beginning the liver and the heart were conspicuous by the higher concentration of the enzyme. In 19- and 21-day-old fetuses skeletal muscle, adipose tissue, hair follicles, intestinal villi, gastric mucosa, choroid plexus, proximal convoluted tubules and intervertebral discs showed intense reaction besides the liver and the heart (Figures 3 and 4). In the 21-day-old fetuses osteoblasts, osteocytes and osteoclasts clearly showed enzyme positive reaction (Figure 1). The quantity of the enzyme was found to increase progressively from day 15 onward. No appreciable difference between the E-sufficient and -deficient embryos could be detected. The demonstration of IDH activity was more or less similar to that of SDH. The findings of this experiment are in accord with FULLMER[6] and disagree with WALKER[7] who denied the presence of these enzymes in all the bone cells of young rats except slight IDH activity in the osteoblasts[8].

Zusammenfassung. Die vergleichende Untersuchung der Aktivität der Bernsteinsäure- und Isozitronensäure-dehydrogenase bei 15–21 Tage alten Rattenföten mit Vitamin-E-Mangel und normalem Gehalt ergab keine bedeutenden Unterschiede zwischen den verschiedenen Organen. Die Gegenwart dieser Enzyme in Osteoblasten, Osteoclasten und Osteocyten ist auffallend.

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The Origin of the Action Potential in Frog Stomach Muscle and Heart

Frog stomach muscle, when frequently washed with deionized half-isotonic ($0.112 M$) solution of sucrose, and frog heart perfused with similar solution, lose all sodium in 1 h[1,2] but exhibit spontaneous contractions[3-6] with conducted action potentials for several hours[7-14]. The spontaneous contractions and the action potentials therefore could not be due to the influx of sodium or any other ion into the muscle fibres. Two possibilities therefore remain for the origin of the action potential. Either it is due to efflux of anions[14] or it is not due to ionic fluxes at all.

The efflux of anions does not appear to be the cause of the action potential. With sodium, all the chloride is washed away from the frog stomach muscle and heart by a half-isotonic solution of sucrose, so that the efflux of chloride ions as the cause of action potential is ruled out. When immersed in Ringer solution the spontaneous contractions with the accompanying action potentials continue to occur if sodium phosphate at pH 7–7.4, or lactate or bicarbonate, is added to the solution to abolish the ionic gradients of these anions across the muscle membrane, or are added in such excess so that there could be no efflux, but rather an influx of these ions if any movement occurs at all. Frog stomach muscle remains excitable to chemical and electrical stimulation if the sodium chloride of the Ringer solution is replaced with an isoosmotic ($0.08 M$) quantity of sodium phosphate at pH 6.6; if perfused with this phosphate solution the frog heart beats vigorously with the accompanying electrical changes. With such high concentration of phosphate in the external solution, efflux of phosphate from the muscle fibres is ruled out. Frog stomach muscle, whether treated with Ringer solution or half-isotonic solution of sucrose, contains phosphates and lactate in the following concentrations (mM/kg wet muscle; water content about 80%): adenosine triphosphate 1.7, creatine phosphate 2.2, adenosine diphosphate 1.1, adenosine monophosphate negligible, inorganic phosphate 5.5, total acid soluble phosphate 17, and lactate 1.1[15]. The presence of any other diffusable anion in significant quantity is not known.

The conclusion, therefore, is that the actionpotential is not due to ionic fluxes at all. But how actually it is produced is difficult to explain. It is suggested that the action potential is due to change in the electronic configuration of the molecules of the membrane. There is some support for this suggestion. It is known that muscle can be excited by light[14]. Photons most likely change the electronic configuration of the cell membrane. They may knock out electrons, which thus freed will make the outer surface of the cell membrane negative.

Zusammenfassung. Das Aktionspotential von Herz- und Magenmuskulatur des Frosches scheint nicht vom Ein- und Ausstoss der Ionen, sondern vom elektronischen Aufbau der Zellmembran abhängig zu sein.

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