Developmental Biology

Volume 53, Issue 1, 1 October 1976, Pages 115-125

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A study of factors involved in induction of the acrosomal reaction in sperm of the sea urchin, *Arbacia punctulata* â˜†

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https://doi.org/10.1016/0012-1606(76)90213-X

Abstract

Several factors involved in induction of the acrosomal reaction in sperm of the sea urchin, *Arbacia punctulata*, have been investigated quantitatively using a simple substrate film technique to monitor extension of the acrosomal process by electron microscopy. Verification of typical acrosomal process formation has been accomplished using thin sections. Sperm were found to undergo the acrosomal reaction in artificial sea water in the absence of egg jelly coat at pH values above 9.6. In the presence of egg jelly a high percentage of sperm react at pH 8.6. At this pH, the fraction of sperm that undergo the acrosomal reaction is directly proportional to the concentration of egg jelly. The Ca^{2+} ionophore A23187 induces the acrosomal reaction in the absence of egg jelly at pH 8.6. The proportion of sperm that react is dependent on the concentration of ionophore and

on the concentration of Ca^{2+} in the medium. Pretreatment of sperm with low levels of La^{3+} ion, which is known to be a Ca^{2+} ion antagonist, results in inhibition of egg jelly induction of the acrosomal reaction. These findings suggest that there are marked similarities between the acrosomal reaction in sea urchin sperm and membrane fusion dependent secretory processes in other cell types.

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â˜† This work was supported by grants from the National Institutes of Health (1 R01 HDÃ¸8357) and The Rockefeller Foundation (GA HS 7512).

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