Bulk synchronization of stem cell cycle for efficient tissue regeneration

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Technology description

Summary

This technology describes a method for synchronizing the cell cycle in a population of stem cells to ensure a uniform response to differentiation signals.

Unmet Need: Consistent, bulk production of synchronized stem cells

Stem cells derived from patients can be differentiated into a variety of cell types, holding great potential for use in regenerative and personalized medicine. The large cell numbers needed for these applications, however, requires the expansion of cell populations in a 2D cell culture system, a process that often introduces asynchrony in cell cycle progression. This asynchrony greatly hinders the efficacy with which stem cells can be differentiated into target cell types, as cells may respond variably to exogenous factors. As such, there is a need for a simple culturing method that synchronizes the cell cycle in a population to enable a homogenous response to differentiation signals.

The Technology: Efficient cell culture system synchronizes stem cells to ensure uniform differentiation

This technology is a drug-free method for synchronizing the cell cycles in a population of cells that only requires physical cell culture methods. Following suspension culture in methylcellulose, previously asynchronous cells are arrested at G1, a critical inflection point in the cell cycle. Subsequent 2D culture of arrested cells allows for simultaneous reentry to the cell cycle. The synchronized cell population can then be transferred to a 2D or 3D culture environment for optimal differentiation into the desired cell type. By ensuring all the cells in a population have a synchronized cell cycle, this technology provides a robust method for the generation of stem cells that could aid efforts in developing stem cell-based approaches to tissue engineering and regenerative medicine.

This technology has been validated in human and bovine stem cell populations from articular cartilage.

Lead Inventors:

Publications

Application area

Platform-based method of stem cell synchronization

Patient-specific tissue generation

Personalized and regenerative medicine

Preservation of tissue quality over multiple passages

Advantages

Synchronizes the cell cycles in a population without drugs or chemicals

Capitalizes on differential responsiveness of cells in various cell cycle stages to external cues, resulting in superior tissue development

Adaptable to multiple tissue types

Required reagents are readily available

Institution

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