

In-Vitro Human Bone Marrow-on-a-Chip

A device for creating a more comprehensive human bone marrow mimic for drug screening and toxicity tests

Georgia Tech researchers have developed a microfluidic organ-on-a-chip to generate a human bone marrow mimic. The device creates three bone marrow microenvironments to allow for distinct support and regulation of hematopoiesis, the production of blood cells and platelets in bone marrow, and hematopoietic stem cell (HSC) maintenance. These microenvironments replicate the three environments of bone marrow, the endosteal niche, the central marrow, and the perivascular niche. The device consists of five channels, a central-gel channel, two media channels, and two outer-gel channels. Cells are 'seeded' in the central-gel channel and begin to grow; cells are then loaded into the outer-gel channels. Media channels are filled with cells over five days as the cells grow and reach maturity. After the vascular system has formed within the device, the quality is tested by exposing it to chemotherapeutics or radiation. This device may allow for expanded disease research and personalized medicine.

Summary Bullets

- **Comprehensive** – Reconstructs the three environments of bone marrow, current technologies reconstruct two
- **Quick** – Does not require lengthy implantation period within an animal model
- **Personalized** – Allows for patient specific drug screening bone marrow tests

Solution Advantages

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Potential Commercial Applications

- High Throughput Ex-Vivo Drug Screening
- Toxicity Tests
- Disease Research

Background and More Information

Bone marrow samples are increasingly desirable for drug discovery because of their wide range of disease research applications. Bone marrow is very sensitive to toxicity. When used in research, toxic components can more easily be identified and eliminated. The use of bone marrow in toxicity tests and drug screening allows researchers to create and edit pharmaceuticals and therapies, decreasing risk associated with side effects and reactions. Further, fresh bone marrow samples allow researchers to isolate sensitive biomarkers for disease research. Replicating human bone marrow may significantly increase research opportunities and drug screening on a patient-to-patient basis.

Inventors

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IP Status

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Publications

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Images

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