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Author(s)	AOYAGI, Shinsuke
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ELECTRIC FUSION OF MOUSE 2-CELL BLASTOMERES

Shinsuke AOYAGI

*Department of Theriogenology
Faculty of Veterinary Medicine
Hokkaido University, Sapporo 060, Japan*

This study was undertaken to observe the development of fused embryos after electric fusion of mouse 2-cell blastomeres from ICR strain mice and to examine the effect of electric fusion on the cell cycle of the embryos. Using the electric fusion method, the mechanism of the 2-cell block in mouse embryos was also investigated.

In the first series of experiments, the optimum conditions for electric fusion, cleavage and subsequent development of fused embryos to the blastocyst stage (cell number & chromosome number) were examined using late 2-cell embryos. The maximum rate of fusion (91.1%), and development (89.9%) to the blastocyst stage were obtained when a pulse strength of 100V and a pulse duration of 50 μ sec at 1 sec intervals were applied three times. After electric fusion, the two nuclei of a fused embryo moved towards each other gradually, the nuclear envelopes broke up and the chromosomes appeared. Thereafter, the chromosomes from each blastomere assembled, separated and cleavage followed. The period required for the first cleavage of the fused embryos was 4-5 hrs longer than that for the cleavage of untreated 2-cell embryos (control) to the 4-cell stage. The development of the fused embryos was one stage behind the control embryos. The compaction of the control embryos was observed at the 8-cell stage while in the fused embryos, it was observed at the 4-cell stage. The cell number in the fused embryos (38.8 ± 9.8) at the blastocyst stage was about half the cell number in the control embryos (89.8 ± 14.5). The chromosomes of the fused embryos were tetraploid. These results suggest that the electric fusion method used in this study induced blastomere fusion without changing the cell cycle of the embryos.

In the second series of experiments, early 2-cell embryos were fused. The developmental rate to the blastocyst stage of early 2-cell embryos fused by the electric stimuli (32.9%) was greater than that of the untreated embryos (14.6%). In order to further improve the development rate of fused embryos, a blastomere from an early 2-cell embryo and a blastomere from a late 2-cell embryo were fused by electric stimuli. However, no improvement in the developmental rate was observed, which suggests that a blastomere from a late 2-cell embryo is not capable of overcoming the 2-cell block.