Universität Basel

Research Project

Modeling multi-layer large-scale data to decipher the translational regulatory code of cellular functions

Third-party funded project

Project title Modeling multi-layer large-scale data to decipher the translational regulatory code of cellular functions
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The production of proteins from mRNAs (translation) is a central, most energy-consuming activity of cells. Yet most studies of gene expression regulation have focused on other steps of gene expression, particularly the synthesis of mRNAs based on the DNA template. Examples of translational control are known in the context of development or diseases such as cancers. However, it remains poorly understood how mutations in genes encoding translation factors lead to specific diseases or how translation is adjusted when cells respond to perturbations. In this project we will take a systematic approach to understand how translation is regulated in relation to the proliferation rate of cells. We will focus on the liver, a key metabolic organ that rapidly integrates a wide range of signals to synthesize many molecules of key relevance for the entire organism and that also retains the capacity for regeneration. With multi-layer omics data and mathematical models we will determine translation parameters of individual transcripts, identify regulatory elements and predict the impact of translation changes on the metabolic networks of cells. Through the analysis of human hepatocarcinoma samples, our study will elucidate the largely uncharted functional impact of translational control in a system that is highly relevant for human health, providing a blueprint for similar studies of other human cancers.

Keywords translation, proliferation, cancer ,ribosome footprinting, machine learning, TASEP, metabolic networks
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ID	Kreditinhaber	Kooperationspartner	Institution	Laufzeit - von	Laufzeit - bis
4638955	Zavolan, Mihaela	Piscuoglio, Salvatore	Visceral Surgery and Precision Medicine Laboratory at the Department of Biomedicine, University of Basel	01.08.2020	31.12.2025