

Preface

Telomeres define and predict the fate of our cells, and are capable to direct the manner of quality and the quantitative values in the specific biological and molecular events. Telomeres could be also named as 'Frontiers in cells'

By looking at a carved tree, we realize the multifarious position of circles indicative of its age. But, in human, it is rather more complicated and we are exposed to the multi-influential factors, cooperating with the telomere territory. Therefore, the phenotype, as a sole, could not reflect the real age of the apparently normal and healthy individuals. Such machinery is even more confusing in cancer patients.

Telomeres act as a 'Bio-Polar System' within the cells which could direct and govern further events in our body.

In programming, 'telomeres begin and terminate the cellular life'. Telomeres make the history of cellular fate, health status, the manner, and future of all cell types which contain chromosomal territory. Telomeres act as guard, protect the cells and guarantee the flow of existence and quality of life.

Telomeres, manage and interact with many events for cancer-puzzling. Normal telomere, 'announcer of life'. Abnormal telomeres, 'trigger and predictor of age and cancer'. In tact telomeres, 'end points of natural and health status'. Telomeres are tracer as predictor, and prognostic values in health and malignant conditions. Shorter telomeres direct aberrant function of telomerase and could act as two edged sword.

Remembering the pioneers who discovered the original facts in telomere and telomerase, seems to be essential; Alexei Olovnikov and Leonard Hayflick (early 1970s) by paving the way, later on Elizabeth Blackburn, Carol Greider, and Jack Szostak (1975–1978) the winner of 2009 Nobel Prize, had discovered the key role of telomeres and the enzyme telomerase for the protection of chromosomes. The original work of Russian theorist Alexei Olovnikov during 1970–1973, is highly appreciated. As he defined the root of Greek words for telomeres (telos “end” and meros “part”), it had been clarified that why the end parts of chromosomes are so critical for the cellular fate and life.

Telomeres are not isolated; they are cooperative and interact with the whole machinery of Cell Biology, Genetics, and environment. They affect other cellular and molecular behavior, and could be affected by many targets in the cellular territories.

Moreover, stem cell is reflective of heterogeneity, and cancer stem cell is sign of evolution and valuable contributor to the cancer research. This paradigm together with telomere territory would pave the way in cancer research towards an innovative therapeutic strategy in future.

Focusing on the current book, it was aimed to provide an educational and research package, preferentially based on the data achieved from our original research projects. The paradigms of *in vivo* and *in vitro* assays, as the essential facts, were also included and highlighted within different chapters. By believing in cancer patients' right and trusting the role of genetics and cell biology, this book is developed through a clinical focal point, i.e., telomerase, as a therapeutic and bio-marker in two chapters. Gradually, the structure of chapters focused on introducing an applicable and new strategy in detection of telomerase activity. Further, telomere was explored, and followed by presenting the interaction between telomere, methylation and nutrition.

Impact of cancer stem cell in different malignancies with special focus on breast cancer was also discussed. Finally, in closing highlights, the whole chapters of this book were thoroughly reviewed.

This book reflects a broad insight in which different domains of life, including eukaryotes, prokaryotes, at *in vivo*, *in vitro*, and human levels, and cooperatively within the chapters were discussed. It also shows that how variety of species including model organisms, fungi including yeast, plants, animals, and human could interact with each other in the nature and share a common biological target, i.e., telomere. This is indicative of, (1) A global diversity and selection, and (2) They need to combat against hazards in our environment, producing by them, by relying on the cellular and molecular events and, (3) Struggling to survive, but in a healthy condition. This is a message to 'take care about our environment'.

That was also my honor to invite, as much as possible, a group including the national and international contributors from different centers as well. I was keenly interested in designing the subject of chapters by considering a complementary strategy of relevant issues in the telomere territory. Upon the manner of developmental based the core concepts in provided chapters focus on:

Chapter 1, "Telomerase From aging to human cancers" provides a complementary basis to serve the scientific investigators with the recent advances of telomerase in human cancers and aging.

Chapter 2, "Telomerase: Basic and clinical approaches" provides the key aspects in telomerase. Specifically, discuss our data on, (1) Association between telomerase activity and hTR in primary breast cancer patients, and (2) By considering clinicopathological parameters, expression of hTR and hTERT in the same patients were also included in this chapter.

Chapter 3, "Detection of telomerase activity: A New Strategy for Detecting Low Activity of Telomerase" presents a progressive and essentials techniques for detecting the telomerase activity including the "Trap assay family". In addition, to bypass limitation such as low activity of telomerase, a new strategy has been also provided in which our data is presented.

Chapter 4, “Telomere, Regulation and Tumorigenesis” mainly, focus on the classic information on structure, interaction between telomeres and DNA damage response, gene expression; and regulation of telomeric chromatin. Mechanism of telomere maintenance and Telomere position effect is also provided. Finally, our data on “telomere and telomerase in brain tumors” is included in this chapter.

Chapter 5, “Novel hypothesis on telomere length: heterogenic targets as genomics/ somatic diverse value in breast cancer and brain tumor” explores the genomic-somatic scenario of telomere length which was initially begun in a group of our patients affected with primary breast cancer, by including the follow up study. In second step, the same model of study was conducted in the patients affected with primary brain tumors.

Chapter 6, “Telomere, Methylation and Nutrition” provides the most important facts regarding the impact of nutritional elements on telomere length, DNA methylation and cancer predisposition. By improving the routine diet composition, the process of aging and cancer could be somehow protected. Such plan would provide a positive impact on the longevity and health of next generations in our pedigrees. The final message would be ‘balancing the dietary elements’.

Chapter 7, “Cancer stem cell” provides basic Information on stem cells and cancer stem cells. Paradigm of gene- gene interactions and cooperation between telomeres and CD44+/Cd24- marker are discussed. The final word emphasized on the translational impact of this marker ‘*CSC is the key target for personalized breast cancer management.*’

Mini chapter 8, “Closing highlights: Final statements at a glance” defines telomere territory as a globalizing domain in genetics and cell biology, interacting with many molecular and cellular targets, which dictate our style of life. The new insight include personalized selection, and cancer family indices through which an appropriate approaches could be planned within specific pedigrees as cancer-prone families. This avenue would facilitate to consider the personalized cancer management.

Finally, whatever we learn about cellular duties in our body, there are still many unmasked facts in telomere territory.

I would also like to gratitude the continuous cooperation of surgeons, nurses, the clinical supportive team, and patients in our projects, whose mutual endeavor is sincerely appreciated.



<http://www.springer.com/978-94-007-4631-2>

Telomere Territory and Cancer

Mehdipour, P. (Ed.)

2013, XX, 204 p., Hardcover

ISBN: 978-94-007-4631-2