9th Yazd International Congress and Student Award on Reproductive Medicine with 4th Congress of Reproductive Genetics

Key Lectures

K-19
Three-dimensional scaffolds and differentiation of embryonic stem cells into oocyte-like cells, mimic cells –matrix interaction model

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Stem cells are undifferentiated cells that present in the embryonic, fetal, and adult stages of life and give rise to differentiated cells that make up the 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 the past few years, considerable progress in the derivation of 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. Three-dimensional (3D) culture matrices is a new technology in stem cells differentiation mimicking the tissue microenvironment. Based on biomaterials and porous substrates that can support cell proliferation, differentiation and regeneration, using scaffold can make tremendous progress in this field. Some growth factors, such as epidermal growth factor (EGF) also facilitate normal meiosis during oocyte maturation in vivo. A 3D culture system along with scaffolds can apply the induction of oocyte differentiation from embryonic stem cells. Therefore, embryonic stem cells can be induced to differentiate into oocyte-like cells using embryoid body protocol along with the three-dimensional microenvironment in vitro. For the effective differentiation of oocyte-like cells can employ the presence growth factor such as EGF and assessed the markers of germ cell differentiation, meiotic progression and oocyte maturation. In our study, EGF exposed cells in the three-dimensional microenvironment, upregulated the gene expression levels of premeiotic (oct4, Mvh), meiotic (SCP1, SCP3, Stra8, Rec8) and oocyte maturation (GDF9, CX37, ZP2) were significant. The high efficiency of differentiation into oocyte-like cells from embryonic stem cells reflects the culture method employed in the 3D co-culture system. These results showed that this culture system along with EGF improved the rate of in vitro oocyte differentiation.