

عنوان مقاله:

Improvement of primordial germ cells derivation from embryonic stem cells and conduce them to enter meiosis: An engineering approach

محل انتشار:

هشتمین کنگره بین المللی و جشنواره دانشجویی طب تولید مثل و سومین کنگره بین المللی ژنتیک تولید مثل (سال: 1398)

تعداد صفحات اصل مقاله: 1

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خلاصه مقاله:

Background: Disruptions in germ cells (GCs) development or function cause infertility which is a major medical problem. However, current knowledge about the various mechanisms that underlie GC biology is still in its infancy. This lack of knowledge is primarily attributed to the low numbers of GCs in vivo which is an obstacle in GC research. Embryonic stem cells (ESCs) hold great promise for the production of an unlimited source of GCs. However, inability of ESC-derived GCs to go through meiosis in vitro remains a challenge. We hypothesized that insufficient diffusion of soluble factors from culture media toward inside the aggregates cannot provide effective signals for efficient GC differentiation from ESCs. Objective: To address this issue, we have developed bone morphogenetic protein 4 (BMP4)-releasing microparticles (MPs) from alginate sulfate and incorporated them within the aggregates to provide a controlled inside-out delivery of BMP4. Materials and Methods: We synthesized alginate sulfate and characterized it by FTIR. MPs were produced from alginate sulfate and BMP4 was loaded in the MPs. The incorporation of MPs within aggregates was assessed. The BMP4-laden MPs were applied during GC differentiation from ESCs. Then, we used immunofluorescence immunohistochemistry and q-RT PCR in order to analysis the BMP4-laden MPs function during PGCLC differentiation from ESCs. Results: Our results showed that affinity-based delivery of BMP4 in a sustained and localized manner increased GC differentiation from ESCs at least two-fold compared to the conventional soluble delivery method. Interestingly, following meiosis induction, we have observed that Dazl, an intrinsic factor that enables GCs to enter meiosis, and two essential meiosis genes (Stra8 and Smc1b) were upregulated significantly in MP-induced aggregates compared to aggregates which formed by the conventional method. MP-induced aggregates formed tube-like structures similar to seminiferous tubules of the testes. Conclusion: Together, these data showed that controlled delivery of BMP4 during ESC differentiation into GC established meiosis-competent GCs, which could serve as an attractive GC source for reproductive medicine.

کلمات کلیدی:

Microparticles, Germ cells, Meiosis, Infertility

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