Poster Presentation

MS081.P02

Structural and functional characterization of ribose-1,5-bisphosphate isomerase in archaea

Prerana Gogoi[1], Shankar Prasad Kanaujia[1]
[1]*Biosciences And Bioengineering, IIT Guwahati, Guwahati, India*
E-mail: prerana@iitg.ernet.in

eIF2B is a multi-subunit translation initiation factor critical for the successful completion of the process of protein biosynthesis in eukaryotes. Made up of two copies each of five subunits, α, β, δ, γ and ε, eIF2B acts as a guanine nucleotide exchange factor (GEF) for its GTP-binding protein partner, eIF2. During protein translation initiation, eIF2 is involved in the delivery of the initiator methionyl tRNA to the ribosome and ensures the correct recognition of the start codon (AUG). eIF2 has to undergo a continuous cycle between an active (GTP-bound) and inactive (GDP-bound) state to impel the process of mRNA scanning. This cycle is effectively driven by eIF2B with α, β & δ functioning as the regulatory subunits and γ & ε as the catalytic subunit.

Owing to the fact that the process of translation initiation in archaea and eukaryote are considerably homologous, the presence of a homologue of eIF2B in archaea has been anticipated. However, archaeal genome includes the homologues of only the regulatory subunits (α, β and δ) of eIF2B and lacks the counterparts of the catalytic subunits (γ and ε). These regulatory subunits has also been found to be significantly similar to a functionally non-related protein, ribose-1,5-bisphosphate isomerase (R15Pi) known to be involved in the NMP degradation pathway wherein it catalyzes the conversion of ribose-1,5-bisphosphate (R15P) to ribulose-1,5-bisphosphate (RuBP).

The three dimensional crystal structure was elucidated to obtain an insight into the availability of a homologue of eIF2B regulatory subunit in archaea. Results indicate that the presumed homologues of eIF2B regulatory subunits share more structural resemblance to R15Pi. Thus, this negates the earlier assumption of the presence of the homologues of eIF2B regulatory subunits in archaea.

Kakuta, Y. (2004) Biochem. Biophys. Res. Commun. 319, 725–732.
Nakamura, A. (2012) J. Biol. Chem. 287, 20784–20796.

Keywords: eIF2B, NMP degradation pathway, Protein translation initiation