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JOURNAL ARTICLE

Facilitative effect of pulsed addition of dibutyryl cAMP on the acrosome reaction of noncapacitated human spermatozoa

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The in vitro acrosome reaction of noncapacitated human spermatozoa was induced by both calcium ionophore (A23187) and dibutyryl adenosine cyclic monophosphate (Bu2cAMP), a membrane permeant cyclic nucleotide analog, in a dose-dependent manner. Maximal frequencies of acrosome-reacted spermatozoa above baseline values (12%; 90% confidence limits = 10.6 to 14.2%) were similar for Bu2cAMP and A23187 (24.5% and 25.1%, respectively). The concentration of Bu2cAMP required for a half-maximal response was 14.3 mumol/L, while that for A23187 was 24.5 pmol/L. The ability of A23187 to induce the acrosome reaction depended on the presence of calcium ion in the incubation medium. The A23187-induced reaction was prevented by the inclusion of human serum albumin in the medium; the inhibitory effect of albumin was partially reversed after preincubation of spermatozoa for 3 hours under capacitating conditions. In contrast, the Bu2cAMP-induced acrosome reaction was unaffected by either Ca2+ or albumin. Pulsed addition of Bu2cAMP enhanced the frequency of acrosome-reacted spermatozoa. This effect appeared to be influenced by pulse frequency: additions made every 5 minutes produced a greater maximal response than additions made every 2 minutes or every 15 minutes. The maximum theoretical acrosome reaction above baseline values (12%) was 88% of the total number of cells, accounting for almost the entire sperm population. Pulsed addition of A23187 did not increase the frequency of acrosome-reacted spermatozoa above values obtained from single equimolar additions of this agent. These data indicate that: (1) intracellular mechanisms for the human acrosome reaction are functional in noncapacitated spermatozoa; (2) the acrosome reaction can be separated from the process of capacitation; and (3) the acrosome reaction is affected by the pattern, as well as the type, of activation.

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