Developmental Biology

Volume 245, Issue 2, 15 May 2002, Pages 237-254

Review

Egg Activation at Fertilization: Where It All Begins ☆

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https://doi.org/10.1006/dbio.2002.0600

Abstract

A centrally important factor in initiating egg activation at fertilization is a rise in free Ca^{2+} in the egg cytosol. In echinoderm, ascidian, and vertebrate eggs, the Ca^{2+} rise occurs as a result of inositol trisphosphate-mediated release of Ca^{2+} from the endoplasmic reticulum. The release of Ca^{2+} at fertilization in echinoderm and ascidian eggs requires SH2 domain-mediated activation of a Src family kinase (SFK) and phospholipase C (PLC)γ. Though some evidence indicates that a SFK and PLC may also function at fertilization in vertebrate eggs, SH2 domain-mediated activation of PLCγ appears not to be required. Much work has focused on identifying factors from sperm that initiate egg activation at fertilization, either as a result of sperm–egg contact or sperm–egg fusion. Current evidence from studies of ascidian and mammalian fertilization favors a fusion-mediated mechanism; this is supported by experiments indicating that injection of sperm extracts into eggs causes Ca^{2+} release by the same pathway as fertilization.

Keywords

fertilization; calcium; egg activation

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☆ Abbreviations used: ADAM, a disintegrin and metalloprotease; ER, endoplasmic reticulum; ICSI, intracytoplasmic sperm injection; IP_3, inositol 1,4,5-trisphosphate; NO, nitric oxide; PDGF, platelet derived growth factor; PIP_2, phosphatidylinositol 4,5-bisphosphate; PLC, phospholipase C; SFK, Src family kinase; SH2, Src homology 2.

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