Studies on Stem Cells Research and Therapy

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Editorial

Expectations of Epigenetic Research Studies Focusing on Mesenchymal Stem Cells

Epigenetic alternations are not associated with any changing the base sequence of DNA, but are closely related to phenome together with genome [1]. Most of them are determined differvvently under various external and internal influences and, even if abnormal, memorized over individual life. In the ontogeny that starts from a totipotent stem cell such as a fertilized egg, the epigenetic alternations occur in good order along with cell differentiation process toward peculiar epigenetic patterns of individual cell series. In contrast, a reverse artificial phenomenon induced by transduction of 4 genes, Oct3/4, Sox2, Klf4 and c-Myc (induced progenitor and stem cells: iPS cells) is known to accompany with significant abnormalities of DNA methylations, one of the epigenetic regulation mechanisms, fearing possible abnormal cell development. These cells should be used for elucidation of unknown reprogramming mechanisms rather than rough- and ready-clinical applications.

Therefore, it is important to elucidate how the epigenetics relate to the disease generation and prognosis. International Human Epigenome Consortium (IHEC), which started in January 2010 and is now composed of the United States, EU, Italy, South Korea, Germany, Canada, and Japan, aims at the decipherment of epigenome of 1,000 kinds of every 7-10 years, may give us big data answering to the above questions and suggesting new aging mechanism, but data among cell kinds and developmental stages are speculated too different to systematize them scientifically. In this respect, research focusing on mesenchymal stem cells (MSCs) may be clinically much more useful information, because they can migrate to the lesions where differentiate into various kinds of cells which play important roles in immune-inflammatory process induced as a first step of various diseases by invading foreign bodies.

In this respect, the primitive MSCs derived from the Wharton's jelly of umbilical cord connective tissues of newborns (WJ-MSCs) [2-6] as well as cord blood, to which various environmental factors are exposed only during pregnancy periods, will provide an idealand basic platform not only for better understanding the biological meanings of the epigenetic alternations in disease generation and aging but also for research and development of a new generation of diagnostics and therapeutics for perspective, preventive, personalized, and participatory medicine, that is, P4 medicine. I hope that such researches are promoted by international collaboration.

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