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Chromosome transfer in mature oocytes

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Abstract

Objective—To demonstrate step-by-step micromanipulation procedures required for transfer of spindle-chromosomal complexes between mature oocytes.

Design—Video presentation of reproductive biology study.

Setting—In vitro fertilization and embryo manipulation laboratory.

Animal(s)—Rhesus (*Macaca mulatta*) primates.

Intervention(s)—Transplantation of the genetic material between mammalian oocytes offers many opportunities to study various aspects of nuclear-cytoplasmic interactions during oogenesis, fertilization and embryo development. We demonstrate the feasibility of isolation and transfer of chromosomes between mature metaphase II (MII) primate oocyte. After fertilization, manipulated oocytes were capable of producing healthy offspring or embryonic stem cells.

Main Outcome Measure(s)—In this video, we show micromanipulation procedures required for isolation and transfer of spindle-chromosomal complexes between rhesus MII oocytes. In brief, the spindle is visualized using a polarized microscope and extracted into a membrane enclosed karyoplast. Karyoplasts are then reintroduced into an enucleated recipient oocyte (cytoplast, derived from an another female) by karyoplast-cytoplast membrane fusion.

Result(s)—Newly reconstructed oocytes consist of nuclear genetic material from one female and cytoplasmic components, including mitochondria and mitochondrial DNA from another.

Conclusion(s)—This video demonstrates the protocol developed for primate oocytes that successfully allowed of isolation and transfer of chromosomes between mature metaphase II (MII) oocytes. Potential clinical applications include mitochondrial gene replacement therapy to prevent transmission of mtDNA mutations and treatment of infertility caused by cytoplasmic defects in oocytes.

Keywords

Micromanipulation; chromosome transfer; spindle-chromosomal complex; oocytes

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Video is available at <http://fertstertforum.com/2012974tachibana/>.

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VIDEO

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SUGGESTED READING

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Figure.

Movie 1.