

Entropic contributions to the splicing process

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Motivation

It has been recently argued that the depletion attraction may play an important role in different aspects of the cellular organization, ranging from the organization of transcriptional activity in transcription factories to the formation of the nuclear bodies. We suggest a new application of these ideas in the context of the splicing process, a crucial step of mRNA maturation in Eukaryotes.

Methods

We use the Freely Jointed Chain modelization of the pre-mRNA and perform semi-analytical calculations in order to highlight the role of the depletion attraction in exon juxtaposition in the two ways of splice-site recognition: intron definition and exon definition. We also analyse the distribution of the exon number per gene to verify theoretical predictions related to cooperative effects.

Results

We show that entropy effects and the resulting depletion attraction may explain the relevance of the aspecific intron length variable in the choice of the splice-site recognition modality. On top of that, some qualitative features of the genome architecture of higher Eukaryotes can find an evolutionary realistic motivation in the light of our model.

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