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# Mathematical Modeling of Cell Volume Alterations under Different Osmotic Conditions

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**Abstract :** Cell volume, together with membrane potential and intracellular hydrogen ion concentration, is an essential biophysical parameter for normal cellular activity. Cell volumes can be altered by osmotically active compounds and extracellular tonicity. In this study, a simple mathematical model of osmotically induced cell swelling and shrinking is presented. Emphasis is given to water diffusion across the membrane. The mathematical description of the cellular behavior consists in a system of coupled ordinary differential equations. We compare experimental data of cell volume alterations driven by differences in osmotic pressure with mathematical simulations under hypotonic and hypertonic conditions. Implications for a future model are also discussed.

**Keywords :** eukaryotic cell, mathematical modeling, osmosis, volume alterations
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