A protein-induced In situ cell-conversion technology and applications

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Technology description

Background

Cell reprogramming and trans-differentiation are techniques that convert somatic cells of individuals into either stem cells, including embryonic and adult stem cells (reprogramming) or the other type of somatic cells (trans-differentiation). These techniques are usually performed in the cell culture settings using viral gene delivery and genetically manipulating the somatic cells. This imposes significant safety concerns and prevents these techniques from safe human clinical applications to treat diseases. To date, no one has documented an in situ protein-induced cell reprogramming or trans-differentiation in the body of live animals. The low conversion efficiency of <1% creates a challenging position to perform the in vivo or in situ cell conversion in the animals and humans. This drawback significantly impedes wide applications of these techniques for disease treatment or regenerative medicine. Our researchers have improved conversion efficiencies to almost 100% and have eliminated viral delivery and genetic manipulations.

Technology

This new invention is an in situ protein-induced cell conversion technology that enables the conversion of somatic cells of individual animals into either stem cells, including induced pluripotent stem cells (piPSCs) and adult stem cells (cell reprogramming) or other types of somatic cells (trans-differentiation) by direct injections of reprogramming or trans-differentiation proteins into the specific tissues of live animals. This invention has shown promise treating invasive glioma (in rats) and metastatic breast cancer (in mice). This in situ protein-induced cell-conversion technology is based on a novel protein-induced pluripotent stem cell (piPSC) technology that generates piPSCs of a fully recovered differentiation potential from invasive cancer cells within one week with nearly 100% conversion. By repeat injections of reprogramming proteins daily into the tumors in live tumor-bearing animals, these proteins initiate cell reprogramming to reset the time clock of the aggressive cancer cells back to the pseudo embryonic stage, which are able to differentiate into normal cells of the specific tissues.

Application area

This in situ protein-induced cell conversion technology can be applied in many scientific research fields including developmental biology, physiology, pathology, immunology, pharmacology, neurology, dermatology, obgyn, and oncology.

Advantages

This protein-induced in situ cell conversion technology can be used to treat many human diseases including but not limited to: heart disease, strokes, diabetes, obesity, cancers, Alzheimer’ s disease, Parkinson’ s disease, ALS, myocardial infarction, muscular dystrophy, CMT-1A, spinal cord injuries, traumatic brain injury, learning defects, missing teeth, wound healing, bone marrow transplantation, osteoarthritis, rheumatoid arthritis, baldness, blindness, deafness, and Crohn’ s disease.

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