Instituto de Medicina Molecular João Lobo Antunes

Master Project Proposal

Title: High-throughput sequencing technologies to decipher co-transcriptional mRNA processing kinetics

Synopsis:

Long DNA molecules inside the nucleus of eukaryotic cells work as handbooks for all cellular behaviours, but they never act directly. Thus, DNA chemical information is transcribed into pre-mRNA molecules, which are then exported to cytoplasmatic ribosomes. However, it requires a preview intense maturation journey of pre-mRNA to mRNA, which comprises such mechanisms as splicing, capping or 3'end processing. The systematic failure of any RNA maturation processing mechanism leads to aberrant transcripts production, which is the reason for several diseases and birth deaths. Surprisingly, RNA processing occurs largely at the same time as transcription, laying on a complex regulatory system that allows a perfect interplay between RNA production and its maturation.

To dissect such a hot topic in the transcriptomic field, our laboratory jointly with Nicholas Proudfoot laboratory from the University of Oxford have recently developed a novel approach to successfully immunoprecipitate elongating RNA Polymerase II (Pol II), followed by the isolation of the intact nascent RNA bound to Pol II active site - POlymerase Intact Nascent Technology (POINT). During this master project, we propose to employ the POINT high-throughput sequencing technology to better understand the intercommunication between distinct RNA processing mechanisms, as well as their coordination with transcription.

We are seeking highly motivated students, with strong bioinformatic skills, biological background, critical thinking and open-minded.

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