with the first two salts, and well marked with the others, particularly with iodide and sulphocyanate. Frog's gastrocnemii immersed for five minutes in *m*/8 NaI or *m*/8 NaCNS show rapid contraction and twitching when immersed in isotonic solutions of the following substances in Ringer's solution or physiological salt-solution: saponin, digitalin and solanin (marked action); agaricin and aconitine (relatively slight action); chloroform (marked action); Na-oleate (marked action); bile-salts (marked action); horse and dog serum (marked action with vigorous twitching); tetanus toxine (vigorous twitching); rattlesnake venom (moderate action). The intensity of the stimulating action shows a general parallelism with that of the hæmolytic action.

Muscles may be similarly sensitized to osmotic stimuli (distilled water and hypertonic sodium chloride solution). This fact, as well as the fact that colloidal substances (serum, etc.) may show marked stimulating action, furnishes additional proof that stimulation depends essentially on an alteration of the plasma membrane.

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Nature of the muscular contraction.

By **E. B. MEIGS.**

[*From the Wistar Institute of Anatomy and Biology.*]

The comparison of histological preparations of uncontracted and contracted smooth muscle indicates that during the contraction of this tissue fluid passes from the fibers to the interstitial spaces. It seems possible, therefore, that the contraction of smooth muscle may be brought about by an interchange of fluid between its cells and their surroundings in the same way that the movements of *Mimosa* are caused by changes in the turgor of its cells. This hypothesis may be tested by investigating the effect of swelling reagents and their opposites on the length of smooth muscle. The hypothesis would be supported if it could be shown that smooth muscle lengthened when immersed in solutions which cause it to gain in weight and shortened in the opposite class of solutions.

The changes of weight and the changes of length of frog's smooth muscle have been followed in Ringer's solution, in various

modifications of Ringer's solution, in 0.7 per cent. NaCl solution, in isotonic saccharose, glucose, glycerine and alanin solutions. In all the cases investigated it has been found that increase in weight goes hand in hand with increase in length and that decrease in weight is accompanied by decrease in length. The changes in weight and the changes in length are roughly proportional to each other in rate and amount.

A suggestion of the nature of the chemical change which brings about contraction is found in the following facts. Smooth muscle usually gains in weight and lengthens in Ringer's solution which has the following formula: NaCl, 0.65 gram; KCl, 0.02 gram; $CaCl_2$, 0.025 gram; $NaHCO_3$, 0.02 gram; H_2O, 100 c.c. If for the $NaHCO_3$, 0.01 gram of lactic acid be substituted, the gain in weight and lengthening do not occur; there may even be a small loss in weight and shortening. Larger amounts of lactic acid may cause gain in weight and lengthening. If the muscle be stimulated with a strong interrupted Faradic current after it has been for some time in the weakly acid Ringer, it responds to the stimulation by lengthening slightly instead of by shortening. These facts may be explained by supposing that smooth muscle responds to stimulation like striated muscle by the production of a small amount of lactic acid. Under ordinary circumstances this production of lactic acid causes the fibers to lose fluid and shorten; but if the fibers have been artificially acidified before the stimulation takes place, the production of more acid on stimulation causes the fibers to take up fluid and lengthen.

55 (580)

Preliminary note on the action of some internal secretions upon erectile tissue.

By **ISAAC OTT** and **JOHN C. SCOTT.**

[*From the Medico-Chirurgical College of Philadelphia.*]

To study the action upon erectile tissue we employed the penile organ of the dog. The length of it was measured by a pair of compasses, from the bulb to the tip. The width of the bulb of the organ was measured in the same way. Then the filtered infusion made with distilled water was injected into a vein and the