Mechanisms Involved in the Control of the Meiotic Cell Cycle

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Studies in our laboratory are directed at identification and characterization of molecular events that regulate reproduction and early development. Of major interest is the control of the meiotic status of the mammalian oocyte. Attempts to unveil this issue include investigation of the gating mechanism of the gap junctions that mediate the communication of the inhibitory cAMP from the somatic cells of the ovarian follicle to the oocyte and the response of the ovarian gap junction protein connexin (Cx) 43 and Cx37 to luteinizing hormone (LH). Special interest is directed at deciphering the role of the oocyte Cx43 and Cx37 in regulation of ovarian development and function (Fig 1). Search for complementary mechanisms that ensure the efficiency of a timely alteration between meiotic arrest and resumption of meiosis include cloning and characterization of an oocyte-specific PKA anchoring protein (AKAP) responsible for sequestration of this enzyme and its possible colocalization with the oocyte phosphodiesterase, PDE3A. These studies are extended to include the exploration of the mechanism of regulation of PDE3A activity. Potential downstream regulators that are subjected to the PKA-mediated cAMP action are examined and their hierarchy is explored. A list of ovarian genes, the expression of which is regulated in association with ovulation has been generated by suppression subtractive hybridization (SSH). Further attempts to characterize and identify the specific function of a selected group of these genes are presently being performed. Microarray cDNA chip analysis has been employed recently to discover endometrial genes that are involved in implantation. Their possible role in uterine receptivity is presently being studied. Our studies on implantation and early embryonic

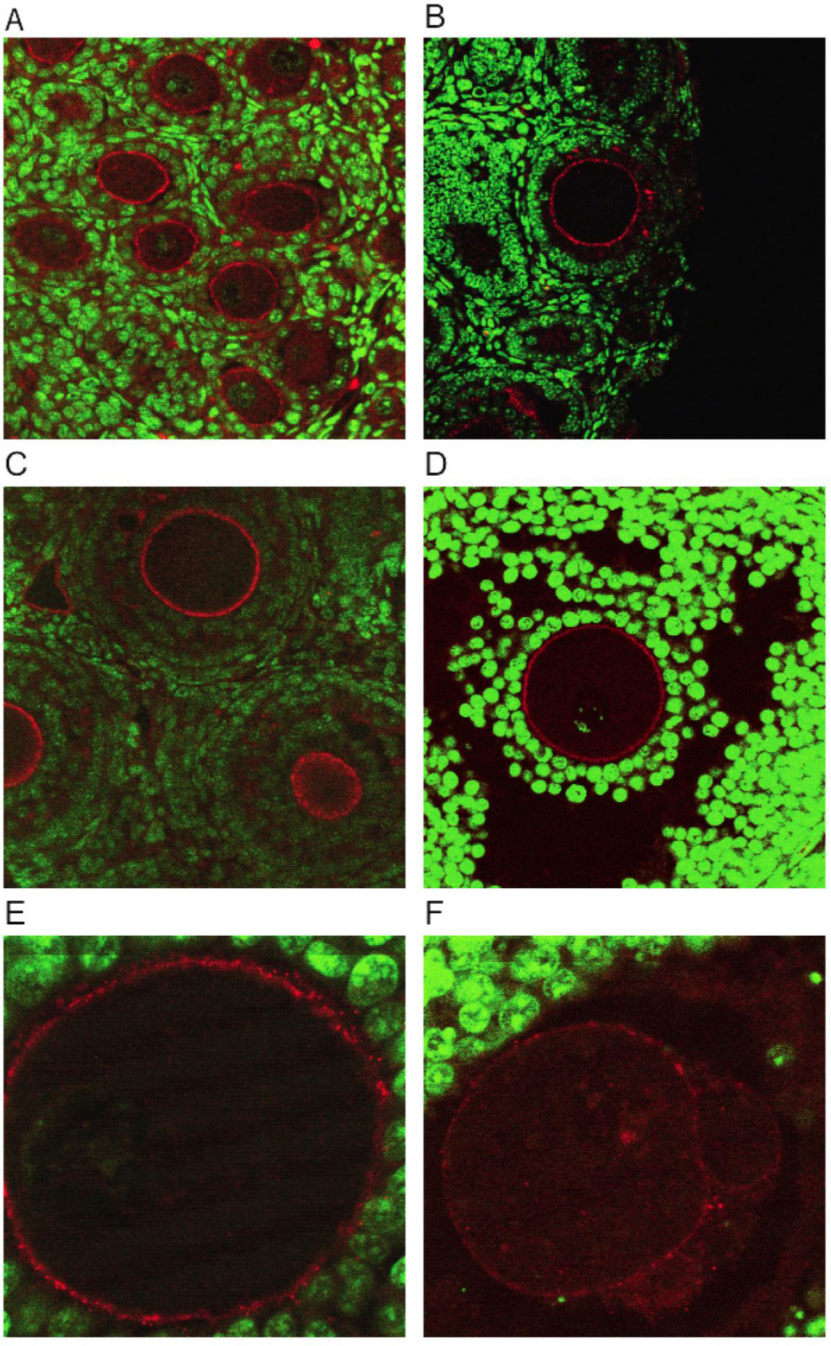

Fig. 1 *Expression and localization of connexin 37 in ovarian follicles at different developmental stages (A) Primordial, a single granulosa cell layer follicles in a 5-day-old mouse ovary (B) Primary, 2-3 granulosa cell layers follicles in a 15-day-old mouse ovary (C) Secondary, large multilayered follicles with more than 60 granulosa cells and no antrum present in a 20-day-old mouse ovary (D) Pre-antral, early antrum visible within the follicle in a 24-day-old mouse ovary (E) An oocyte in a large antral (Graffian) follicle of a 24-day-old, pregnant mare's serum gonadotropin (PMSG) - treated mouse (F) An oocyte with a polar body within a Graffian follicle of a PMSG-primed, human chorionic gonadotropin (hCG)- administrated mouse.*

development are also directed at exploration of signals that control the response of the uterus to the implanting embryo and its possible association with Cx43 expression.

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