A METHOD TO DERIVE FUNCTIONAL HEPATOCYTES

IITM Technology Available for Licensing

Problem Statement

- The current challenges in treating liver failure revolve around the limitations of liver and hepatocyte transplantation, including donor availability and high costs.
- Stem cell-based approaches, particularly with mesenchymal stem cells (MSCs), hold promise, but existing differentiation protocols are expensive and time-intensive.
- Moreover, reliance on a single small molecule for differentiation raises concerns about long-term efficacy.
- Despite the advantageous immunomodulatory properties of MSCs, their potential in clinical settings remains underexplored due to extended differentiation times and cost considerations.
- There is a critical need for a more efficient, cost-effective, and **technology-driven method to derive functional hepatocytes from MSCs for effective liver failure treatment.**

Intellectual Property

- IITM IDF Ref. **2025**
- **IN 411233 - Patent Granted**

Technology Category/ Market

Regenerative Medicine & Stem Cell Therapy.
Applications- Liver Failure Treatment, InVitro Drug Testing, Biomedical Research

Industry- Regenerative Medicine, Pharmaceuticals.

Market - The regenerative medicine market was valued at $12.2 billion in 2022 and is forecast to reach $40.6 billion by 2027, reflecting a **CAGR of 27.2%.**

Technology

- The present invention relates to a method for **deriving functional hepatocytes from mesenchymal stem cells** using a combination of small molecules.

Accelerated Differentiation Process: Unlike traditional methods requiring 28 days, the present invention achieves hepatocyte differentiation in just 14 days. This shortened duration enhances the practicality and efficiency of the process for clinical applications.

Consistent and Defined Media Composition: The chemically defined composition of the differentiation media eliminates batch-to-batch variation, ensuring a standardized and clinically viable protocol for deriving functional hepatocytes.

Safe and Clinically Relevant Source: Utilizing mesenchymal stem cells, which are already employed in clinical settings, ensures the safety and relevance of the derived hepatocytes for therapeutic use in liver failure treatment and in vitro drug testing.

TRL (Technology Readiness Level)

TRL - 4: Technology validated in lab scale.

Research Lab

Prof. Rama S Verma,
Dept. of Biotechnology

CONTACT US
Dr. Dara Ajay, Head
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
https://ipm.icsr.in/ipm/

