Title

Biogenesis of Ribosomes and Cancer: A review of the molecular mechanisms regulating ribosome function

Authors

Christopher Robles and Marc Nahmani

Abstract

Ribosomes are intricate microscopic machinery that translate genetic information from RNA into functional proteins, a vital process which regulates cellular homeostasis, as well as the structure and function of gene expression. Ribosomes consist of ribosomal ribonucleic acid (rRNA) from the nucleus and rProtein from the cytoplasm. When these two components come together, they produce a ribosomal subunit ready for protein synthesis. This literature review focuses on ribosomal biogenesis and discusses our current understanding of the molecular mechanisms in charge of keeping biological organisms alive. Ribosomal biogenesis is a tightly regulated process that involves the synthesis, processing, and assembly of ribosomal subunits within the nucleus and their transport into the cytoplasm of a cell. Ribosomal subunits promote cell growth and regulate stress responses via signaling feedback loops. Therefore, deviation from these molecular processes can cause a variety of diseases such as degenerative, developmental, and neurological diseases due to frantic cell growth and uncontrolled proliferation. Indeed, dysregulation of ribosome biogenesis is directly linked to the development of various types of degenerative diseases like cancer, which cause abnormal cell growth, division, and spread within the body. Research shows that cells are prone to multiple points of failures during protein synthesis and are affected by both extra- and intracellular stressors. Therefore, it is important to understand the underlying mechanisms regulating ribosome function in order to gain insight into why some cancers form as well as how to develop treatments that can combat ribosomal dysregulation and mutagenesis.