Docket #: S18-056

Ultrasound-induced convection for drug delivery and controlled perfusion of therapeutics via glymphatic and lymphatic flows

A common hurdle for many drug delivery applications is getting the desired compounds to the targeted cells or receptors. Additional barriers of achieving the therapeutic drug concentration and necessary drug diffusion are also present even after successful targeted delivery. The Airan lab at Stanford leveraged ultrasound to overcome these barriers, accelerating the transport of drugs within the interstitium of an organ and developing a novel ultrasound technique for drug delivery. By applying low-intensity focused ultrasound directly to the desired organ, the method can be used to noninvasively facilitate drug diffusion in a timed and controlled manner. The invention can also be applied therapeutically on its own by modulating lymphatic and glymphatic flow. Additionally, prior work by the inventors demonstrated the efficacy and safety of the method in delivering drugs to the brain. By enhancing the delivery of a therapeutic to the CNS following intrathecal administration (i.e. via spinal tap), the technology can be incorporated as a treatment for neurodegenerative disorders including Alzheimer's, traumatic brain injury, sleep disorders, pseudotumor cerebri, and other CNS disorders. As the only noninvasive method that can safely administer therapeutics to the whole brain, the invention provides a novel tool that can be used to develop targeted therapies for neurodegenerative disorders.

Applications

- Therapies that drive lymphatic flow to treat lymphedema and related cancers
- Neuromodulatory device for therapies to treat neurodegenerative disorders (e.g. Alzheimers, CNS disorders, etc)

- Scientific tool that can be used in neuroscience research

Advantages

- Noninvasive and targeted delivery of therapeutics to the organ / cells of interest, even to deep regions of the tissue
- Compatible with existing drug delivery approaches to achieve improved performance
- Can effectively impact the glymphatic and lymphatic flow in a controlled and timed manner

Publications

- Aryal, M., Zhou, Q., Rosenthal, E. L., & Airan, R. D. (2020). " Noninvasive Ultrasonic Glymphatic Induction Enhances Intrathecal Drug Delivery." bioRxiv.

Patents

- Published Application: 20220072128

Innovators

- Raag Airan

Licensing Contact

Eileen Lee

Email