

A Nanoparticle Delivery System for Treatment of Glomerular Diseases

Researchers at the University of South Florida have developed a novel nanoparticle delivery system to specifically target glomeruli for the treatment of glomerular diseases.

Glomerulonephritis is a group of inflammatory diseases that damage the filters of the kidney, glomeruli. Patients with glomerulonephritis exhibits a wide variety of symptoms from asymptomatic proteinuria to end-stage renal disease. Glomerulonephritis requires aggressive immunosuppressive therapy, but unfortunately most current agents produce severe side effects. Therefore, development of new site-targeted strategies to minimize side effects while maintaining high local therapeutic efficiency could open a new avenue for more effective disease management. Perfluorocarbon (PFC) nanoparticles comprise a hydrophobic PFC core. With a nominal size of 200 - 250 nm, PFC nanoparticles are limited primarily to intravascular spaces unless the integrity of endothelial barriers is compromised .

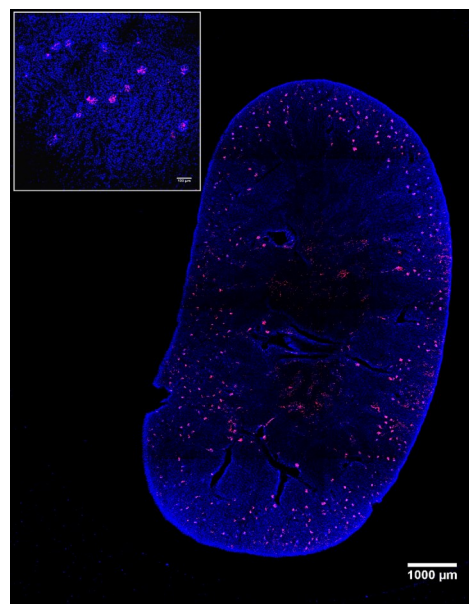
Collagen IV is expressed in the glomerular basement membrane, which is the only site in the body that collagen IV has direct contact with blood via fenestrated capillary endothelium. USF inventors have formulated the collagen IV targeted PFC nanoparticles with amine-carboxyl coupling to a collagen IV targeting peptide. Furthermore, they have demonstrated that: 1) the collagen IV targeted PFC nanoparticles selectively bind to collagen IV coated surface as well as collagen IV in mesangial cells in vitro; 2) fluorescent signals are detected exclusively in glomeruli at 24 hours after i.v. injection of the collagen IV targeted PFC nanoparticles labeled with rhodamine; 3) loading of prednisone in the collagen IV targeted PFC nanoparticles is possible and quantifiable with high-performance liquid chromatography (HPLC).

The development of the glomerulus-targeted therapeutic PFC nanoparticles might have strong translational significance and offer potent site-specific precise treatments for glomerular diseases with minimized systemic side effects.

ADVANTAGES:

- Site-specific precise treatment
- High local therapeutic efficiency
- Minimized systemic side effects

Novel Delivery System for Glomerular Diseases



*Representative Images of Kidneys from Mice
Receiving the Collagen IV Targeted PFC
Nanoparticles
(Red: nanoparticles, Blue: nucleus)*

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