

Emerging Functions of Nuclear Lipids

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A reader's guide to the revised STKE Review
"Nuclear lipid signaling,"

<http://www.stke.org/cgi/content/full/sigtrans;2002/150/re13>

Since the publication of the original review two years ago, there have been many exciting and encouraging advances in our knowledge of nuclear lipid metabolism. These advances, which are discussed in the revised version of the review, include findings that provide new hints to the functions for nuclear lipids and some of the regulatory mechanisms controlling their synthesis and metabolism. The updated review includes an entirely new section called "Other Inositol Lipids," which describes the regulation and potential functions for 3-phosphorylated lipids and other inositol lipids, including phosphatidylinositol 4,5-bisphosphate [PtdIns(4,5)P₂] and PtdIns5P, that have been detected in the nucleus. In addition, a new figure (Fig. 5 in the updated review) has been included that illustrates the putative functions for the various lipids and indicates some suggested points of regulation. Some highlights of the updated review (with selected reference examples) are listed below, organized by the sections that contain the most details about the topics.

PI-PLC in the Nucleus

- Nuclear phosphoinositide-specific phospholipase C β 1 (PI-PLC β 1) (probably the b splice variant) may be regulated through phosphorylation by extracellular signal-regulated protein kinases (ERKs) (1).

Nuclear Diacylglycerol

- The nuclear localization of diacylglycerol (DAG) kinases has been found to involve several different isoforms that are regulated in complex ways.

The Cell Cycle and Signaling by Nuclear Lipids

- Complex changes in the mass levels and metabolism of nuclear inositol lipids occur during the cell cycle (2).
- New possible functions have been revealed for PtdIns(4,5)P₂; for example, it may be involved with pre-messenger RNA splicing (3).

Other Inositol Lipids

- New angles on the nuclear metabolism and function of the higher inositol phosphates have emerged, including a possible role for inositol hexakisphosphate in the regulation of DNA repair (4).

- The presence in the nucleus of 3-phosphorylated inositol lipids and the enzymes that make them has been extended. For example, a complex story is emerging involving PIKE, a nuclear guanosine triphosphatase that activates phosphatidylinositol 3-kinase (5). PIKE, in turn, may be regulated by the Src-homology 3 (SH3) domain of PI-PLC γ (6).
- Indirect evidence implies a nuclear function for PtdIns(3,4)P₂ (7).

Other Lipids

- A new nuclear function for phosphatidylcholine is suggested by the specific nuclear synthesis of this lipid with a saturated fatty acyl profile (8).

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