

Cellular criticality

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The mitochondrial network constitutes a crucial structure for cell functioning in most eukaryote organisms. This network is composed by about tens of thousands of tubular shaped organelles, organized as a set of clusters of different sizes in constant change. The dynamics of this system is ruled by the competition between organelles fission and fusion microscopic processes that give rise to a macroscopic stationary stochastic process.

In this work we present both theoretical and experimental evidence that such dynamical process presents the characteristic of a critical phenomenon, in the universality class of standard percolation. Our results suggest that mitochondrial criticality is associated to healthy cells, where withdrawal from the critical state leads to disease and eventually to cell death.