

## Book Reviews

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**Adult stem cells in aging, diseases and cancer**, K.L. Rudolph, editor (Karger, Basel, Switzerland) 2015. 88 pages. Price: US\$ 93.00/CHF 79.00/EUR 74.00

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This is a timely publication of a long awaited book correlating diminished function of adult stem cells with ageing, diseases and cancer. Since adult stem cell research has reached the level of clinical trials all over the world it is important to know the advances and applications of adult stem cells in ageing and diseases and cancer as well. Professor Karl Rudolph has compiled the proceedings of the 5<sup>th</sup> Else Kroner-Fresenius Symposium, held at Wartburg Castle in May 2013. All the speakers of this Symposium are renowned scientists engaged in specific organ resident stem cells. Therefore, the book covers an account of stem cells from adult intestine, muscle, bone marrow hematopoietic stem cells, *etc.* A notable feature of this book is the chapter on stem cell microenvironment and DNA damage checkpoint responses of adult stem cells which play a pivotal role in ageing and cancer.

Understanding the concept of stem cell ageing is likely to help us to find out how ageing impairs the

repair abilities of tissue resident stem cells. Further, this book covers emerging issues in the ageing process and diseases associated with ageing. The chapters include original research information with appropriate references.

This book covers six major topics namely, stem cells in adult intestine, muscle stem cell ageing, hematopoietic stem cell ageing, microenvironment ageing and diseases, sestrins in ageing and metabolism, telomeres and stem cell ageing, DNA damage and checkpoint responses in adult stem cells among other topics. The authors explain the research to make each chapter a complete story that educates the beginners and enriches the experts. They carefully document key historical developments in this field and provide examples of up-to-date laboratory findings. Each chapter provides an abstract, description, conclusion/outlook and a short list of references for further reading. Coloured figures and illustrations are educative.

Though the book does not provide detailed protocols and methodology, it focuses on key concepts and strategies for success. For example, how muscle stem cell ageing progresses is explained well with pictures. Information about satellite stem cell dynamics, Wnt and Notch signalling involved in muscle stem cell ageing is also provided. The role of niche or how polarity and Wnt5a signalling play a central role in ageing is explained clearly and the molecular basis of satellite cell myogenesis is detailed with the satellite cell dynamics. With the example of Pax it is suggested that the dysfunction of aged muscle progenitors is to some extent induced by systemic regulators and these alterations appear to be partially reversible in satellite cells when re-exposed to a young environment. The knowledge about the ageing process and mechanism may offer novel therapeutic approaches for prevention and treatment of age related muscle atrophy. Ageing is further discussed as the major risk factor for leukaemia, it might be a result of ageing of MSCs in part (underlying resource for cells forming the stem cell niche). The biological mechanism of this age related incidences is not fully understood but it is widely recognized that the combination of extrinsic and intrinsic mechanisms with respect to leukaemia initiating cells drives this process. Stem cells which are diseased are distinct from the normal MSCs. The book provides an interesting discussion of the recent advances in this rapidly growing field.

Overview of the hematopoietic hierarchy and cell surface markers characterizing the different

progenitor cells is discussed appreciably. The subsequent chapter summarizes about the sestrins in regulating metabolism and leading to the development of age related pathogenesis. The potential role of sestrins and calorie restrictions in modulating ageing and age related diseases by activation of AMPK, inhibition of TORC1 and induction of autophagy in mammals is briefed with data from animal experiments which will be relevant to researchers from the same field.

The chapter, 'Telomeres and Stem Cell Aging' briefs about short telomeres which by themselves are able to induce DNA damage, an important problem to be addressed in induced pluripotent stem cells to fully develop their therapeutic possibilities. Length of telomere plays a twin role in cancer biology. Shortened telomeres in somatic cells (usually telomerase free) are known to carry p53 mediated senescence where as shortened telomeres induce chromosomal instability, which, together with successive reactivation of telomerase, can promote carcinogenesis.

'DNA Damage and Checkpoints Responses in Adult Stem Cells' is one of the chapters focusing on stem cell progenitor cell senescence in ageing where it is discussed that the ultimate consequence of DNA damage response is senescence or apoptosis. The mechanism through which stem cells enter senescence is not currently known. The mechanism of DNA damage responses in adult stem cells during ageing and upon numerous stresses is important for the clinical applications targeting to rejuvenate the old stem cells and are focused on treating age related diseases.

On the whole this book is comprehensive, yet concise and discusses various aspects of adult stem cells in ageing, diseases and cancer with an aim to understand significance of each of these to portray future of stem cells as a drug to control some of the degenerative diseases which cannot be controlled otherwise with the existing drugs. This book will change the outlook of readers towards disease evolution during ageing and will serve as a guide for future developments of cellular therapies aiming to improve quality of life of elderly.

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