Regenerative medicine in clinical practice

Tom Kho and Kampon Srisawanakul
Asian Society of Regenerative Medicine, Thailand

Regenerative technologies to boost up innate repair processes and restore damage organs and tissues is becoming a new era in health care. A regenerative medicine model would consist of scalable production and standardized applications of clinical grade biotherapies. Regenerative medicine aims to offer solutions for many incurable diseases. The need for innovative technology is due to the rising number of chronic diseases afflicting an aging global population. It has been estimated that by 2020 chronic diseases in particularly cardiovascular diseases, diabetes, brain diseases, respiratory conditions and cancers will cause more than 70% of all death globally. People over 60 years-old will suffer from disabilities ranging from visual and hearing loss, dementia or osteoarthritis. There are several methods employed in regenerative medicine. These technologies may incorporate stem cell transplantations, tissue engineering and uses of growth factors and appropriate cytokines. Our current approaches employ platelet rich plasma (PRP), growth factor complex, autologous stem cell therapy and immunotherapy for rejuvenation, aesthetic applications and for the treatments of osteoarthritis, sport injuries and diabetic wounds. The allogeneic mesenchymal stem cell (MSC) therapy can be given intravenously and home to sites of tissue injury and can accelerate the tissue repair processes. Several clinical trials and ongoing studies indicated their potential uses in various degenerative diseases. During the last decade, many published data suggest that MSCs possess the innate capacity to home to site of inflammation, including tumor microenvironments. This homing response can be applied by using MSCs a cellular delivery vehicle to deliver anti-cancer agent directly to tumor. Stem cell function declines with age in both human and experimental animals. Aging leads to functional decline of hematopoietic stem cells, including alterations of self-renewal and cell differentiation. It has been hypothesized that aging of stem cell is the underlying cause of impaired tissue homeostasis as well as cancers in aged individuals. Recently, the aspect of aging of the stem cell niche on altered phenotypes associated with aged stem cell is more clearly understood. New data were presented on the role of sestins in regulating metabolism and therefore the development of aging-related pathologies. Different status of metabolism of the cell and its niche could lead to activation or inactivation of the signaling pathways of metabolism and consequently influence cell fate regulation. More evidences indicate that stem cells have distinct metabolism compared to differentiated cell and the unique metabolism property of stem cell is important for their maintenance. It is of great significance for studies of energy metabolism in aging as well as carcinogenesis. The interactions between telomeres, telomerase, DNA damage response and senescence as well as their relations to cancer and aging are also needed to be explored much further.

Biography

Tom Kho is a leading stem cell researcher especially in the field of mesenchymal stem cell technology. He has developed several innovative stem cell products currently available in the global market. He has contributed significantly to several research and development projects currently on going in Thailand.

drsrikul@gmail.com

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