

Exon junction complex: the guardian of messenger RNA

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Abstract

The exon junction complex (EJC) proteins closely associate with messenger RNA (mRNA) to form messenger ribonucleoprotein (mRNP) that essentially assembles during the splicing event. This mRNP firmly binds to mRNAs upstream of the exon-exon junctions. Most importantly EJC proteins strongly regulate the post-transcriptional fate of mRNA. EJC proteins escort the newly synthesized mRNA from the nucleus into the cytoplasm, where the translation event is destined. EJC proteins participate and actively control several major molecular events such as pre-mRNA splicing, mRNA export, translation and nonsense-mediated mRNA decay (NMD). Primarily the EJC proteins guards the mRNA from being hijacked into the decay process under typical physiological conditions, but favours the decay process when the mRNA is aberrant in nature thus allowing the cell to escape from any post-translation detrimental effect(s). Mutations in EJC proteins possess detrimental effects in metazoans. This review mostly summarizes the components of the EJC complex and their role in maintaining the cellular homeostasis.

Keywords: Exon junction complex, messenger RNA, post-transcriptional, pre-mRNA splicing, nonsense-mediated mRNA decay.

Introduction

In eukaryotes the efficiency and fidelity of key molecular events is possible due to a number of transcriptional and post-transcriptional regulatory mechanisms (Fig.1). The exon junction complex (EJC) in metazoans is a multi-protein complex and associates with the spliced messenger RNA (mRNA) to form mRNA-ribonucleoproteins (mRNPs) which further facilitates the post-transcriptional events [1,2,3]. Primarily EJCs consist of three core factors and many associating proteins, depending on the cellular event that they will be engaged upon. During the pre-mRNA splicing process, in a sequence-independent manner the EJCs assemble and bind to the mRNAs in the region of 20-24 nucleotides (nts) upstream of exon-exon junctions [4,5]. Throughout the life cycle of the EJCs, they remain bound to mRNA [6,7]. Post-transcriptional and the translational events are well regulated by the EJC proteins, but the detailed mechanism(s) in which they regulate the events still remains blurred. Currently the EJCs are believed to be one of the key complexes which eventually contributes the life forms to remain alive [8,9]. The EJC proteins affect the fate of mRNA as they regulate the mRNA export, translation and consequently the