Docket #: S21-374

Targeted locoregional delivery of therapeutic extracellular vesicles with enhanced bioenergetic profile

Researchers at Stanford have developed a novel cell-free stem cell derived extracellular vesicle (EV) therapy powered by pulsed focused ultrasound (pFUS) that enhances its therapeutic and bioenergetic effect. The therapeutic effect of Mesenchymal Stem Cells (MSCs) comes not from stem cell differentiation but from their release of EVs which contain therapeutic factors. The Stanford research group investigated the use of purified MSC derived EVs as a form of cell-free therapy. MSC-EVs are small enough to bypass the microvascular trapping in the lung, allowing them to reach targeted areas. The group optimized the therapeutic effects by using pFUS to stimulate MSCs which they have shown increases the bioenergetic potential of the cargo within the EVs. The group has demonstrated the therapeutic effect of this cell-free therapy in intro and in vivo in a mouse model of lung injury. This pFUS-MSC-EV is system is cell-free, noninflammatory, stable and effective, and it has profound clinical translations for treatment of other pathologies.

Stage of Development:
In vivo mouse work

Applications

- Therapeutic treatment of chronic or acute respiratory distress syndrome and other related lung diseases
- Therapeutic treatment of kidney injury
- Treatment for other diseases with mitochondrial dysfunction such as pneumonia, chronic obstructive pulmonary disease, bronchial asthma, and idiopathic pulmonary fibrosis

Advantages

- Cell-free, non self-replicating therapy
- Easy storage and transportation while maintaining biologically active
- Less susceptible to damage by hostile environment
- Various modes of safe tissue delivery
- Allogeneic transplantation

Patents

- Published Application: WO2023077160
- Published Application: 20260069633

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