

We have made no studies to ascertain the mechanism by which excessive amounts of sodium chloride in the diet cause an increase in liver glycogen stores, but we plan to do so in the future. A study is now in progress to determine whether the sodium ion, the chloride ion or a combination of the two is responsible for the results obtained.

These results are of considerable interest in connection with the observation of McQuarrie and coworkers^{5, 6} that when large amounts of sodium chloride were added to the diet of diabetic children the fasting blood sugar was lowered and glycosuria was decreased.

8761 P

Volume Changes of Smooth Muscles of *Phascolosoma* During Activity.

ERNST FISCHER.

From the Marine Biological Laboratory, Woods Hole.

Meyerhof's method¹ of measuring the volume changes of amphibian muscles was applied to the smooth muscles of *Phascolosoma*, a marine worm, belonging to the Sipunculidea. Using the retractor muscle in the volume chamber, after single or tetanic stimulation, a temporary change in volume was observed, starting almost simultaneously with the isometric mechanogram. However, only in a few of the experiments was the course of the volume curves more or less parallel to the tension curves. Often the volume curves showed 2 phases; sometimes even 3 were present. The direction of the volume changes varied greatly from experiment to experiment; but in general there was a tendency towards volume increase. The maximum change occurring in the course of the volume curves was, on the average, of the order of magnitude of 0,000 005 of the total muscle volume. The dependence of direction of the volume change on the initial length of the muscles could not be demonstrated so clearly for the *Phascolosoma* retractor as for amphibian muscle

⁵ Thompson, W. H., and McQuarrie, I., *PROC. SOC. EXP. BIOL. AND MED.*, 1934, **81**, 907.

⁶ McQuarrie, I., Thompson, W. H., and Anderson, J. A., *J. Nutrition*, 1936, **11**, 77.

¹ Meyerhof, O., u. Hartmann, H., *Pflüg. Arch. f. d. ges. Physiol.*, 1934, **234**, 722; Meyerhof, O., u. Möhle, O., *Biochem. Ztschr.*, 1936, **284**, 1.

and turtle heart muscle as shown in a previous paper.² No distinct volume changes were observed during the recovery.

Pieces of the body wall, containing the longitudinal muscle fibers, showed spontaneous volume changes of about 0.000 02 of the total muscle volume, although the motor activity of the muscle was so weak that it could not be recorded with the isometric levers at my disposal.

Since the retractor muscle develops a smaller tension than a striated muscle, but has a volume change about as large as that of a striated muscle, a markedly higher volume change occurs in the retractor than in frog muscle per unit of tension developed. For the body wall muscles of *Phascolosoma* the volume change per gm. tension must be at least 100 times greater than for a frog sartorius. Meyerhof¹ assumes that the volume change is caused by the chemical processes involved in the energy output for contraction, and that the size of the volume changes is more or less parallel to the working metabolism. Since it is generally assumed that less energy is needed for the activity of smooth muscle than for the contraction of striated muscle, it is hard to explain why the volume change in smooth muscle is so much larger. Furthermore, the fact that the direction of the volume changes is not constant and can be influenced to a certain extent by the physical conditions (initial length or tension) indicates that other factors are much more important as the cause of the volume changes than the working metabolism of the muscles.

8762 C

Permeability to Water and Staining Rate of Developing and Resting Sea Urchin Eggs.*

D. M. WHITAKER.

From the Hopkins Marine Station, Stanford University.

It was shown some years ago by R. S. Lillie¹ that fertilized *Arbacia* (sea urchin) eggs are more permeable (about four times) to water than unfertilized eggs, since they swell and shrink more

² Fischer, E., *Am. J. Physiol.*, 1935, **113**, 42.

* This work has been supported in part by funds granted by the Rockefeller Foundation. The author is indebted to Mr. Edward Lowrance for assistance in carrying out the experiments.

¹ Lillie, R. S., *Am. J. Physiol.*, 1916, **40**, 249.