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719

Images

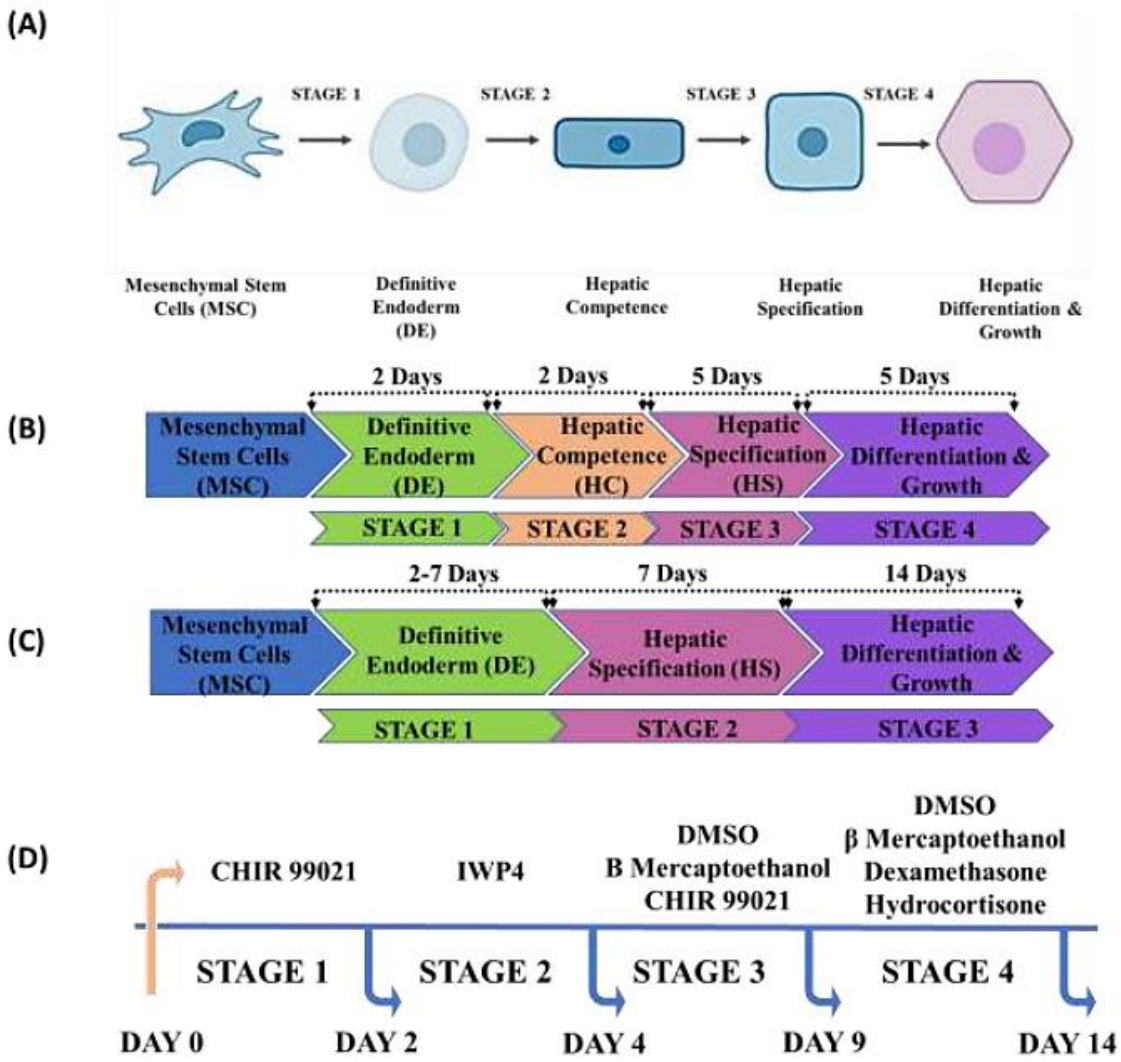

Figure 1

Figure 1(A) illustrates schematic representation of the stage specific differentiation of hepatocytes developed in the present invention.
Figure 1(B) illustrates chronological representation of stages employed in the differentiation of hepatocytes using small molecules in the present invention.
Figure 1(C) illustrates the established growth factor-based protocol.
Figure 1(D) illustrates the description of use of small molecules in the present invention along with optimized time taken to induce stage specific cell types for hepatocytes deviation.

CONTACT US
Dr. Dara Ajay, Head
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
https://ipm.icsr.in/ipm/

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719

Key Features / Value Proposition

1. Cost Efficiency and Affordability:

- The chemical method significantly reduces costs compared to growth factor-based approaches, offering an economically viable solution for hepatocyte differentiation

2. Rapid Differentiation Timeline:

- Achieves functional hepatocyte differentiation in just 14 days, providing a time-efficient alternative to the conventional 28-day duration associated with growth factor-based methods.

3. Consistent and Defined Media Composition:

- The chemically defined media ensures consistency, eliminating batch-to-batch variation and providing a standardized protocol for deriving functional hepatocytes.

4. Clinical Viability and Safety:

- Derives hepatocytes from mesenchymal stem cells, already used in clinical settings, ensuring safety and making it a suitable candidate for clinical applications in liver failure treatment.

5. Alternative to Growth Factors:

- Overcomes the need for growth factors, reducing the overall complexity and cost of the differentiation process for functional hepatocytes.

6. Versatile Applications:

- Extends beyond liver failure treatment to include potential applications in cell-based therapeutics and in vitro drug testing, enhancing its versatility and relevance across multiple domains.

CONTACT US
Dr. Dara Ajay, Head
Technology Transfer Office,
IPM Cell- IC&SR, IIT Madras

IITM TTO Website:
https://ipm.icsr.in/ipm/

Email: smipm-icsr@icsrpis.iitm.ac.in
sm-marketing@imail.iitm.ac.in
Phone: +91-44-2257 9756/ 9719