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BHLH Transcription Factors DEC1 and DEC: From Structure to Various Diseases

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ABSTRACT

The circadian rhythms in complex multicellular organisms are regulated by clock genes located in the Suprachiasmatic Nucleus (SCN) of hypothalamus, as well as many other kinds of cells throughout the body. Along with the other two core clock genes Period (PER) and Cryptochrome (CRY), differentiated embryonic chondrocyte (DEC)1 and DEC2 participate in the interlocked transcriptional feedback loop by repressing the CLOCK/ARNTL -induced transactivation of PER1. Additionally, as the members of basic helix-loop-helix transcription factor family, DEC1 and DEC2 have been reported to directly or indirectly correlate with the expression of dozens of genes in different cell types. They also physically interact with proteins that participate in pathways relevant to carcinogenesis and/or malignancy progression. DEC1 and DEC2 are widely expressed in both embryonic and adult tissues. Their expressions are regulated by various extracellular stimuli, such as grow factors, serum starvation, hypoxia, hormones, nutrient, cytokines, light, infection. Therefore, they play vital roles involving development, cell differentiation, cell growth, cell death, immune systems, homeostasis, metabolic reprogramming, aging and cancer. In addition, it has been evidenced that mutation at certain position of DEC2 gene resulted in the short sleep phenotype. Although DEC1 and DEC2 share similarity at about 40% in their whole protein structure, they functioned differently or even oppositely when upon the same stimulus. The structural features, functions and biological roles of DEC1 and DEC2, especially the roles of DEC in various kinds of malignancy will be discussed.

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