

**Correlation studies of open and closed state fluctuations in an ion channel:  
Analysis of ion current through a large-conductance locust potassium channel**

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Ion current fluctuations occurring within open and closed states of a large-conductance locust potassium channel (BK channel) were investigated for the existence of correlation. Both the time series, extracted from the ion current signal, were studied by the autocorrelation function and the detrended fluctuation analysis (DFA) methods. The persistent character of the short- and middle-range correlations of time series is shown by the slow decay of the autocorrelation function. The DFA exponent  $\alpha$  is significantly larger than 0.5. The existence of strongly persistent long-range correlations was detected only for closed state fluctuations, with  $\alpha = 0.98 \pm 0.02$ . The long-range correlation of the BK channel action is therefore determined by the character of closed states. The main outcome of this study reveals that the memory effect is present not only between successive conducting states of the channel but also independently within the open and closed states themselves. As the ion current fluctuations give information about the dynamics of the channel protein, our results point to the correlated character of the protein movement regardless of whether the channel is in its open or closed state.