BIOENGINEERING SEMINAR

“Coordinating Transcription and Translation in Eukaryotes”

Monday – August 17, 2015 – 12:15 p.m.
EPFL – room SV1717a

Prof. Brian M. Zid
Department of Biochemistry,
UC San Diego, La Jolla, CA (USA)

*host: Prof. Sebastian Maerkl*

Abstract

In eukaryotes, transcription and translation are considered to be discrete processes both spatially and in terms of regulatory factors. On the other hand, close coordination of transcription and translation for subsets of cellular mRNAs would be advantageous when an organism needs to rapidly alter its cellular composition, such as during environmental stress. A universal feature of the response to stress and nutrient limitation is transcriptional upregulation of genes encoding proteins important for survival. Under many of these conditions overall protein synthesis levels are reduced, thereby dampening the stress response at the level of protein expression. For example, during glucose starvation in yeast, translation is rapidly repressed, yet transcription of many stress- and glucose-repressed genes is increased. Using ribosome profiling and microscopy, we found that this transcriptionally upregulated gene set consists of two classes: (1) one producing mRNAs that are translated during glucose limitation and are diffusely localized in the cytoplasm – this class includes many heat shock protein mRNAs; and (2) another producing mRNAs that are not efficiently translated during glucose limitation and are concentrated in foci that co-localize with P bodies and stress granules – this class is enriched for glucose metabolism mRNAs. Surprisingly, the information specifying differential localization and protein production of these two classes of mRNAs is encoded in the promoter sequence – promoter responsiveness to heat shock factor (Hsf1) specifies diffuse cytoplasmic localization and higher protein production upon glucose starvation. Thus, promoter sequences and transcription factor binding can influence not only mRNA levels, but also subcellular localization of mRNAs and the efficiency with which they are translated, enabling cells to tailor protein production to environmental conditions.

Sandwiches will be provided

See current Bioengineering seminar calendar at [http://bioengineering.epfl.ch/seminars](http://bioengineering.epfl.ch/seminars)