Abstract Title:

On-chip mouse embryo culture: evaluation of effects of uterine cells-conditioned media on embryo development and gene expression

Abstract text:

Microfluidics has recently been proposed as a method to overcome the limitations of traditional oocyte and embryo culture methods. In this work, we report the use of a microfluidic polydimethylsiloxane device as promising alternative for in vitro embryo culture, and we have evaluated the effects of cells-conditioned media (CM) on embryo development. The microfluidic device was fabricated using traditional soft-lithographic technique. To produce CM, mouse uterine epithelial cells (Creative Bioarray, USA) were cultured in KSOM (Merck Millipore, UK) for 24 h. The CM was used to culture groups of 12, 1 cell murine embryos (B6C3F1xB6D2F1 strain, EmbryoTech, USA) into a microfluidic device. Control embryos were cultured in the device using KSOM. We compared blastocyst rates of embryos cultured in CM with those obtained using KSOM. The effect of treatment on embryo gene expression was assessed in cDNAs generated from individual stage matched, blastocysts using a custom, real time PCR array. Developmental ability of mouse embryos in the presence of CM was significantly higher ($p<0.05$) in comparison with control media. Blastocyst rates for the CM (n=15 devices, 180 embryos) and control media (n=15 devices, 180 embryos) groups were 68.9% and 45.1%, respectively. qPCR results showed that expression of Makorin Ring Finger Protein (MKRN, p=0.036), DNA Methyltransferase 3β (DNMT3β, p=0.012), DNA (Cytosine-5-)-Methyltransferase 3-Like (DNMT3L, p=0.043), Histone Acetyltransferase 1 (HAT1, p=0.006), Keratin 18 (KRT18, p=0.028), and Ubiquitin Like With PHD And Ring Finger Domains 1 (UHRF1, p=0.043) was significantly different between the treatment groups. Specifically, we observed in the CM group increased expression of DNMT3β and DNMT3L, which play an important role in early embryo development. Those finding revealed that the new microfluidic device supports mouse preimplantation embryo development in vitro. Uterine epithelial cells-conditioned medium has the potential to enhance blastocyst development. Further investigations are required to identify the mechanism of this effect.

References

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Authors of the Abstract

Mancini, Vanessa; Lu, Jianping; Colucci, Francesco; McKeegan, Paul J; Huntriss, John D; Picton, Helen M; Pensabene, Virginia
University of Leeds, UK ;