MACHINE LEARNING AND/OR NEURAL NETWORKS TO VALIDATE STEM CELLS AND THEIR DERIVATIVES FOR USE IN CELL THERAPY, DRUG DELIVERY, AND DIAGNOSTICS

SUMMARY (1024-CHARACTER LIMIT)

Researchers at the National Institute of Health (NIH) and National Institute of Standards and Technology (NIST) seek licensing or co-development partners for a method to predict functions, identity, disease state, and health of stem cells using machine learning.

NIH REFERENCE NUMBER

E-058-2018

PRODUCT TYPE

- Software

KEYWORDS

- Machine Learning, Neural Networks, Stem Cell Diagnostics, Less Invasive Diagnostics, Cell Therapy, Stem Cell Therapy, Cell Validation, Quality Control, Bharti

COLLABORATION OPPORTUNITY

This invention is available for licensing and co-development.

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STATUS

Active

DESCRIPTION OF TECHNOLOGY

Many biological and clinical procedures require functional validation of a desired cell type. Current techniques to validate rely on various assays and methods, such as staining with dyes, antibodies, and nucleic acid probes, to assess stem cell health, death, proliferation, and functionality. These techniques potentially destroy stem cells and risk contaminating cells and cultures by exposing them to the environment; they are low-throughput and difficult to scale-up. Therefore, there is a significant need for potentially less invasive, scalable, higher throughput methods of validation, while maintaining quality and accuracy.

Trained biologists can often recognize cells and phenotypic cell function based on cell appearance under a microscope. Applying machine learning to perform similar visual analysis may have many advantages. Computer-automated, image-based validation of a cell's function does not require exposing the cells to the environment, thus significantly reducing the chance of cell contamination or destruction. Furthermore, such technology could be more inexpensive to implement than other validation or quality controls. It even has potential for high throughput use, to be scaled up, for many applications in research, manufacturing, and cell therapeutics settings.

Scientists at the National Cancer Institute (NCI) and National Institute of Standards and Technology (NIST) have developed an image-based machine learning system that is able to validate functional cell phenotypes. The system may be trained to automatically recognize image features that correlate to a desired cell-type or properties for research, diagnostic, and therapeutic purposes. Learned models based on multiple visual characteristics may be developed using this system. The system has been shown to accurately recognize retinal pigment epithelial (RPE), with validated physiological function. It may also be trained to recognize numerous other cells such as embryonic stem cells (ESC), induced pluripotent stem cells (IPSC), neural stem cells (NSC), mesenchymal stem cells (MSC), hematopoietic stem cells (HSC), and cancer stem cells (CSC). This novel technology may have applications for cell therapies & transplants, (including those that are stem cell-derived), and for validation, quality control, and cell diagnostics in many areas.

POTENTIAL COMMERCIAL APPLICATIONS

- Stem cell therapies
- Validation
- Quality control
- Cell diagnostic
- Clinical diagnostic

COMPETITIVE ADVANTAGES

- Least invasive means of identifying cell qualities
- Inexpensive means of performing cell diagnostics

INVENTOR(S)

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DEVELOPMENT STAGE

- Pre-clinical (in vivo)

PATENT STATUS

- **U.S. Provisional:** U.S. Provisional Patent Application Number 62/644,175 , Filed 16 Mar 2018

THERAPEUTIC AREA

- Cancer/Neoplasm
- Cardiovascular Systems
- Skin and Subcutaneous Tissue