Inositol phosphate metabolism

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02/02/2021
Introduction

Reactome is open-source, open access, manually curated and peer-reviewed pathway database. Pathway annotations are authored by expert biologists, in collaboration with Reactome editorial staff and cross-referenced to many bioinformatics databases. A system of evidence tracking ensures that all assertions are backed up by the primary literature. Reactome is used by clinicians, geneticists, genomics researchers, and molecular biologists to interpret the results of high-throughput experimental studies, by bioinformaticians seeking to develop novel algorithms for mining knowledge from genomic studies, and by systems biologists building predictive models of normal and disease variant pathways.

The development of Reactome is supported by grants from the US National Institutes of Health (P41 HG003751), University of Toronto (CFREF Medicine by Design), European Union (EU STRP, EMI-CD), and the European Molecular Biology Laboratory (EBI Industry program).

Literature references


Reactome database release: 75

This document contains 13 pathways (see Table of Contents)

https://reactome.org
Inositol phosphates (IPs) are molecules involved in signalling processes in eukaryotes. myo-Inositol consists of a six-carbon cyclic alcohol with an axial 2-hydroxy and five equatorial hydroxyls. Mono-, di-, and triphosphorylation of the inositol ring generates a wide variety of stereochemically distinct signalling entities. Inositol 1,4,5-trisphosphate (I(1,4,5)P3), is formed when the phosphoinositide phosphatidylinositol 4,5-bisphosphate (PI(4,5)P2) is hydrolysed by a phospholipase C isozyme. An array of inositol trisphosphate (IP3) and tetrakisphosphate (IP4) molecules are synthesised by the action of various kinases and phosphatases in the cytosol. These species then transport between the cytosol and the nucleus where they are acted on by inositol polyphosphate multikinase (IPMK), inositol-pentakisphosphate 2-kinase (IPPK), inositol hexakisphosphate kinase 1 (IP6K1) and 2 (IP6K2), to produce IP5, IP6, IP7, and IP8 molecules. Some of these nuclear produced IPs transport back to the cytosol where they are converted to an even wider variety of IPs, by kinases and phosphatases, including the di- and triphospho inositol phosphates aka pyrophosphates (Irvine & Schell 2001, Bunney & Katan 2010, Alcázar-Román & Wente 2008, York 2006, Monserrate and York 2010).

**Literature references**


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Synthesis of IP3 and IP4 in the cytosol

**Location:** Inositol phosphate metabolism

**Stable identifier:** R-HSA-1855204

An array of inositol trisphosphate (IP3) and tetrakisphosphate (IP4) molecules are synthesised by the action of various kinases and phosphatases in the cytosol (Irvine & Schell 2001, Bunney & Katan 2010).

**Literature references**


**Editions**

2011-10-28  Authored, Edited  Williams, MG.
Inositol trisphosphate (IP3) and tetrakisphosphate (IP4) molecules are exported from the cytosol to the nucleus (Dewaste et al. 2003, Nalaskowski et al. 2002). It is unknown whether this occurs by diffusion or is mediated by a transporter.

**Literature references**


**Editions**

2011-10-28 Authored, Edited Williams, MG.
Synthesis of IPs in the nucleus

Location: Inositol phosphate metabolism

Stable identifier: R-HSA-1855191


Literature references


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IP6 and IP7 transport between cytosol and nucleus

Location: Inositol phosphate metabolism

Stable identifier: R-HSA-1855229

The inositol phosphates IP6 and IP7 are exported from the cytosol to the nucleus (Saiardi et al. 2001, Mulugu et al. 2007). The molecular details of these transport processes remain uncertain.

Literature references


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Inositol phosphates IP4, IP5, and IP6 are exported from the cytosol to the endoplasmic reticulum (ER) lumen (Caffrey et al. 1999, Chi et al. 1999). The molecular details of these transport processes remain uncertain.

**Literature references**


Synthesis of IPs in the ER lumen

**Location:** Inositol phosphate metabolism

**Stable identifier:** R-HSA-1855231

In the endoplasmic reticulum (ER) lumen, inositol phosphates IP4, IP5, and IP6 are dephosphorylated by multiple inositol polyphosphate phosphatase 1 (MINPP1) (Caffrey et al. 1999, Chi et al. 1999, Deleu et al. 2006, Nogimori et al. 1991).

**Literature references**


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Inositol phosphates IP3 and IP5 are imported into the cytosol from the endoplasmic reticulum (ER) lumen (Caffrey et al. 1999, Chi et al. 1999, Nalaskowski et al. 2002, Ho et al. 2002, Brehm et al. 2007). The molecular details of these transport processes remain uncertain.

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IPs transport between ER lumen and nucleus

Location: Inositol phosphate metabolism

Stable identifier: R-HSA-1855156

Inositol phosphates IP4 and IP5 are exported from the endoplasmic reticulum (ER) lumen to the nucleus (Caffrey et al. 1999, Chi et al. 1999, Nalaskowski et al. 2002, Verbsky et al. 2002, Brehm et al. 2007, Choi et al. 2007). The molecular details of these transport processes remain uncertain.

Literature references


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Inositol phosphate IP6 is imported to the endoplasmic reticulum (ER) lumen from the nucleus (Caffrey et al. 1999). The molecular details of these transport processes remain uncertain.

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Synthesis of IP2, IP, and Ins in the cytosol

**Location:** Inositol phosphate metabolism

**Stable identifier:** R-HSA-1855183

Inositol phosphates IP2, IP and the six-carbon cyclic alcohol inositol (Ins) are produced by various phosphatases and the inositol-3-phosphate synthase 1 (ISYNA1) (Ju et al. 2004, Ohnishi et al. 2007, Irvine & Schell 2001, Bunney & Katan 2010).

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