



Targeting Primary Cilia with Nanoparticles

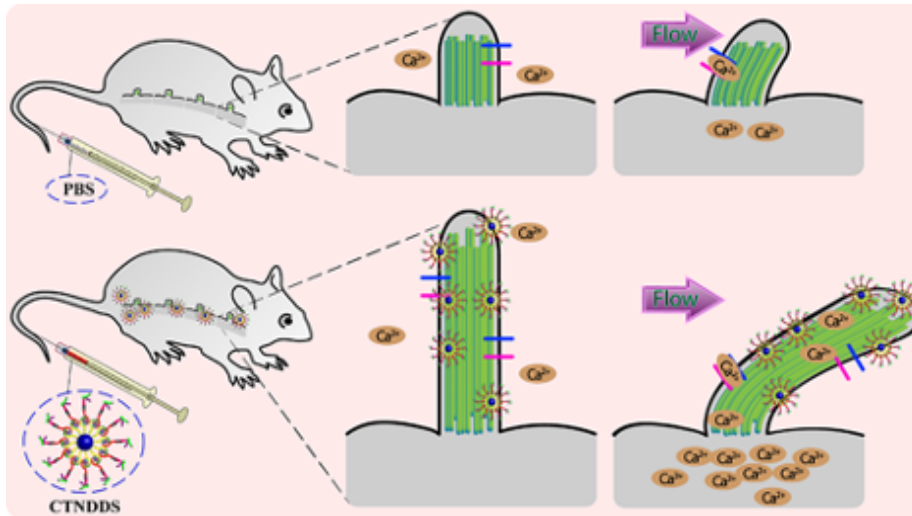
Chapman Case #2020-001

Market Need

A potential drug that can treat hypertension in Autosomal Dominant Polycystic Kidney Disease (ADPKD) is fenoldopam. The most effective way to use fenoldopam for this disease is to directly deliver the drug to the primary cilia of the affected cells. Currently, fenoldopam can only be delivered via pump perfusion, often resulting in excessive dosage which in turn causes tachycardia-induced high blood pressure, a major side effect. The proposed invention solves this problem by delivering fenoldopam via nanoparticles selectively to the cilium, resulting in a much more targeted and specific drug delivery, and a significant reduction of drug dosage; thus, enabling fenoldopam to be used effectively to treat hypertension.

Chapman Solution

[Dr. Surya Nauli](#) and Dr. Rajasekharreddy Pala at Chapman University have invented a cilia-targeted nanoparticle drug delivery system that delivers fenoldopam to the primary cilia of targeted cells in ADPKD disease models. There are no existing nanoparticles in current literature that target cilia either in vitro or in vivo studies. Our research showed successful binding of the nanoparticles to the primary cilia of the targeted cells in vivo, with a slow-sustained release of fenoldopam at a rate of between 50-60% of maximum release over 60 hours, when we administered as a single bolus injection. The loading efficiency of the fenoldopam is about 55%. Flow cytometry and other preclinical toxicology studies also showed no toxicity of the nanoparticles.



Applications

- Targeted delivery of fenoldopam into the cilia of hypertension cells
- In addition to delivering fenoldopam effectively, the invention has the potential to work with other drugs and/or different types of nanoparticles to enable targeted drug deliveries for other illnesses, especially ciliopathies

Key Publication

- [Ciliotherapy: Remote Control of Primary Cilia Movement and Function by Magnetic Nanoparticles](#), ACS Nano, 2019
- [Personalized Nanotherapy by Specifically Targeting Cell Organelles To Improve Vascular Hypertension](#), Nano Letters, 2019

Intellectual Property

- U.S. patent application filed: 17/105,949

Stage of Development

- *In vivo* demonstration of fenoldopam delivery to the cilia of hypertension cells in mice
- Available for licensing and further research collaborations

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