Docket #: S17-466

LPM-3D: Cell culture media to grow and expand Sox9+ multipotent mouse lung stem cells

Researchers at Stanford and their colleagues have developed cell culture media, known as LPM-3D, to grow a pure population of multipotent lung stem cells in culture. The lungs are the target of many prevalent diseases but, currently, there are no regenerative therapies for lung disease. One challenge has been obtaining a multipotent stem cell that can generate both lung compartments- the airways (which allow air to pass in and out of the lungs) and the alveoli (which allow gasses to pass in and out of the blood). As a first step toward future lung regenerative therapies, the inventors identified $Sox9^{+}$ multipotent stem cells that can generate both airways and alveoli. This technology provides the LPM-3D cell culture media they developed to enable long term expansion of these multipotent lung stem cells. The media was used in a feeder-free, serum-free 3D culture regimen that allowed for rapid proliferation, great expansion and *in vitro* culture of the cells for more than 6 months. This technology enables the normally transient $Sox9^{+}$ multipotent stem cells to be stably and clonally expanded over the long term in culture.

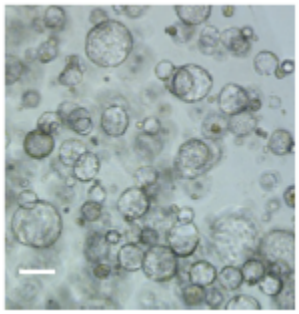

Image of stem cell colonies after 6 days in culture.

Stage of research
The inventors have shown that in LPM-3D conditions, $Sox9^{+}$ lung stem cells rapidly proliferated and maintained progenitor markers and normal karyotype for more than 6 months. Further, the stem cells differentiated into airway and alveolar lineages *in vitro* and *in vivo*.

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Applications

- Culture media for mouse lung stem cells

Advantages

- Allows growth of a pure population of mouse multipotent lung stem cells in culture
- Cells grown in this media can regenerate new lung tissue *in vivo*
- Cell culture media:
  - Allows for rapid proliferation of lung stem cells
  - Promotes great expansion of cells (approximately 10^{20} expansion of cell numbers)
  - Enables long term maintenance of cells in culture (more than 6 months)
  - Selects for propagation of the desired stem cells over other lung cells

Publications

- Nichane M, Javed A, Sivakamasundari V, Ganesan M, Ang LT, Kraus P, Lufkin T, Loh KM, Lim B. Isolation and 3D expansion of multipotent Sox9+ mouse lung progenitors. Nat Methods. 2017 Dec;14(12):1205-1212. doi: 10.1038/nmeth.4498. Epub 2017 Nov 6.
- Vaughan, C. Researchers find lung stem cell, heal lung injury in mice. Stanford News. 2017 Nov 14.

Innovators

- Bing Lim
- Massimo Nichane
- Kyle Loh

Licensing Contact

Cheryl Cathey

Senior Licensing and Strategic Alliance Manager

Email