P-1.182

The Advantage of Periodic Over Constant Signalling in Micro-rna Mediated Regulation

Candela Szischik [1], Elsi Ferro [2], Alejandra Ventura [1], Carla Bosia [2]

[1] Instituto de Fisiología, Biología Molecular y Nuerociencias. Universidad de Buenos Aires, FCEN, Departamento de Física, Buenos Aires, Argentina

[2] Department of Applied Science and Technology, Politecnico di Torino. Italian Institute for Genomic Medicine, Turin, Italy

Cells may exploit oscillatory gene expression to encode biological information. Temporal features of oscillations such as pulse frequency and amplitude are determinant for the outcome of signalling pathways. However, little effort has been devoted to unveiling the role of pulsatility in the context of post-transcriptional gene regulation, where microRNAs act by binding to RNAs and regulate their

expression. Here we study the effects of periodic against constant microRNA synthesis within minimal microRNA-target networks. We find that there is a repressive advantage of pulsatile over constant microRNA synthesis, and that the extent of repression depends on the frequency of pulses, thus uncovering frequency preference behaviors.

We show that the preference for specific input frequencies is determined by relative microRNA and targets kinetic rates, and can lead to exclusive frequency-dependent repression on distinct RNA species, thereby highlighting a potential mechanism of selective dynamical target regulation. Our findings might have implications for experimental studies aimed at understanding how periodic patterns drive biological responses through microRNA-mediated signalling and provide suggestions for validation in synthetic networks.