Short Communication

Stem Cell Research and Regenerative Medicine

Interpretations of Stromal Cells and Their Medical Relevance in the Treatment of Kittens and Puppies

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Abstract

The ability to differentiate into many cell types and the capacity to multiply like undifferentiated cells make stromal cells multipotent cells. The therapeutic potential of MSCs, such as cell therapy or tissue regeneration, is the subject of extensive research, and MSCs are regarded as potent instruments in veterinary regenerative medicine. Due to their immunosuppressive, immunomodulatory, and anti-inflammatory qualities as well as their minimal teratogenic risk as compared to pluripotent stem cells, they are the most popular type of adult stem cells in clinical studies. The current state of knowledge on MSCs' basic biology is described in detail in this review. In order to provide an overview of therapeutic developments based on MSCs in dogs and cats, we concentrate on the traits and properties.

Keywords: Regenerative medicine stromal cells • Biology • Treatment

Introduction

Current cell therapies use multipotent stromal cells isolated from adult tissues. They represent an emerging field of regenerative medicine aimed at restoring tissues and organs damaged by trauma, pathology, or the aging process [1]. Years of research into the therapeutic properties of stem cells in humans have shown the benefits that can be achieved in inflammatory and degenerative diseases by using adult stem cells, especially multipotent or bone marrow-derived stromal cells [2]. Although administration of MSCs is supported by immunosuppressive therapy, autologous MSCs, which allow for individualized immunomodulation, appear to be an interesting approach to limit immune risks and promotion of MSCs' apoptosis [3]. However, this approach requires isolation of patients without systemic disease or long-term storage of MSCs prior to transplantation, resulting in high additional costs. Several teams are looking to the use of allogeneic mesenchymal stem cells to enable manufacturing of therapeutic batches [4]. This approach is strengthened by the fact that injection of allogeneic mesenchymal stem cells appears to have the same immunomodulatory properties in vitro and in vivo. Due to the large individual differences in MSCs, it is preferable to select lots with high immunomodulatory capacity [5].

Mesenchymal stem cells

MSCs are immature cells derived from the mesenchyme, or embryonic connective tissue, which is part of the mesoderm. In adults they are found in connective tissue [6]. MSCs are present in varying abundance and potential throughout life, depending on the tissue of origin, age, and health status. Cells can be significantly isolated from a variety of connective tissues, especially bone marrow, umbilical cord, and adipose tissue [7]. Adult mesenchymal stem cells self-renew, generate multiple types of mature, functionally differentiated cells, and depending on the environment, select specific cells of mesodermal origin (adipocytes, myoblasts, osteoblasts, and chondroblasts) [8].

A total of 12 cats were treated, 6 in each group. Cats receiving fMSCs ranged in age from 4.5 to 13 years and included 3 spayed males and 3 spayed females weighing 4-5.9 kg.

Cats were injected intravenously with fresh allogeneic adipose tissue-derived MSCs at 2 × 106 cells/kg every 2 weeks [9]. The prednisolone group included castrated women with a mean age of 8.3 years and a mean weight of 3.6 kg. They received her 1–2 mg/kg oral dose every 24 hours. In each group, 1 cat failed a re-examination at 2 months of treatment, and 5 completed the 6-month study without changing diet or medication. The results showed that fresh allogeneic adipose tissue-derived MSCs are safe and can be safely administered to cats with IBD without side effects [10]. Responses to treatment were similar between groups receiving MSC infusion and those receiving standard prednisolone therapies. However, more comprehensive studies are needed to confirm efficacy and duration of effect.

Conclusion

In addition to scientific interest in regenerative medicine, interest in mesenchymal stem cells has also increased over time. Numerous studies have made it possible to characterize these cells and demonstrate their regenerative potential, and their use in new therapeutic approaches seems essential. In fact, her two key properties of mesenchymal stem cells make them extremely important for regenerative medicine. The ability to proliferate without losing its undifferentiated nature and the ability to differentiate into specialized cells. Other recently discovered properties, such as the ability to modulate the immune system or secrete molecules that influence the environment, also make them even more attractive. A better understanding of MSCs and their uses will enable the development of new therapeutic strategies, especially in veterinary regenerative medicine. Furthermore, MSC therapy is a promising option for treating multiple diseases. Long-term safety evaluations are highly recommended to ensure no adverse effects occur. If adverse events occur after stem cell intervention, it is important to report them and, more importantly, to consider potential risk factors such as toxicity, tumorigenesis and immune response. Additionally, there are regulations and guidelines for the use of stem cell-based products in veterinary medicine issued by the European Medicines Agency (EMA), the US Food and Drug Administration (FDA), and the Animal and Plant Quarantine Agency (APQA). Korean government endorses safety evaluation of cell-based products for animal use.

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