

Network inference of circadian clock

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ABSTRACT

The Mammalian circadian rhythm is governed by the principal clock which is located in the suprachiasmatic nucleus (SCN). This clock is composed of ten thousands of neurons and their connection to one another is essential to important roles of SCN: synchronization, entrainment to light, etc. Previous studies about the SCN network used the maximal information coefficient (MIC) statistic to oscillating time course data during resynchronization after desynchronization by TTX. Since this method requires desynchronization and resynchronization, it takes a long time and the recovered structure may not be similar to the normal SCN network. Finally, even though numerous studies argued that the connection between SCN cells are asymmetric, MIC cannot detect directionality.

We develop our own method, which can detect causality. This method does not require desynchronization by TTX, so it takes shorter time and one can obtain the normal network structure of the SCN. Moreover, it is able to obtain main results of previous studies: small-world network, exponential distribution of node degree. Finally, as our method can diagnose causality, our method can also be used to verify the asymmetry of the SCN.