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Editor Speech of IC - BTI

International Conference is the 12th international interdisciplinary peer reviewed conference which publishes works of the scientists as well as practitioners in the area where UBT is active in Education, Research and Development. The UBT aims to implement an integrated strategy to establish itself as an internationally competitive, research-intensive institution, committed to the transfer of knowledge and the provision of a world-class education to the most talented students from all backgrounds. It is delivering different courses in science, management and technology. This year we celebrate the 21th Years Anniversary. The main perspective of the conference is to connect scientists and practitioners from different disciplines in the same place and make them be aware of the recent advancements in different research fields, and provide them with a unique forum to share their experiences. It is also the place to support the new academic staff for doing research and publish their work in international standard level. This conference consists of sub conferences in different fields: - Management, Business and Economics - Humanities and Social Sciences (Law, Political Sciences, Media and Communications) - Computer Science and Information Systems - Mechatronics, Robotics, Energy and Systems Engineering - Architecture, Integrated Design, Spatial Planning, Civil Engineering and Infrastructure - Life Sciences and Technologies (Medicine, Nursing, Pharmaceutical Sciences, Phycology, Dentistry, and Food Science),- Art Disciplines (Integrated Design, Music, Fashion, and Art). This conference is the major scientific event of the UBT. It is organizing annually and always in cooperation with the partner universities from the region and Europe. In this case as partner universities are: University of Tirana – Faculty of Economics, University of Korca. As professional partners in this conference are: Kosova Association for Control, Automation and Systems Engineering (KA – CASE), Kosova Association for Modeling and Simulation (KA – SIM), Quality Kosova, Kosova Association for Management. This conference is sponsored by EUROSIM - The European Association of Simulation. We have to thank all Authors, partners, sponsors and also the conference organizing team making this event a real international scientific event. This year we have more application, participants and publication than last year.

Congratulation!

Edmond

Hajrizi, Rector of UBT and Chair of IC – BTI 2023

Content

OXIDATIVE STRESS EFFECT IN RIBOSOMAL BIOGENESIS IN CANCER CELLS

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Abstract. Oxidative stress is a condition where the levels of reactive oxygen species (ROS) exceed the normal level on the cell's antioxidant defenses. Oxidative stress can cause damage of the DNA, proteins, and lipids. Ribosome biogenesis is the process of making ribosomes. Ribosome biogenesis involves the transcription, processing, and assembly of ribosomal RNA (rRNA) and ribosomal proteins (r-proteins) into functional ribosomal subunits. Cancer is a disease characterized by uncontrolled cell growth, invasion, and metastasis. Cancer cells often have increased levels of oxidative stress and ribosome biogenesis, which can promote their survival, adaptation, and proliferation in the tumor microenvironment. In this review, we discuss how oxidative stress can have different effects on ribosome biogenesis in cancer cells, depending on the type, severity, and duration of the stress, as well as the genetic and epigenetic characteristics of the cells.

Keywords: oxidative stress, Ribosome biogenesis, acute lymphoblastic leukemia, Therapy

Introduction

Ribosome Biogenesis

Ribosome biogenesis is the very coordinated process which start in the nucleolus. The ribosome are consider as a machine who are responsible for protein synthesis1,2,3. The ribosome biogenesis is divided into transcription, processing, and the assembly of the rRNAs (ribosomal RNA) and the ribosomal proteins (r-proteins) also, into the functional ribosomal subunits2,1.

In the prokaryotic cell, the ribosome biogenesis take place in the cytoplasm with transcription of many ribosome genes1, where as in eukaryotic cells, the ribosome biogenesis take place in the cytoplasm and in the nucleolus. In the nucleolus it is the specialized region where the rRNA is transcribed and processing2,1,4.

The ribosome biogenesis is very complexed process who are involved a huge number of proteins, more than 250 non-ribosomal assembly factors, which play pivotal role in this process4. Ribosome biogenesis play pivotal role in the cell growth, survival, and functions, and is shown to be responsible for many human diseases, for example cancers, aging, and the ribosomopathies5. For study of ribosomal biogenesis are developed many protocols and methods such as in vitro-technology, fluorescence microscopy, sequencing of RNAs, mass spectrometry, and CRISP-Cas96.

Oxidative Stress and Ribosome Biogenesis

During the oxidative stress the level of ROS (reactive oxygen species) overcome the normal level in the cell's antioxidant defense7. Oxidative stress can cause damage to various cellular components, including DNA, proteins, and lipids7,21.

Ribosome biogenesis is essential for cell growth, survival, and function8,9. The oxidative stress is shown to have negative influence in ribosome biogenesis in many ways. This is based on the duration and severity of the stress9. Some possible effects are:

Oxidative stress can cause the hyperactive ribosome biogenesis in some cells, by activating a signaling pathway involving nucleolin, β-catenin, and n-Myc10.

The oxidative stress is responsible for ribosome dysfunction. It is shown to be responsible for the damaging the ribosomal RNA or proteins, leading to impaired protein synthesis and quality control. This negative influence is responsible for misfolding proteins in the cell, which than can stimulate the apoptotic process9.

The tumor suppressor protein p53 is activated by oxidative stress. The p53 can regulate ribosome biogenesis. The p53 is responsible for inhibition of the ribosome biogenesis, this may occur by suppressing the expression of ribosomal genes or by causing the degradation of ribosomal proteins. This can cause decrease cell proliferation and cell cycle arrest or apoptosis8,11.

Ribosomal Protein Mutation and Acute Lymphoblastic Leukemia

Many diseases are shown to be associated with ribosomal protein mutations19. One of them is T-acute lymphoblastic leukemia (ALL), when the ribosomal protein gene mutations are shown to be associated with different genetic lesion12,13. These mutations can affect the structure and function of ribosomes, which are essential for protein synthesis. The T-ALL is associated with mutation of ribosomal proteins genes such as13,12. These gene mutation in ribosome caused the impair of the ribosome biogenesis, affecting the protein translation, dysregulate work of tumor suppressor protein p53, modulate different signaling pathways, and are shown to affect the epigenetic regulation13. This type of ribosomal proteins involved in the T-ALL are under the investigation12.

Acute Lymphoblastic Leukemia-The Future Therapy the Acute lymphoblastic leukemia (ALL) is a type of blood cancer. It is characterized by affection of white blood cells. Chemotherapy or combination therapy are the main treatment for ALL. This type of therapies is given in different phases. The aim of this treatment is to kill the leukemia cells and prevent them from coming back14,15,16,20. Treatment of ALL is depended from many factors. First of one is subtype of ALL. Other is the risk group, and the age and health of the patients, and the end response of the therapy15. Sometimes is shown that treatment may cause the side effects. For example, increase infections, bleeding, infertility, or tumor lysis syndrome15.

Conclusion

In conclusion, we can say the oxidative stress can have different effects on ribosome biogenesis in cancer cells. This is depended by the type, severity, and duration of the stress, as well as the genetic and epigenetic characteristics of the cells. Understanding the influence of oxidative stress in ribosome biogenesis in cancer cell for the future may be very important by provide new insights into the molecular mechanisms of tumorigenesis and new targets for therapeutic intervention17,5

In conclusion, for RP mutations we can say that they have different effects on T-ALL pathogenesis. This is by depending on the type, location, and frequency of the mutation, as well as the genetic background and microenvironment of the tumor cells. Understanding how RP mutations affect T-ALL biology may provide a new strategy for targeting the therapeutic intervention12,18.

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