

2 Summary in English

The female germ cells called oocytes arise from the primordial germ cells during embryogenesis. They are essential for the reproduction. Already during embryogenesis oocytes enter meiosis, however, they arrest at the dictyate stage of prophase I. After onset of sexual maturity luteinizing hormone induces the resumption of meiosis of follicle enclosed oocytes (GV stage) in animals (in vivo) but removing of oocytes from follicles and culture in a suitable medium allows the spontaneous resumption of meiosis in vitro. Nuclear envelope break down (NEBD or GVBD) is the first visible mark of the meiosis resumption. Later after GVBD, the metaphase I (MI) spindle forms and after all chromosome bivalents are correctly attached to microtubules (MTs) anaphase I occurs. Following meiosis I completion, oocytes enter directly meiosis II and arrest at metaphase II (MII). These oocytes are fertilizable and sperm trigger meiosis II completion. The development from GV to MII oocytes is governed mainly by meiosis promoting factor (MPF) that consists of cyclin dependent kinase 1 (CDK1) and cyclin B (CCNB). On the mouse oocytes, we have shown using functional studies (RNA interference, mRNA microinjection) that phosphatases CDC25A and B cooperate in the induction of CDK1 activity and resumption of meiosis. After GVBD, decrease in CDC25A protein level is essential for chromosome congression and MI-MII transition. Aurora-A kinase A (AURKA) controls biogenesis of acentriolar microtubule organizing center (MTOC) and its activity is critical for correct spindle assembly at metaphase I. Serine/threonine protein kinase B (PKB) is differentially phosphorylated on T308 and S473 during meiotic maturation of mouse and porcine oocytes. It seems, that in mouse oocytes phosphorylation of T308 PKB is important for resumption of meiosis but in porcine oocytes it is connected to metaphase I spindle formation.

Key words: resumption of meiosis, meiotic maturation, cell cycle, CDK1, CDC25, AURKA, PKB, spindle formation, centrosome, MTOC