Revisiting Ca^{2+} signaling during the fertilization process: new insights into the F-actin dynamics

Luigia Santella[1], Nunzia Limatola1 and Jong Tai Chun[2]

[1]*Department of Research Infrastructures for Marine Biological Resources*

[2]*Department of Biology and Evolution of Marine Organisms, Stazione Zoologica Anton Dohrn, Napoli, Italy.*

Eggs from marine invertebrates that reproduce by external fertilization (starfish and sea urchin) constitute an exceptional animal model to study the cellular and molecular aspect of the meiotic cycle (oocyte maturation) and the sperm -induced egg activation. This is so because the female gametes resume the cell cycle in which they are arrested during their development as the result of the intracellular Ca^{2+} increase triggered by the fertilizing sperm. Thus starfish and sea urchin eggs also offer advantages of abundance, size, cytoplasm transparency that allow to follow the structural and biochemical spatio-temporal changes regulating a successful oocyte maturation and fertilization in experimental conditions closely resembling those of the sea. Data from our laboratory have provided evidence that, in both species, a normal fertilization response ,which includes Ca^{2+} signaling, cortical granule exocytosis and monospermic incorporation, is strictly dependent on the structural organization of the actin cytoskeleton of the egg cortex and on its proper changes upon sperm stimulation.