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Editorial

Stem Cell Tecnology in Urology

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Stem cells are the body's raw materials from which all other cells with specialized functions are generated. Under the right conditions in the body or a laboratory, stem cells divide to form more cells called daughter cells [1]. Findings have shown that stem cells can be used to promote tissue regeneration and repair in patients with urinary incontinence or erectile dysfunction. Additionally, stem cells can regenerate damaged renal tissue, offering the latest treatment options for patients with kidney disease. A promising area of research includes the use of Mesenchymal Stem Cells (MSCs) to treat urological conditions. They have been shown to improve the quality of life in patients with urinary incontinence. Research has shown that iPSCs (induced pluripotent stem cells) can be used to produce functional urothelial cells, which line the urinary tract and play a key role in bladder function. [2]

Stem cell role has been studied in bladder dysfunction, painful bladder syndrome, bladder outflow obstruction, stress urinary incontinence, erectile dysfunction, and urethral regeneration. Stem cells research in uro-oncology, especially bladder and prostate cancer, provided significant insight in understanding pathogenesis processes and expanded potential therapeutic options [3].

Due to the resistance of many patients with sexual dysfunction, especially in the case of concomitant diabetes, to conventional drug therapies, it is necessary to discover new alternative treatments for these patients. It can be concluded that intracavernosal stem cell injection improves sexual function, as well as Peak Systolic Velocity (PSV) and Resistance Index (RI) [4]. Changes are needed to help speed the translation of stem cell therapies for the major need in kidney diseases [5]. Studies involving, transgenic mouse models and novel differentiation protocols of pluripotent stem cells (PSCs), have shed light on the factors and processes involved in the formation of renal cells, thereby providing an understanding of successful renal regeneration [6]. *In vitro* expansion of discrete stages of early human nephrogenesis in nephron stem cell cultures may be used for drug screening on a full range of developing kidney cells and for prospective isolation of mesenchymal or epithelial renal lineages for regenerative medicine [7].

A mammalian kidney contains a large number of nephrons (approximately one million in humans), which are functional units consisting of glomeruli and renal tubules. The kidney is formed by reciprocally inductive interactions, starting at embryonic day 10.5. Progenitors are generated from mouse embryonic stem cells and human induced pluripotent cells could be expanded with retained nephron-forming potential [8]. Despite being a biological waste, human urine contains a small population of cells with self-renewal capacity and differentiation potential into several cell types. Being derived from the convoluted tubules of nephron, renal pelvis, ureters, bladder and urethra, Urine-Derived Stem Cells (UDSC) have a similar phenotype to Mesenchymal Stroma Cells (MSC) and can be reprogrammed into iPSC (induced pluripotent stem cells). Having simple, safer, low-cost, and noninvasive collection procedures, the interest in UDSC has been growing in the last decade. With great potential in regenerative medicine applications, UDSC can also be used as biological models for pharmacology and toxicology tests [9]. The application of pluripotent stem cells iPSCs and Urine-derived stem cells USCs will be useful for predicting drug response and assessing environmental disease triggers in neuromuscular and neurodegenerative diseases. The development of USCs- and iPSCs-based technology provides a new platform in the field of disease modeling and works in complementary ways, it is expected to benefit research and clinical applications in personalized medicine [10].

Urine specimens represent a novel and non-invasive approach to isolate patient-specific stem cells by easy and low-cost procedures, replacing the traditional sources (muscle/skin biopsy/adipose tissue) obtained with invasive and time-consuming methods. Urine-Derived Stem Cells (USCs) can be used in a broad field of applications, such as regenerative medicine, cell therapy, diagnostic testing, disease modeling, and drug screening. USCs are a good source of cells for generating induced Pluripotent Stem Cells (iPSCs) and importantly, they can also be directly converted into specific cell lines. In this review, we show the features of USCs and their use as a promising in vitro model to study genetic diseases [11]. Stem cells can self-renew and differentiate and by this,

repair and in certain conditions regenerate damaged tissue. In the past two decades, there has been significant research into its value in several chronic urological conditions for which conventional therapy is unsatisfactory. Stem cell therapy has been tried on animal models of bladder dysfunction, Stress Urinary Incontinence (SUI), erectile dysfunction, and urethral injury and certain preclinical studies have had very encouraging results. Yet despite this explosion of knowledge about the nature and value of stem cells, translation of research into the clinical domain has been slow. In addition, lack of regulation of stem cell therapy has resulted in indiscriminate, unscientific administration of stem cell therapy to patients [12].

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