Keynote Lecture VIII

Digital Differential Display - A Powerful Tool to Define Molecular Signature

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After graduating in Medicine at Kobe University in 1987, Shinya Yamanaka worked as a clinician for two years and then took a PhD at Osaka City University, followed by three years at Gladstone Institute of Cardiovascular Disease in San Francisco, USA. He returned to Osaka in 1997. He has been Professor at Nara Institute of Science and Technology since 2003 and at Kyoto University since 2004.

His main research contributions have been in the understanding of the molecular mechanisms underlying pluripotency and rapid growth of mouse embryonic stem (ES) cells. His group was the first to show that the homeobox protein Nanog is essential for pluripotency in both ES cells and early embryos. They also showed that the constitutively active ERas protein stimulates proliferation of mouse ES cells.

He was awarded the NAIST Prize in 2003 and the Gold Medal Prize, Tokyo Technoforum in 2004.

Embryonic stem (ES) cells derived from inner cell mass of mammalian blastocysts grow rapidly and infinitely while maintaining pluripotency, the ability to differentiate into all types of cells. These properties have raised a hope that ES cells could be used to treat a host of degenerative diseases such as Parkinson's disease and diabetes. However ES cells also raised substantial ethical issues since human embryos have to be destroyed. One solution to avoid such ethical issues is to generate pluripotent cells directly from somatic stem and other cells. An essential step toward this goal is to identify so called reprogramming factors that can change somatic cells to the embryonic state. To this ends, we utilized *in silico* approach (digital differential display) to identify genes that are specifically expressed in ES cells and pre-implantation embryos. Characterization of these genes, which we designated ECAT for ES cell associated trasnscripts, has revealed important aspects of pluripotency and opened up an opportunity to identify reprogramming factors.