Research News For U (RNFU) ISSN: 2250 –3668, Vol. 9, 2012
Available online http://www.doublehelixresearch.com/RNFU

Parthenogenesis: 'A novel method of generating embryos in caprine'

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Parthenogenesis is a reproductive strategy in some species of insects such as flies, ants, and honeybees and vertebrates such as lizards, snakes, fishes and amphibians where a female gives birth to offspring without a paternal contribution. Parthenogenesis is not reported as a form of natural reproduction in mammals even if mammalian oocytes under appropriate stimuli can undergo to parthenogenetic activation in vivo and in vitro which mimics embryonic development in its early phases. Thus far, parthenotes obtained in vitro have been studied and transferred in the uterus of recipient female in a verity of mammals including mice, sheep, cow, pigs and monkeys.

Activation of oocytes matured in vitro is essential for the success of animal cloning by nuclear transfer. Artificial stimuli elevating the cytoplasmic levels of calcium ions can induce activation of the oocytes even without penetration of the sperm into the oocyte. Chemical activating stimuli such as ethanol, calcium ionophore and ionomycin are used to induce the artificial activation of mammalian oocytes. Ethanol was shown to induce oocyte activation in the mouse and cattle. Yang et al. (1994) reported that the combined treatment with 7% ethanol for 10 min and cycloheximide (CHX), the protein synthesis inhibitor, improved the rate of activation of the young oocytes of cattle. The histone kinase inhibitor, 6-dimethylaminopurine (6-DMAP), has been reported to accelerate and enhance the formation of pronuclei in non-age metaphase II oocytes from mice and cattle. Also, cytochalasin B (CCB) prevents the release of the second polar body after activation of the oocytes, which would result in diploid development (Fukui et al., 1992), and may also help prevent fragmentation of embryos. The oocytes during maturation carry diploid chromosome for good amount of time. Hence, it can be hypothesized that if all the chromosomes are carried forward to the parthenogenetic embryos without extrusion as through polar body then normal embryo development may occur leading to live birth. Chemicals like Cytochalasin B (CCB) is actin polymerization inhibitor, shortens actin filaments by blocking monomer addition at the fast-growing end of polymers and in the presence of cytochalasin, segregation of the chromosomes occurred, but cytokinesis does not take place. Therefore, this chemical can be used to produce parthenogenetic embryos with diploidy. When matured bovine oocytes activated in presence of CCB, diploid zygotes with two pronuclei formed. Diploid parthenogenetic mouse embryo produsd

by heat-shock and cytochalasin B can develop beyond implantation, but do not survive beyond the early egg-cylinder stage (Hanna and Andrej, 1976).

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