Epigenetic Signatures for Quality Control of Pluripotent Stem Cells

INVENTION: The reprogramming of mature cells to a pluripotent state similar to embryonic stem cells (ESC) requires complete reversion of the somatic epigenome to an ESC-like state. Our investigators used whole-genome profiling of the DNA methylomes of multiple ESC, iPSC (induced pluripotent stem cells), and somatic progenitor lines to identify epigenomic signatures in human iPSCs that differ from human ESCs. These differentially methylated regions in the human iPSC genome are useful for identifying iPSCs and can be used as diagnostic markers for incomplete iPSC reprogramming. In addition, these signatures can be used to aid characterization of the efficacy of different reprogramming techniques, identification of the factors that enable reprogramming, and standardizing the manufacture of stem cells for application sin cell therapy and drug development screening.

APPLICATIONS:

- Identification of iPSCs
- Diagnostic marker for incomplete reprogramming
- Characterization of the efficacy of different reprogramming methods
- Identification of reprogramming factors
- Cell purity analysis
- Standardization of iPSCs across multiple reprogramming methods
- Generation of stem cells to GMP standards
- Monitor stem cell integrity

ADVANTAGES:

- Based on whole genome profiles of DNA methylation at single-base resolution in five human iPSC lines
- Provide loci information for differentially methylated regions in iPSCs
- Well-characterized stem cells
- Scale up for integration with clinical GMP facilities

STAGE OF DEVELOPMENT: In vitro data

BACKGROUND: Generation of iPSCs from somatic cells offers tremendous potential for therapeutics, the study of disease states and elucidation of development processes, without the controversy of using embryos. Understanding the full range of epigenomic variability and the factors that enable complete reprogramming to occur is invaluable for the progression of stem cell research and the development of cell regeneration therapies using iPSCs.

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PATENT STATUS: U.S. patent 9,427,811

PUBLICATIONS:

Lister, et al. 2011. Hotspots of aberrant epigenomic reprogramming in human induced pluripotent stem cells. Nature, 471:68-73.
http://www.salk.edu/news-release/cell-reprogramming-leaves-a-footprint-behind/

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