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## JOURNAL ARTICLE

# Bi carbonate-dependent lipid ordering and protein aggregation are part of the nongenomic action of progesterone on capacitated spermatozoa

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The nongenomic action of progesterone (P) on capacitated sperm in mediating acrosomal exocytosis operates through transmembrane signal transduction involving increased intracellular calcium ions and modulation of protein kinases and phospholipid metabolism through a second messenger pathway. Conflicting views exist regarding the nature of the nongenomic receptor of P. It is thought to be a cell-surface receptor having the properties of a calcium channel, chloride channel, bicarbonate/chloride exchanger, and gamma aminobutyric acid type A (GABA(A)). In this study, we tried to understand the role of bicarbonate and/or P in inducing membrane perturbations in capacitated and acrosome-reacting spermatozoa. We also attempted to characterize the membrane responses in P-stimulated and bicuculline-poisoned sperm. The presence of a high level of bicarbonate in the medium favored high rotational mobility of lipids and proteins in capacitated sperm. However, the capacitated sperm exhibited low lipid ordering and unaltered protein ordering in response to the high bicarbonate concentration. P and bicuculline appeared to bind to the same or similar binding sites, probably a GABA(A) receptor, eliciting similar motional perturbations in sperm membranes. It appears that both P and bicuculline can induce receptor aggregation and lipid ordering in sperm membranes, which alter the capability of sperm to bind zona pellucida, and that the P action on sperm takes effect through a bicarbonate-dependent signal transduction mechanism.

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