



Office of Technology Management

Reprogramming and Expansion of Primitive Hematopoietic Cells

Technology Reference

CW032

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Field

Hematopoiesis
Cell culture

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partner

Patent Status

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Application filed

Overview

HSC's are self-renewing, multi-potential cells mainly residing in bone marrow that are the progenitors of red blood cells, white blood cells and of the cells of the immune system. The HSC can also be isolated from umbilical cord blood and from the peripheral blood. HSC's comprise only a small fraction of bone marrow cells or umbilical cord blood cells, but are a critical element in hematopoietic stem cell transplantation due to their ability to colonize bone marrow and to differentiate into the full complement of hematopoietic cells. Numerous attempts have been made to grow HSC's in cell culture in order to obtain sufficient numbers of such cells for use in transplantation. These attempts to culture HSC's have met with limited success due to the propensity of HSC's to differentiate and to, therefore, to lose their capability for self renewal and colonization.

Technical Summary

There is evidence that maintenance of self-renewal and multi-potential capability requires that HSC's express a broad set of transcription factors and an open chromatin structure. Furthermore, certain patterns of DNA methylation and histone acetylation are known to be associated with HSC differentiation and loss of self-renewal capability. This invention demonstrates that treatment of HSC's with agents that promote DNA hypo-methylation and hypo-acetylation during cell culture result in the retention of self-renewal and multi-potential capability even in the presence of cytokines that promote differentiation. Umbilical cord blood transplantation has become a standard therapeutic option for pediatric patients with hematologic malignancies. However the limited numbers of stem cells present in a cord blood graft compromises the outcome of the transplant in an adult patient. Our culture method of expanding cord blood stem cells in vitro prior to administering to patient has the potential to increase the number of stem cells optimum for an adult.

This invention presents a means of growing and expanding Hematopoietic Stem Cells (HSC's) in cell culture while suppressing differentiation but capable of retaining the self-renewing capability of HSC's. Cells grown in accordance with this invention have been demonstrated to be capable of engraftment and or restoration of immune function.

Benefits

- Method for expanding HSC's harvested from a patient to levels that are desirable for use in bone marrow transplantation procedures.
- These cells retain the self-renewal and multi-potential capabilities of HSC's; are capable of engraftment; and are capable of self-sustaining restoration of immune function.

Areas of Application

- Stem cell transplants
- Cellular therapy
- Cell culture
- Insertion therapeutic genes

Stage of Development

- Use Engraftment has been demonstrated in laboratory