OMICS Group Conferences
Accelerating Scientific Discovery
3rd World Congress on
Cell Science & Stem Cell Research
November 20- 22, 2013 DoubleTree by Hilton Baltimore-BWI Airport, USA

Monitoring the effect of a stem-cell-converting therapy with a novel MRI cell tracking technique in a 4T1 breast cancer model at 7.0t

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Abstract

Metastasis, therapeutic resistance and cancer recurrence remain the main challenges of malignant cancer treatments. Despite many milestone achievements, the overall cancer therapeutic strategy remain the same over the past 50 years, focusing on a cell-killing strategy using chemical, radiation and/or surgical means. We hypothesize that stem-cell-converting based therapy could be a solution for the challenges. We have developed a protein induced pluripotent stem cells (piPSC) technology based on our novel QQ-protein delivery technique to generate piPSCs with 90±4% conversion efficiency using Sox2, Oct4 and Nanog (SON) proteins in less than one week. The high conversion allowed us to eliminate colony selection during piPSC generation and colonial expansion, significantly reducing the mutation rates associated with colony selection and accelerated piPSC expansion. This technology also eliminates oncogenic Klf4, c-Myc proteins, and also problems associated with using virus-based vectors. Based on our QQ-technique, we have also developed a novel MRI cell tracking techniques that use ferritin (instead of iron-particles) to directly label piPSCs. Preliminary study suggests:1) administration of 4T1-piPSCs into fat pads in a 4T1-breast cancer mouse model can induce tumor stasis, lung metastasis inhibition and differentiation into brown adipocytes and mammary ducts; 2) the QQ technique can label cells with ferritin, which naturally occurs in the body, for MRI cell-tracking; 3) 4T1-piPSCs displays a tropism for both primary and metastatic tumors.

Biography

Dr. Jiani Hu received his PhD from Vanderbilt University and completed his postdoctoral training in Fox Chase Cancer Center. Dr. Hu is the Vice Director of MRI Institute for Biomedical Research, Associate Professor of Radiology, and also a Scientific Member of Karmanos Cancer Institute at Wayne State University. He has published 90 papers in reputable journals and also serves as an editorial board member of PLOS ONE.