nerveless muscle is about a third of that in muscle with nerves. Thus it appears that the bulk of ChE production can be ascribed to nerve endings. These findings, in harmony with those of Martini and Torda, are further links in the chain of evidence coupling cholinesterase and neural activity.

To summarize, cholinesterase in the embryo appears to be concentrated at nerve endings and to be directly related to speed of motility and to metabolic rate. It seems clear that cholinesterase content is a biochemical criterion of functional capacity in the developing neuromuscular apparatus.

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Phosphate Equilibrium Between Plasma and Saliva.*

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Incidental to a trial of radioactive phosphorus in the therapy of carcinomatous metastases to bone we have been able, through the courtesy of Dr. George E. Fahr, to make some observations as to the secretion of radiophosphorus in the saliva. The results have some bearing on the interpretation of the studies by Sognnaes and Volker[1] and Barnum and Armstrong[2] dealing with the uptake of radioactive phosphorus by dental enamel from the saliva. The subject was a woman, aged 52, with advanced carcinoma of the breast, and the observations were made 19 days before death when the patient was not cachectic. Four grams of sodium phosphate, containing 42,000,000 Geiger-Mueller counts of radioactive phosphorus, dissolved in 100 cc of water were administered by stomach tube.

One hour following the administration of the radioactive salt a sample of saliva, stimulated by the chewing of paraffin, was collected over a 26-minute period. A second saliva sample was collected 3 hours after administration of the salt and, midway in this collection, a sample of venous blood was obtained. The final saliva sample

* This work was carried out with the aid of a grant from the Carnegie Corporation. The radiophosphorus used in this work was kindly supplied by Professor S. K. Allison of the University of Chicago.

1 Sognnaes, R. F., and Volker, J. F., *Am. J. Physiol.*, 1941, **133**, 112.

2 Barnum, C. P., and Armstrong, W. D., *Am. J. Physiol.*, in press.

was taken 24 hours after the administration. The urine was collected during the 24 hours following the administration of the active phosphate.

The saliva samples were centrifuged to remove the mucus, treated with equal volumes of 14% trichloracetic acid and centrifuged again. The supernatant fluid was used for the determination of radiophosphorus and total phosphorus. The blood was collected in an oxalate tube and centrifuged. The proteins were removed from the plasma by addition of trichloracetic acid to 5% concentration and the supernatant fluid was used for the active phosphorus and chemical phosphorus determinations. The radioactivity measurements were made upon basic calcium phosphate precipitates prepared under identical conditions by a technic developed in this laboratory.

Table I shows the phosphorus content of saliva and plasma and also the specific activities (percent of administered radiophosphorus found per mg of phosphorus) of the fluids. Equality of distribution of phosphate between 2 fluids is demoted by equality of values for specific activity. Since the specific activities of the first 2 saliva samples and the point for zero activity, when plotted against time, fell on the same straight line it appears that the peak of the saliva activity was reached somewhere between 3 and 24 hours. The 3-hour saliva activity failed to reach a value equal to the plasma activity. A possible explanation for the failure to find the expected equilibrium between plasma and saliva might be that inactive phosphorus, stored in the salivary glands, was secreted with the active phosphorus derived from the plasma. It is also possible that absorption of phosphate from the intestine had not been completed 3 hours after the administration of the salt so that the specific activity of the plasma was still increasing when the blood was drawn.

The urine was treated with an excess of calcium lactate and made alkaline. The calcium phosphate precipitate was ashed and dissolved in HNO_3 and the phosphate isolated by the method of Hull and Williams.[3] The recovered radiophosphorus amounted to 15.8% of that administered and it was used in some further studies. Since some of the radiophosphorus was lost during the various steps in-

TABLE I.
Distribution of Phosphorus between Plasma and Saliva.

	mg P/cc	Sp. Act. (×1000)
1 hr saliva	0.196	2.75
3 " "	0.195	7.49
24 " "	0.162	4.74
Plasma (inorganic phos.)	0.054	17.6

[3] Hull, D. E., and Williams, J. H., *Rev. Sci. Instr.*, 1940, **11**, 299.

volved in the isolation, this result means that a minimum of 16% of the administered dose was lost in the urine in the first 24 hours. This extreme clinical inefficiency might be overcome by a preliminary period of phosphorus starvation since it has been observed in this laboratory that rats on a high calcium-low phosphorus diet reduce their urinary output of radioactive phosphorus to about 1/60th of its normal value. If such a diet were employed preliminary to the clinical use of radiophosphorus it would be necessary to administer the active phosphorus by a parenteral route or, if the oral route is used, to subject the patient to a preliminary fast sufficiently long to clear the intestine of calcium.

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Experimental Production of Target Cells by Splenectomy and Interference with Splenic Circulation.*

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(Introduced by J. H. Pratt.)

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Target cells are erythrocytes which in the stained blood film show a central mass of hemoglobin within an unstained intermediate zone which is in turn surrounded by a peripheral rim of hemoglobin, thus giving the appearance of a "bull's eye" or target. Haden and Evans[1] first described these cells as "Mexican hat" cells and stated they were characteristic of sickle cell anemia. Barrett,[2] who suggested the term "target cell", found them in increased numbers in obstructive jaundice, certain cases of hypochromic anemia, in steatorrhea, and following splenectomy. He also demonstrated that target cells were abnormally thin and showed an increased hypotonic resistance. Recently these cells were described by Dameshek[3] and by Wintrobe, *et al.*,[4] as the outstanding hematological feature of a

* Aided by grants from the Charlton Fund, Tufts College Medical School, and the Dazian Foundation.

1 Haden, R. L., and Evans, F. D., *Arch. Int. Med.*, 1937, **60**, 133.

2 Barrett, A. M., *J. Path. and Bact.*, 1938, **46**, 603.

3 Dameshek, W., *Am. J. Med. Sci.*, 1940, **200**, 445.

4 Wintrobe, M. M., Matthews, E., Pollack, R., and Dobyns, B. M., *J. A. M. A.*, 1940, **114**, 1530.