Cell-based Therapeutic Interventions: A Force Awakening

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Editorial

Cell-based therapy can be defined as the administration of live cells to the body of a patient for the treatment of a medical condition. This mode of therapy can be classified under three broad categories based on the disease indication and intended outcome. The replacement therapy is indicated under various diseases and involve therapeutic administration of red blood cells such as in cases of anemia, blood platelets for thrombocytopenia, and hepatocyte transplantation in viral diseases [1,2]. Second category of cell-based therapies is termed as immunotherapy. Use of various T lymphocytes for regulation of the immune system comes under immunotherapy [3]. Further, regenerative medical applications uses variety of cell based therapies such as stem cells and progenitor cells, which poses an ability to produce other cells [4]. Overall, cell-based therapeutics are applicable in variety of disease conditions such as cardiovascular diseases & stroke, diabetes, inflammatory and immune diseases, wound healing and soft tissue regeneration, neurodegenerative diseases, spinal cord injury, musculoskeletal disorders, and ocular disease. According to an estimate, by 2021 the requirements of cell-based therapeutics in regenerative medical applications will be US $53.7 billion [5]. Thus, cell-based therapeutics is indicative of a huge potential in the market requiring interplay between various organizations such as academic institutes, government organizations, and industry.

Cell-based therapy are highly individualized treatment and do not confirm to a single type of therapy. Therefore, regulated production of therapeutic cells under good manufacturing practice (GMP) is challenging. These are complex biological products and highly sensitive to their environment. Due to an intrinsic variability, which comes from both the source and process conditions, a tight regulation of manufacturing practices is essential. It become more important in autologous cell-based therapies, where patient is source of the cells and following certain modifications cells are returned to the same patient. It offers challenges in the quality test, logistics of personalized medicine, complexity for large-scale production and delivery of a cost effective treatment. The shelf life of cell-based products is another challenge. For example, shelf life of Provenge, an autologous peripheral blood mononuclear cell-based therapy where cells are suspended in Lactated Ringer's solution, is only 18 h at 2-8°C [6]. Besides shelf life, varieties of cells are used for specific treatment and require cell specific procurement and processing protocol. Thus, cell-based therapies are certainly not a "one-size-fits-all" kind of therapies and require an advanced understanding of characteristics of the cell.

Veterinary medicine plays an important role in advancing field of cell-based therapy. Stem cells have been predominantly used for orthopedic injury in horse and heart diseases of dog. Concerted efforts are underway to use cell-based therapies in disease conditions such as feline chronic kidney disease, feline chronic gingivostomatitis, canine inflammatory bowel disease, canine keratoconjunctivitis sicca, equine recurrent uveitis, and several other diseases. Besides, animals are extensively being used as model organism in translational research settings to test various cell based therapies.

Overall, cell-based therapy are in their infancy and contain a huge potential to cure various clinical conditions, both in animal and human, which are not treatable with current drugs and surgical practices. While these therapeutic options are exciting, it also poses a safety hazard. A slight change in the property of stem cell or immunotherapy can induce cancer or immunological syndrome. The under or altered performance of cells used in treatment is mainly a function of insufficient understanding of the fate of cell products following administration. Active research towards characterization of cells with therapeutic potential, development of practical guidelines for their usage and protocols for their manufacturing in a tightly controlled regulatory environment will go long way in harnessing potential of this green industry.

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