

Phosphatidylinositol kinases in GtoPdb v.2025.1

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Abstract

Phosphatidylinositol may be phosphorylated at either 3- or 4- positions on the inositol ring by PI 3-kinases or PI 4-kinases, respectively.

Phosphatidylinositol 3-kinases

Phosphatidylinositol 3-kinases (PI3K, provisional nomenclature) catalyse the introduction of a phosphate into the 3-position of phosphatidylinositol (PI), phosphatidylinositol 4-phosphate (PIP) or phosphatidylinositol 4,5-bisphosphate (PIP₂). There is evidence that PI3K can also phosphorylate serine/threonine residues on proteins. In addition to the classes described below, further serine/threonine protein kinases, including [ATM \(Q13315\)](#) and [mTOR \(P42345\)](#), have been described to phosphorylate phosphatidylinositol and have been termed PI3K-related kinases. Structurally, PI3Ks have common motifs of at least one C2, calcium-binding domain and helical domains, alongside structurally-conserved catalytic domains. [wortmannin](#) and [LY 294002](#) are widely-used inhibitors of PI3K activities. [wortmannin](#) is irreversible and shows modest selectivity between Class I and Class II PI3K, while LY294002 is reversible and selective for Class I compared to Class II PI3K.

Class I PI3Ks (EC 2.7.1.153) phosphorylate phosphatidylinositol 4,5-bisphosphate to generate phosphatidylinositol 3,4,5-trisphosphate and are heterodimeric, matching catalytic and regulatory subunits. Class IA PI3Ks include p110 α , p110 β and p110 δ catalytic subunits, with predominantly p85 and p55 regulatory subunits. The single catalytic subunit that forms Class IB PI3K is p110 γ . Class IA PI3Ks are more associated with receptor tyrosine kinase pathways, while the Class IB PI3K is linked more with GPCR signalling.

Class II PI3Ks (EC 2.7.1.154) phosphorylate phosphatidylinositol to generate phosphatidylinositol 3-phosphate (and possibly phosphatidylinositol 4-phosphate to generate phosphatidylinositol 3,4-bisphosphate). Three monomeric members exist, PI3K-C2 α , β and γ , and include Ras-binding, Phox homology and two C2 domains.

The only **class III PI3K** isoform (EC 2.7.1.137) is a heterodimer formed of a catalytic subunit (VPS34) and regulatory subunit (VPS15).

Phosphatidylinositol 4-kinases

Phosphatidylinositol 4-kinases (EC 2.7.1.67) generate phosphatidylinositol 4-phosphate and may be divided into higher molecular weight type III and lower molecular weight type II forms.

Contents

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Database links

Phosphatidylinositol kinases

<https://www.guidetopharmacology.org/GRAC/FamilyDisplayForward?familyId=781>

Enzymes

PI4KIII α /PIK4CA(phosphatidylinositol 4-kinase alpha)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2148>

PI4KIII β /PIK4CB(phosphatidylinositol 4-kinase beta)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2149>

PI4KII α /PI4K2A(phosphatidylinositol 4-kinase type 2 alpha)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2498>

PI4KII β /PI4K2B(phosphatidylinositol 4-kinase type 2 beta)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2499>

C2 α /PIK3C2A(phosphatidylinositol-4-phosphate 3-kinase catalytic subunit type 2 alpha)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2150>

C2 β /PIK3C2B(phosphatidylinositol-4-phosphate 3-kinase catalytic subunit type 2 beta)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2151>

C2 γ /PIK3C2G(phosphatidylinositol-4-phosphate 3-kinase catalytic subunit type 2 gamma)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2288>

VPS34(phosphatidylinositol 3-kinase catalytic subunit type 3)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2152>

PI3K α (phosphatidylinositol-4,5-bisphosphate 3-kinase catalytic subunit alpha)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2153>

PI3K β (phosphatidylinositol-4,5-bisphosphate 3-kinase catalytic subunit beta)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2154>

PI3K γ (phosphatidylinositol-4,5-bisphosphate 3-kinase catalytic subunit gamma)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2156>

PI3K δ (phosphatidylinositol-4,5-bisphosphate 3-kinase catalytic subunit delta)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2155>

p85 α /PIK3R1(phosphoinositide-3-kinase regulatory subunit 1)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2503>

p85 β /PIK3R2(phosphoinositide-3-kinase regulatory subunit 2)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2504>

p55 γ /PIK3R3(phosphoinositide-3-kinase regulatory subunit 3)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2505>

p150/VPS15/PIK3R4(phosphoinositide-3-kinase regulatory subunit 4)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2157>

p101/PIK3R5(phosphoinositide-3-kinase regulatory subunit 5)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2506>

p87/PIK3R6(phosphoinositide-3-kinase regulatory subunit 6)

<https://www.guidetopharmacology.org/GRAC/ObjectDisplayForward?objectId=2507>

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