Expression of uncoupling proteins in mouse oocytes, embryos and fetal organs

Chihiro Furuhata

Laboratory of Theriogenology,
Department of Veterinary Clinical Sciences,
School of Veterinary Medicine,
Hokkaido University, Sapporo 060-0818, Japan

Three isoforms of uncoupling protein (UCP), namely UCP-1, UCP-2 and UCP-3 have been cloned. They are located in the inner membrane of mitochondria and uncouple the proton gradient generated by the respiratory chain from ATP synthesis. It is suggested that UCPs play a role in the metabolism and cell proliferation in mammals; however, there is no report on the expression of UCPs in oocytes and early embryos. In this study, the expression of UCPs in the mouse oocytes, early embryos and fetal organs was examined by a semi-quantitative RT-PCR method. The expression of UCPs were compared to that of β-actin in oocytes and preimplantation embryos, from the early 2-cell to blastocyst stages.

First, the expression of UCPs in ovulated oocytes and preimplantation embryos was examined. At all stages from oocyte to blastocyst, UCP-2 was detected at greater amount than β-actin; however, UCP-3 was not detectable at all stages. The expression of UCP-1 was lower than that of β-actin except at the late 2-cell stage. Secondly, changes in expression of UCP-2 in *in vitro* fertilized and unfertilized oocytes were examined. The expression levels of UCP-2 in *in vitro* fertilized oocytes were significantly lower than those of unfertilized oocytes at 5.5-6.5 hr and 10.5 hr after insemination ($p<0.05$). Lastly, the expression of UCPs of day 9 developing embryos, day 14 and 19 fetal organs, and the placenta of all ages was examined. UCP-2 was expressed in all the samples examined, but the expression of UCP-1 and UCP-3 varied among the samples.

The present results suggest that UCP-1 and UCP-2 may have some role in ontogeny, and that the amount of UCP-2 expression may change after fertilization.