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JOURNAL ARTICLE

Progesterone-induced calcium influx in cynomolgus monkey (Macaca fascicularis) spermatozoa

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For in vitro capacitation to occur in cynomolgus monkey (Macaca fascicularis) spermatozoa, there is an absolute requirement for exogenous stimulation with the sperm activators, caffeine (1 mM) and db-cyclic adenosine monophosphate (dbcAMP) (1 mM), which are known to induce capacitation-related hyperactivated motility. Tyrosine phosphorylation of sperm tail proteins is an integral component of this caffeine- and dbcAMP-stimulated hyperactivated motility. In both capacitated and noncapacitated human spermatozoa, progesterone (P4) has been reported to elicit an immediate, potent increase in intracellular calcium ion concentrations [Ca2+]i. The objective of this study was to examine the effects of progesterone on requisite events in macaque fertilization, including [Ca2+]i, hyperactivated motility, and the concomitant tyrosine phosphorylation of sperm tail (STTP) proteins after treatment with caffeine and dbcAMP. The effect of 1 microM of progesterone on [Ca2+]i was determined by spectrofluorometry with the fluorescent indicator, fura-2/AM, on hyperactivated motility using computer analysis (HTM-IVOS) with the sorting criteria lateral head amplitude (> or = 8.0 microm), curvilinear velocity (> or = 150 microm/s), linearity (< or = 60%), and on STTP by immunocytochemistry. The results showed that progesterone elicited a significant increase in [Ca2+]i in caffeine- and dbcAMP-activated macaque sperm with maximal stimulation at 30 minutes after activation. The response in nonactivated sperm was dramatically reduced compared with the response in activated sperm. Basal [Ca2+]i increased as a function of time in both activated and nonactivated control sperm although basal levels were significantly increased in activated sperm. Progesterone stimulation resulted in a small but significant increase in both hyperactivation and STTP when sperm were first pretreated with caffeine and dbcAMP. Our results provide evidence that macaque sperm activation with caffeine and dbcAMP is required for a progesterone-elicited response, which results in calcium influx, hyperactivated motility, and sperm tail tyrosine phosphorylation.