

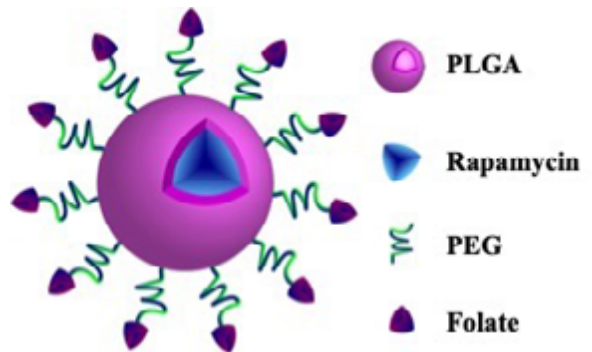


Targeting Polycystic Kidney Disease with Nanomedicines

Chapman Case #2020-009

Market Need

Polycystic Kidney Disease (PKD) is a condition characterized by abnormal cellular proliferation in renal epithelial cells, resulting in the growth of fluid-filled sacs (cysts) in the kidneys. The growth of the cysts can eventually cause the patient's kidneys to increase in size (up to 3 – 4 times larger than normal), leading to kidney failure and other problems such as abdominal pain, high blood pressure, kidney stones, and urinary tract infections. Rapamycin is a well-known drug being studied to treat PKD but its optimal dosage is constrained by its side effects. Since targeted drug delivery has been shown to be effective at mitigating the side effects of overdosing, to treat PKD, there is a need for a specific kidney-targeting delivery system that can deliver the ideal dose of rapamycin into the PKD-affected renal cells while limiting the side effects.



Chapman Solution

Researchers at Chapman University, led by Dr. Surya Nauli, have designed a kidney-targeting PLGA-nanoparticle delivery system via drug-folate conjugation to deliver rapamycin-TEMPO to PKD-affected renal cells. This delivery system demonstrated high selectivity for rapamycin-TEMPO uptake by the polycystic kidney cells. In addition to high selectivity, the proposed delivery system also allows for a sustained release of the drug, which make weekly dosage sufficient to treat PKD, instead of administering the treatment on a daily basis. The proposed nanoparticle system can carry the drug without modifying its chemistry, thus not changing its pharmacological action. Nanoparticle delivery is also known to be very stable.

Applications

- Targeted drug-delivery of rapamycin-TEMPO to PKD-affected cells
- Potential multiple-therapy strategy with a capability of loading more than one pharmacological agent
- Potentially efficacious for other renal epithelial disorders

Key Publication

“Folate conjugated nanomedicines for selective inhibition of mTOR signaling in polycystic kidneys at clinically relevant doses”, Science Direct, November 2023.

Intellectual Property

- US patent application filed

Stage of Development

- In-vivo demonstration of delivering rapamycin-TEMPO using the proposed PLGA-nanoparticles into PKD-affected cells, showing high selectivity and drug uptake
- Available for licensing and further research collaborations

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