,	16 x ,,	100	100	100	113
8/19	l.	130 x ,,	10 hr.	23 x ,,	20 x ,,	13 x ,,	13 x ,,	0	100	115	100	100
19	l.	130 x ,,	,,	13 x ,,	13 x ,,	7 x ,,	7 x ,,	0	100	100	100	100
9/11	r.	670 x ,,	,,	186 x ,,	190 x ,,	93 x ,,	93 x ,,	20 x ,,	100	102	100	100
7/29	r.	370 x ,,	20 hr.	216 x ,,	210 x ,,	97 x ,,	97 x ,,	13 x ,,	100	97	100	100
29	l.	400 x ,,	,,	160 x ,,	166 x ,,	90 x ,,	97 x ,,	10 x ,,	100	96	100	108
8/19	r.	420 x ,,	,,	66 x ,,	63 x ,,	23 x ,,	26 x ,,	3 x ,,	100	95	100	88
								Avg	100%	101%	100%	101%

* The nervous matter belonging to the normal (*i.e.*, active) visual system is arbitrarily given the value 100%. Since the rabbits have virtually only crossed fibers, we have to consider that the right optic nerve belongs to the left optic tract and vice versa.

[3] Winterstein, H., *Pflueger's Arch.*, 1930, **224**, 749.

[4] Lebedur, J., *Pflueger's Arch.*, 1931, **227**, 343.

[5] Parker, C. H., *J. Gen. Physiol.*, 1928, **12**, 419.

[6] Gerard, R. W., and Hartline, H. K., *J. C. C. P.*, 1934, **4**, 141.

NaCl and 0.05% Na_2HPO_4, followed by 100-200 ml of 4% formaldehyde. Then both optic nerves (the anatomically well defined part from the bulb to the chiasma) and both optic tracts (anatomically as far as possible corresponding parts) were removed and weighed immediately. Then each of these 4 samples were pressed separately between 2 tin foils, the resulting layer being about 2 mg of nervous tissue per sq. cm. The tin foils, after being covered with a cellophane sheet of about 0.02 mm in thickness, were wrapped directly around the counter tube. In this way the rate of radioactivity was determined, and from the number of disintegrations per second the content of P^{32} per mg fresh nervous matter was calculated. In order to obtain a test of the sensitivity of the whole experimental procedure, we determined on the same rabbits the P^{32} content of the right and left dorsal roots S_2, taking anatomically corresponding pieces (from the ganglion to the cord) of about the same weight as the optic nerves. Working on the assumption that the P^{32} uptake herein is the same on both sides, we found a mean error of $\pm$ 4% of the methodical procedure as a whole.

The data are given in Table I. The relatively great differences in the absolute values of certain rabbits, which are otherwise under the same conditions, are sufficiently explained by the fact that the perfusing process apparently was not equally efficient in every case. This becomes clear by a comparison of the values of the intravascular fluid which remained in the circulatory system after the perfusing process.

Table I shows that the values for the total phosphorus metabolism of the optic nerves (and optic tracts) are practically the same whether the optic system is in a stage of activity or not. This seems to be true for the average of all of the experiments as well as for each of the 3 groups calculated separately. And since the bulk of all P-compounds of a nerve belong to the nerve sheet of its fibers, our data may support the conception, that the metabolism of the nerve sheet is not immediately altered by the activity of the axis cylinder. Furthermore Table I shows that the phosphorus metabolism of the optic nerves is about twice as high as that of the immediately adjacent optic tracts. This is in accord with the fact that there are also remarkable histological differences (Schindler),[7] and that the total metabolism (measured by the CO_2-production) of a nerve becomes greater approaching to the nerve cell body (Tashiro).[8]

Conclusion. We may therefore conclude that there is no difference between the phosphorus metabolism of these active and inactive nerves.

Summary. No difference was found by means of P^{32} in the phosphorus metabolism of stimulated and unstimulated nerves.

7 Schindler, E., *Z. f. Augenheilk.*, 1926, 15.

8 Tashiro, S., and Adams, H. S., *J. Biol. Chem.*, 1914, **18**, 329.

15854

Studies on the Culture of *Endamoeba histolytica.**

J. N. DELAMATER AND F. A. HALLMAN. (Introduced by John F. Kessel.)

From the Department of Bacteriology and Parasitology, School of Medicine, University of Southern California, Los Angeles.

Endamoeba histolytica has been grown in culture for many years.[1] Little is known, however, concerning the metabolic requirements of this organism or of the true functions of bacteria which so far appear to be necessary to the *in vitro* cultivation of this

* Supported by a grant from the Parke-Davis Company, Detroit.

1 Boeck, W. C., and Drbohlav, J., *Am. J. Hyg.*, 1925, **5**, 371.