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The random walk and Langevin approaches to diffusive model of the BKCa ion channel kinetics.

Up to date, several different theoretical approaches were introduced to describe open and closed states of ion channels. They describe correctly dwell-time distributions, however many of them are incapable of predicting and explaining long-term correlations between the dwelling times of subsequent states of a channel, found in experimental patch clamp time series. In this work, we have proposed a new diffusive model for the kinetics of voltage and Ca2+-activated potassium channels (BKCa). We have considered and compared two theoretical approaches towards the construction of modeled states: the random walk and Langevin ones. Our results show that the kinetic properties of experimental time series and the corresponding simulated data obtained from the model, turn out to be quite concurrent. Moreover, the rescaled range analysis (R/S analysis, Hurst analysis), which in our investigations measures the correlation in the time series of adjacent openings and closings dwell times of the BK channel, gives close results for experimental and modeled data.