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Urothelial differentiation of human urine-derived stem cells with barrier functional for urological tissue repair

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Abstract

Urothelial cells act as a permeability barrier and protect underlying muscle tissue from the caustic effects of urine, which prevent formation of scarring in urethras and bladder tissue repair. It is a challenge to induce mesenchymsal stem cells to differentiate into urothelial cells with barrier function. This study demonstrated that urine-derived stem cells (USC) possess self-renewal and multipotent capacity, and can efficiently give rise to urothelial cells with barrier function *in vitro*. USC may be a potential cell source for tissue regeneration in urology.

Biography

Yuanyuan Zhang has been conducting research in stem cell biology, cell therapy, microspheres for drug delivery, tissue engineering, and regenerative medicine in urology for 20 years. He was the first to demonstrate that stem cells exist in urine and that those cells with self-renewal and multipotent capacity have a number of potential applications in cell-based therapy or invasive diagnosis in urology. He has a productive record of 72 original peer-reviewed research publications. In addition, he has received 6 patents for his work and applied for 2 more. Since 2006, he has been a faculty member at the Wake Forest Institute for Regenerative Medicine (WFIRM), a premier environment for research in cell therapy for stress urinary incontinence. At WFIRM, he has expanded his research to include studies of adult mesenchymal stem cells, decellularized extracellular matrix biological scaffolds, and alginate microspheres for drug release for urological applications.

In establishing optimal approaches to enhance stem cell therapy combined with growth factors for urinary incontinence, Dr. Zhang has built strong ties with the clinical and research community inside and outside the Institute. He has collaborated with other researchers, including Drs. Emmanuel Opara and Xiaobo Zhou, and produced several peer-reviewed publications from each project. For this proposal, his co-investigators Dr. Opara will provide additional expertise in FDA-approved alginate microspheres for drug delivery, and Dr. Zhou will offer his expertise in synergetic effect of growth factors on cell survival, growth, differentiation, revascularization, never regeneration and recruiting the resident cells to participate into urethral sphincter tissue repair.

Dr. Zhang has a broad background in urology, stem cell biology and tissue engineering, with specific training and expertise in key research areas required for this application. He serves as an editor for two scientific journals and a peer reviewer for 27 peer-reviewed journals in urology, tissue engineering, biomaterials and related fields. Furthermore, he has successfully administered project components such as staffing and budget management. He has a demonstrated record of successful and productive research projects in an area of high relevance for patients with stress urinary incontinence.