

Review Article

Stem Cells as New Agents for the Treatment of Infertility: Current and Future Perspectives and Challenges

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Stem cells are undifferentiated cells that are present in the embryonic, fetal, and adult stages of life and give rise to differentiated cells that make up the building blocks of tissue and organs. Due to their unlimited source and high differentiation potential, stem cells are considered as potentially new therapeutic agents for the treatment of infertility. Stem cells could be stimulated *in vitro* to develop various numbers of specialized cells including male and female gametes suggesting their potential use in reproductive medicine. During past few years a considerable progress in the derivation of male germ cells from pluripotent stem cells has been made. In addition, stem cell-based strategies for ovarian regeneration and oocyte production have been proposed as future clinical therapies for treating infertility in women. In this review, we summarized current knowledge and present future perspectives and challenges regarding the use of stem cells in reproductive medicine.

1. Introduction

Nearly 72.4 million people or 15% of couples experience fertility problems [1]. For couples and clinicians, a diagnosis of infertility signals the start of investigations and possible treatment. Infertility, defined as failure to conceive a clinically detectable pregnancy after >12 months of unprotected intercourse, is a common condition, reported by 1 in 6 couples [1, 2]. As infertility is a heterogeneous condition, caused by various underlying pathologies, it is possible that some of the mechanisms leading to infertility also play a role in the etiology of this outcome [3–5]. In recent years, several advancements have been made in assisted reproduction treatment and now more than 80% of couples experiencing infertility issues can conceive a child [6].

Due to their unlimited source and high differentiation potential, stem cells are considered as potentially new therapeutic agents for the treatment of infertility. In this review,

we will summarize current knowledge regarding the use of stem cells in reproductive medicine.

2. Stem Cells: A Novel Hope in Cell-Based Therapy

Stem cells are undifferentiated cells that are present in the embryonic, fetal, and adult stages of life and give rise to differentiated cells that are building blocks of tissue and organs (Table 1). In the postnatal and adult stages of life, tissue-specific stem cells are found in differentiated organs and are instrumental in repair following injury to the organ. The major characteristics of stem cells are (a) self-renewal (the ability to extensively proliferate), (b) clonality (usually arising from a single cell), and (c) potency (the ability to differentiate into different cell types) [7, 8]. Totipotent or omnipotent cells are the most undifferentiated cells and

