

The Inorganic Signatures of Life

Teresa K. Woodruff, Ph.D. The Thomas J. Watkins Professor of Obstetrics and Gynecology, The Feinberg School of Medicine, Northwestern University, Chicago, IL and Thomas V. O'Halloran, Ph.D. The Morrison Professor of Chemistry, The Weinberg College of Arts and Sciences, Evanston, IL.

Little is known about the signaling networks that support the integration of the male and female germ cells into a new totipotent cell, the one-cell embryo. We propose that heretofore poorly understood inorganic signaling molecules initiate the massive changes in the physiology of a fertilized egg. Based on preliminary studies, the team hypothesizes that fluxes in zinc ions mediate the first definitive signal in embryonic development. This hypothesis will be tested by two approaches: one targets real time changes in the subcellular concentrations of free zinc and calcium in live cells and the other rigorously maps specific changes in the total zinc pools at the nanometer level. The mouse oocyte is an ideal model system to study this novel inorganic signaling pathway. It undergoes a clear developmental pattern of receptor-mediated events as it transitions from a dormant stage to a fully active state upon fertilization. Also, its large size facilitates spatial localization of key molecular players. New analytical tools will be developed to map the abundance of specific inorganic molecules and biological receptors.



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A PROJECT FUNDED BY THE W. M. KECK FOUNDATION

This work is supported by A Keck Foundation Grant, The Vice President for Research, Northwestern University, The Chemistry of Life Processes Institute, the Institute for Women's Health Research, and the Chicago Biomedical Consortium.