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Changes of mitochondrial distribution in human oocytes during meiotic maturation

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Since mitochondria play critical roles in the pathogenesis of age-related diseases, we hypothesized that they also underlie the mechanism of ovarian aging and/or poor quality of embryos. In this study, we investigated the mitochondrial distribution in human oocytes during meiotic maturation which is required to emit extra chromosomes for fertilization. Informed consents were obtained from all patients for using immature oocytes (germinal vesicle: GV and metaphase I: MI). These immature oocytes were not used for fertilization. Metaphase II oocytes (MII) were obtained after additional culture of these oocytes. These oocytes were stained with JC-1 and observed using confocal laser microscope. We compared the mitochondrial distribution among immature and mature oocytes. We observed 2 types of mitochondria with high and low membrane potentials. Mitochondria with low membrane potential in GV oocytes formed large clusters as compared with those in MI and MII oocytes showing small clusters and homogenous distribution. At all stages, mitochondria with high membrane potential localized predominantly around periplasmic oolemma, suggesting that mitochondrial function and distribution in human oocytes change during meiotic maturation, pathophysiological significance of the 2 types of mitochondria in human oocytes will be discussed with respect to aging and ROS generation.