12. Lazarus, S. S., Bencosme, S. A., *Am. J. Clin. Path.*, 1956, v26, 1146.

13. Anderson, E., Long, J. A., *Endocrinology*, 1947, v40, 98.

14. Hartroft, S. W., *Proc. Am. Diabetes Assn.*, 1950, v10, 46.

Received June 17, 1959. P.S.E.B.M., 1959, v102.

Effect of Parathyroid Extract on *in vitro* Uptake of Ca^{45} by Voluntary Muscle.* (25146)

G. REAVEN,† A. SCHNEIDER AND E. REAVEN (Introduced by John M. Weller)

Depts. of Internal Medicine and Pathology, University of Michigan Medical Center, Ann Arbor

For many years the majority of studies investigating mode of action of parathyroid hormone was undertaken to prove that it acted solely on bone or solely on kidney, with the result that a good deal of evidence has accumulated suggesting it acts on both(1). More recently, it has been suggested that parathyroid glands might also regulate transfer of phosphorus between extracellular and intracellular fluid(2,3). The thesis that parathyroid hormone can modify the passage of electrolytes across a membrane is implicit in earlier work of Clark(4), who, by addition of parathyroid extract, could almost completely inhibit *in vitro* uptake of calcium by the lens. The present experiment indicates that parathyroid extract (PTE) also inhibits *in vitro* uptake of calcium by muscle.

Materials and methods. Rats weighing approximately 150 g were used. They were sacrificed by blow on head, and abdominal wall musculature was excised and cut into equal segments. Incubating medium was prepared by adding to one liter of distilled water 9 g NaCl, 0.42 g KCl, 0.2 g $MgCl_2$, 1 g $NaHCO_3$, 0.05 g NaH_2PO_4, and 1 g glucose. $Ca^{45}Cl_2$ was added to give an activity level of 2000 cts/min/cc of incubating medium. The final concentration of calcium was 0.1 mg/liter. Twenty-five units (0.25 cc) of parathyroid extract (Eli Lilly Co.) was added to experimental flasks, and an equal volume of saline to control flasks. Each flask contained 6 cc of buffer at pH 7.4, and incubated in water bath at 37°C. Flasks were incubated unstoppered for 30 minutes and shaken manually every 5 minutes. Then the incubating medium was removed from both sets of flasks. Three 1 cc aliquots from each flask were pipetted into planchets, dried, and counted in Geiger-Müller counter. Values were expressed as amount of radioactivity remaining after incu-

TABLE I. Inhibition of Ca^{45} Uptake by Parathyroid Extract.

	Ca^{45} activity remaining after incubation (cts/cc/min.)*	
Flask No.	Control	PTE added
1	1366	1644
2	1451	1611
3	1421	1621
Mean	1410	1623
1	1269	1574
2	1328	1544
3	1346	1498
Mean	1312	1536
1	1343	1693
2	1372	1676
3	1368	1685
4	1368	1641
Mean	1361	1672
1	1328	1446
2	1396	1568
3	1240	1598
4		1524
Mean	1319	1532
1	1423	1599
2	1487	1624
3	1470	1595
4	1270	1590
Mean	1411	1600
$t = 10.96$	$df = 4$	$p < .001$

* Initial conc. 2000 cts/cc/min.

*Authors are grateful to Dr. Glen Irwin of Eli Lilly Co. for generous supply of parathyroid extract, and express appreciation to Dr. Donald Korst, Radioisotope Service, Vet. Admin. Hospital, Ann Arbor, Mich., for laboratory facilities.

† Present address: Stanford Univ. Hospital, Stanford, Calif.

bation with muscle. In early experiments each individual slice was weighed and counts/mg wet weight/cc/minute determined. However, it became apparent that weight variation was insignificant, and this was discontinued.

Results. Table I represents accumulated data from 5 experiments. Numerical values are the mean of 3 aliquots from each flask, and measured amount of radioactivity remaining after incubation. It is apparent that addition of PTE to the incubating medium consistently increased amount of radioactivity remaining and consequently must have inhibited uptake of Ca^{45} by muscle, or altered degree of absorption of Ca^{45} on the muscle cell membrane. Addition of PTE to the incubating medium in absence of muscle did not affect the final activity of Ca^{45}. The data were analyzed by Student-Fisher t test for significance of mean differences, and mean difference was significantly different from zero (P value $<.001$).

Summary and conclusions. Administration of parathyroid extract (PTE) elevates serum calcium(5). The present experiment indicates that PTE consistently inhibited *in vitro* uptake of calcium by rat voluntary muscle. This observation is compatible with the known hypercalcemic effect of parathyroid hormone and provides evidence for the hypothesis that parathyroid glands regulate movement of calcium between extracellular and intracellular fluid.

1. Greep, R. O., Kenny, A. D., In *The Hormones,* vIII, Ed. by Pincus, G., and Thimann, K. V., Academic Press, N. Y., 1955, 153-174.

2. Milne, M. D., *Clin. Sc.,* 1951, v10, 471.

3. Foulks, J. G., Perry, F. A., *Am. J. Physiol.,* 1959, v196, 554.

4. Clark, J. H., *ibid.,* 1939, v126, 136.

5. Collip, J. B., Thomson, D. L., *Physical Rev.,* 1932, v12, 309.

Received June 17, 1959. P.S.E.B.M., 1959, v102.

Changes in Human Lung Collagen and Lipids with Age. (25147)

A. M. BRISCOE, W. E. LORING AND J. H. MCCLEMENT*

Depts. of Biochemistry and Medicine, Columbia University, College of Physicians and Surgeons, Chest Service, Bellevue Hospital, and Dept. of Pathology, N. Y. University College of Medicine, N. Y. City

Preliminary investigations indicate that collagen in human lung undergoes both quantitative and qualitative changes with increasing age(1). It is already known that a quantitative change occurs in animals; collagen content of guinea pig lung(2) and of rat lung(3, 4) increases with age. A qualitative change with advancing age has been demonstrated in collagen isolated from animal tissues other than lung. Collagen becomes increasingly stable with age when subjected to chemical and enzymatic degradation and to physical stress(5,6,7,8). While our investigations were in progress, it was reported that shrinking temperature (T_s) of collagen isolated from human skin increases with age(9). Differences in T_s among collagens from fish and bovine sources were reported by Gustavson (10). Imino acid analyses of these collagens led him to postulate that T_s is related to hydroxyproline content of the molecule, because collagens with the highest hydroxyproline content had the highest T_s(11). Hydroxyproline is thought to provide crosslinks between peptide chains by means of hydrogen bonds and thus to stabilize the structure of the protein and increase its resistance to stress. Our results concern both these quantitative and qualitative changes in collagen in human lung parenchyma and pleura. Concentration of collagen in lung parenchyma, the T_s of collagen of pleura, and the hydroxyproline content of collagen isolated from pleura have been studied and correlated with age. Observations of the lipid content of the lung are also included.

* Supported in part by grants from N.I.H., U.S.P.H.S. and the Polachek Fn.

Materials and methods. Samples of normal human lung parenchyma and pleura were ob-