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JOURNAL ARTICLE

Importance of bicarbonate to the progesterone-initiated human sperm acrosome reaction

K. Sabeur and S. Meizel

Department of Cell Biology and Human Anatomy, School of Medicine, University of California-Davis 95616-8643, USA.

Progesterone, a putative *in vivo* initiator of the human sperm acrosome reaction (AR), has previously been shown to act at the sperm plasma membrane to initiate the AR *in vitro*. Here, we have investigated whether bicarbonate (HCO₃⁻) was required for the progesterone-initiated human AR and whether HCO₃⁻-dependent cAMP activation might be involved. Capacitated human sperm were suspended in the presence of high (25 mM) or low (1 mM) HCO₃⁻ media. The AR was assayed using fluorescein isothiocyanate (FITC)-concanavalin A with sperm fixed 5 minutes after progesterone or solvent control addition. Progesterone initiated the AR in both high and low HCO₃⁻ media, but the percentage of AR was significantly lower in the latter medium. In the presence of high HCO₃⁻, 20-minute preincubation with 4,4'-diisothiocyanostilbene-2,2'-disulfonic acid (DIDS), a blocker of HCO₃⁻ transport, inhibited the progesterone-initiated AR in a dose-dependent manner. The maximum inhibition (85%) was obtained with 18 μM DIDS. Inhibition by DIDS was reversed by washing sperm after treatment. Preincubation of sperm with dibutyryl cAMP (0.1 μM-1 mM) plus DIDS almost completely eliminated the inhibition of the progesterone-initiated AR by DIDS. Dibutyryl cAMP alone did not have a stimulatory effect on the progesterone-initiated AR, when high HCO₃⁻ was present, but it was able to partially overcome the reduction of AR by low HCO₃⁻. These results are the first to demonstrate the importance of HCO₃⁻ to: 1) mammalian AR initiation by the putative physiological initiator progesterone, and 2) the human sperm AR. (ABSTRACT TRUNCATED AT 250 WORDS)

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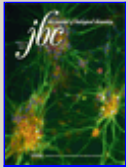
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