Electrophoretic Mobility of Sarcoplasmic Reticulum Vesicles is determined by Amino Acids of A+P+N Domains of Ca\textsuperscript{2+}-ATPase

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It was found that the electrophoretic mobility of sarcoplasmic reticulum (SR) vesicles originates from ionizable amino acids of cytoplasmic domains of the Ca\textsuperscript{2+}-ATPase, the Ca\textsuperscript{2+} pump of SR. The mobility was measured at pH 4.0, 4.7, 5.0, 6.0, 7.5, and 9.0 in the region of ionic strength from 0.05 to 0.2 M. Mobility data were supplemented by studies of SR vesicles by photoelectron microscopy. The mobility data were analyzed using Helmholtz-Smoluchowski model. The charge of the SR vesicles is dominated by the charge of the Ca\textsuperscript{2+}-ATPase. The charge is due to ionized amino acids obtained from the amino acid sequence of Ca\textsuperscript{2+} pump, pKa and pH. It was shown that a linear relationship exists between the mobility and the total charge on three cytoplasmic domains of Ca\textsuperscript{2+} pump: A, P, and N. The relationship between mobility, $\mu$, and the charge of A, P, N domains of the Ca\textsuperscript{2+} pump, Q, is $\mu = \alpha + \beta \cdot Q$ where $\beta = 0.033 \pm 0.002$ mu/e and $\alpha = 0.11 \pm 0.02$ mu. The mobility unit, mu = 1x10\textsuperscript{-8} m\textsuperscript{2}.V\textsuperscript{-1}.s\textsuperscript{-1}.

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