

Tracking the Dance of PIP3 in Living Cells with Cell-Permeable Rapid Response Sensors

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A cell's growth, proliferation, and motion signals are primarily mediated by PIP3, a crucial phospholipid. It is essential for PIP3 production to be transient and controlled spatially to ensure optimal signal propagation. However, mutations in proteins responsible for regulating PIP3 synthesis and depletion can lead to abnormally high PIP3 levels on the cell membrane, which have been associated with many malignant cancers.

To gain valuable insights into PIP3-mediated signaling pathways and to detect PIP3 in intact cancer cells, two quick responsive sensors have been developed. These sensors are capable of entering living cells through direct incubation and exhibit rapid signal change. Furthermore, while one of the sensors enables real-time monitoring of temporal dynamics in PIP3 levels upon stimulation by growth factors, the other possesses the remarkable ability to detect the substantial pool of nuclear PIP3. These innovative sensors hold promise for understanding PIP3-related signaling events and offer a potential diagnostic tool for detecting breast cancer cells. I will present the design strategies and in cell applications of these sensors.