

Mechanism of potassium ion uptake by the Na⁺/K⁺-ATPase

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Na⁺/K⁺-ATPase restores sodium (Na⁺) and potassium (K⁺) electrochemical gradients dissipated by action potentials and ion-coupled transport processes. As ions are transported, they become transiently trapped between intracellular and extracellular gates. Once the external gate opens, three Na⁺ ions are released, followed by the binding and occlusion of two K⁺ ions. While the mechanisms of Na⁺ release have been well characterized by the study of transient Na⁺ currents, smaller and faster transient currents mediated by external K⁺ have been more difficult to study. Here we show that external K⁺ ions travelling to their binding sites sense only a small fraction of the electric field as they rapidly and simultaneously become occluded. Consistent with these results, molecular dynamics simulations of a pump model show a wide