

Pre-Ovulatory Glucocorticoid Synthesis and Its Regulatory Role in Oocyte Maturation and Developmental Competence

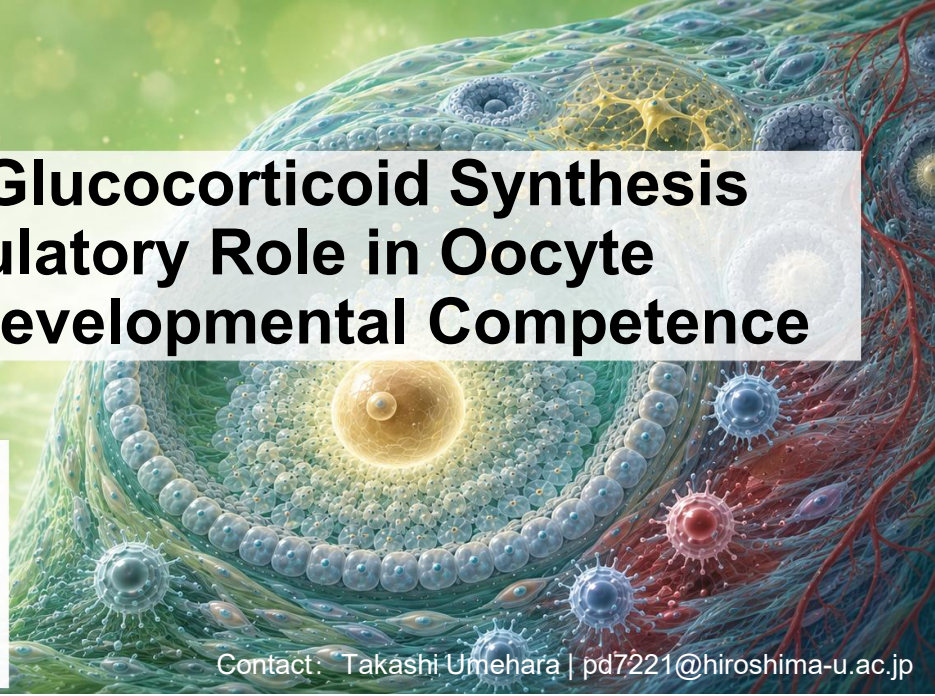
AKTER SHAHRINA

Graduate School of Integrated Sciences for Life,
Hiroshima University

Program of Food and AgriLife Science

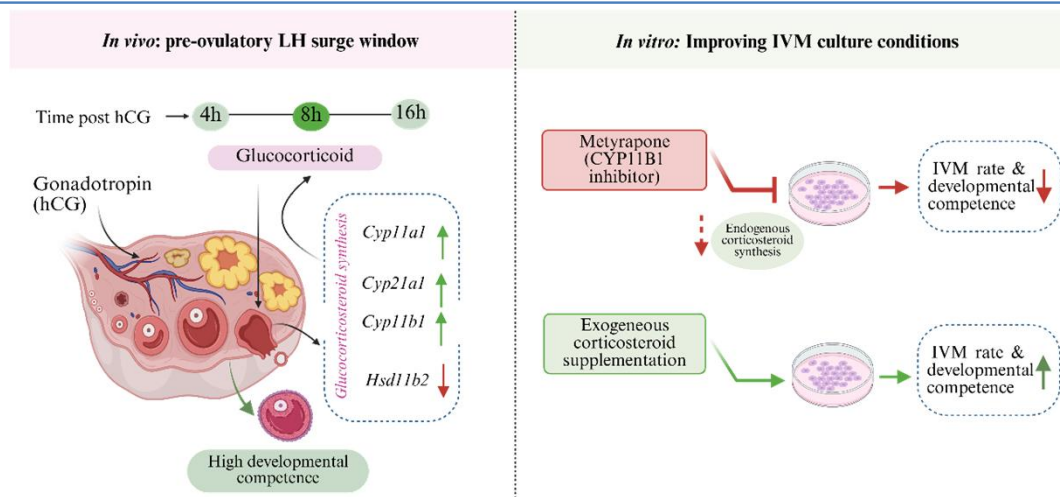
Student ID: D233786

Contact: Takashi Umehara | pd7221@hiroshima-u.ac.jp



Abstract

Oocyte maturation and ovulation require coordinated regulation of steroid hormones, inflammatory mediators, and ovarian somatic cells. Because ovulation is an inflammatory-like event, timely resolution of inflammation is essential for maintaining ovarian homeostasis and oocyte developmental competence. This thesis demonstrates that corticosterone accumulates locally in follicular fluid during the pre-ovulatory period, particularly after hCG stimulation, without parallel changes in serum or oviductal fluid. *Cyp11a1*, *Cyp21a1*, and *Cyp11b1* were upregulated in cumulus and granulosa cells, whereas *Hsd11b2* was downregulated, indicating temporally regulated intra-ovarian glucocorticoid signaling. Inhibition of corticosterone synthesis impaired cumulus expansion, oocyte maturation, and embryo development. Physiological corticosterone supplementation restored these effects and improved maturation, fertilization, and embryonic development, whereas excessive corticosterone negatively affected developmental outcomes. Together, these findings identify pre-ovulatory glucocorticoid synthesis as a local regulatory mechanism that supports inflammatory balance and oocyte competence. Controlled glucocorticoid supplementation may provide a strategy for improving in vitro maturation systems and assisted reproductive technologies.



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