

Biology - Jenna Zarino

Analysis of the Role of Increased PLC Concentrations on the expansion of the vitelline Membrane to Prevent Polyspermy without the occurrence of a Fertilization Event

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Abstract:

Prevention of polyspermy has been aided by various evolutionary mechanisms, particularly expansion of the vitelline membrane in sea urchins. On the basis of this research, phospholipase C (PLC) plays a major role in the cascade of events that are involved in the fertilization of egg by sperm. Although it has been understood that PLC is thoroughly involved in fertilization, its significance as a polyspermy prevention agent has not been widely recognized or studied. The data gathered suggests that PLC not only serves the purpose of breaking down PIP_2 into inositol 1,4,5-triphosphate (IP_3) and diacylglycerol (DAG), but also in vitelline membrane expansion and development of the fertilization window. Therefore, the observable components, particularly of the vitelline membrane expansion as a result of exogenous PLC application, reinforce the role that PLC has in membrane activity. This membrane activity was analyzed by exposing sea urchins to concentrations of PLC to observe whether or not vitelline membrane expansion occurs without a fertilization event. The most notable finding from this approach was expansion of the sea urchin vitelline membrane, suggesting successful cortical granule docking, following exposure to PLC. Since the membrane expansion was observed shortly after exposure to the PLC agent, it suggested that fertilization by sperm is not necessarily required for fertilization window formation, as previously thought. The content of this experiment therefore concluded that exogenous PLC application can activate vitelline membrane expansion as a result of intracellular concentration increases and gradient formations.