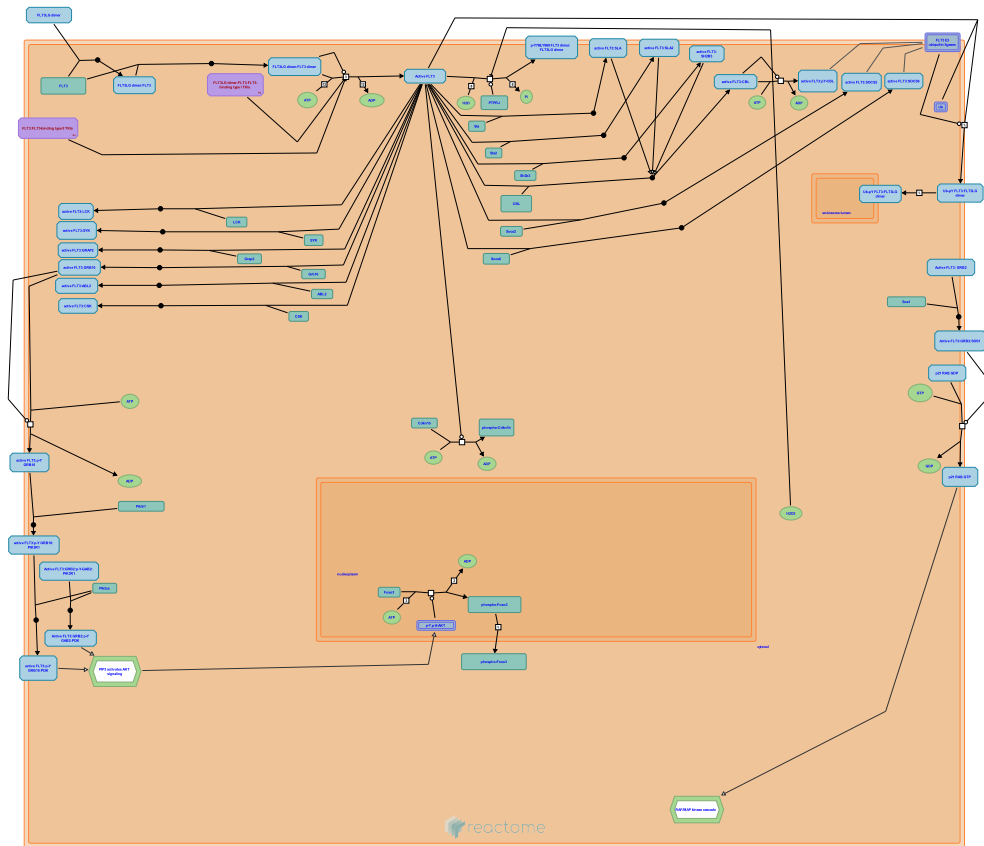


FLT3 Signaling



European Bioinformatics Institute, New York University Langone Medical Center, Ontario Institute for Cancer Research, Oregon Health and Science University.

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This is just an excerpt of a full-length report for this pathway. To access the complete report, please download it at the [Reactome Textbook](https://reactome.org/textbook/).

04/05/2024

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

- Fabregat, A., Sidiropoulos, K., Viteri, G., Forner, O., Marin-Garcia, P., Arnau, V. et al. (2017). Reactome pathway analysis: a high-performance in-memory approach. *BMC bioinformatics*, 18, 142. [↗](#)
- Sidiropoulos, K., Viteri, G., Sevilla, C., Jupe, S., Webber, M., Orlic-Milacic, M. et al. (2017). Reactome enhanced pathway visualization. *Bioinformatics*, 33, 3461-3467. [↗](#)
- Fabregat, A., Jupe, S., Matthews, L., Sidiropoulos, K., Gillespie, M., Garapati, P. et al. (2018). The Reactome Pathway Knowledgebase. *Nucleic Acids Res*, 46, D649-D655. [↗](#)
- Fabregat, A., Korninger, F., Viteri, G., Sidiropoulos, K., Marin-Garcia, P., Ping, P. et al. (2018). Reactome graph database: Efficient access to complex pathway data. *PLoS computational biology*, 14, e1005968. [↗](#)

Reactome database release: 88

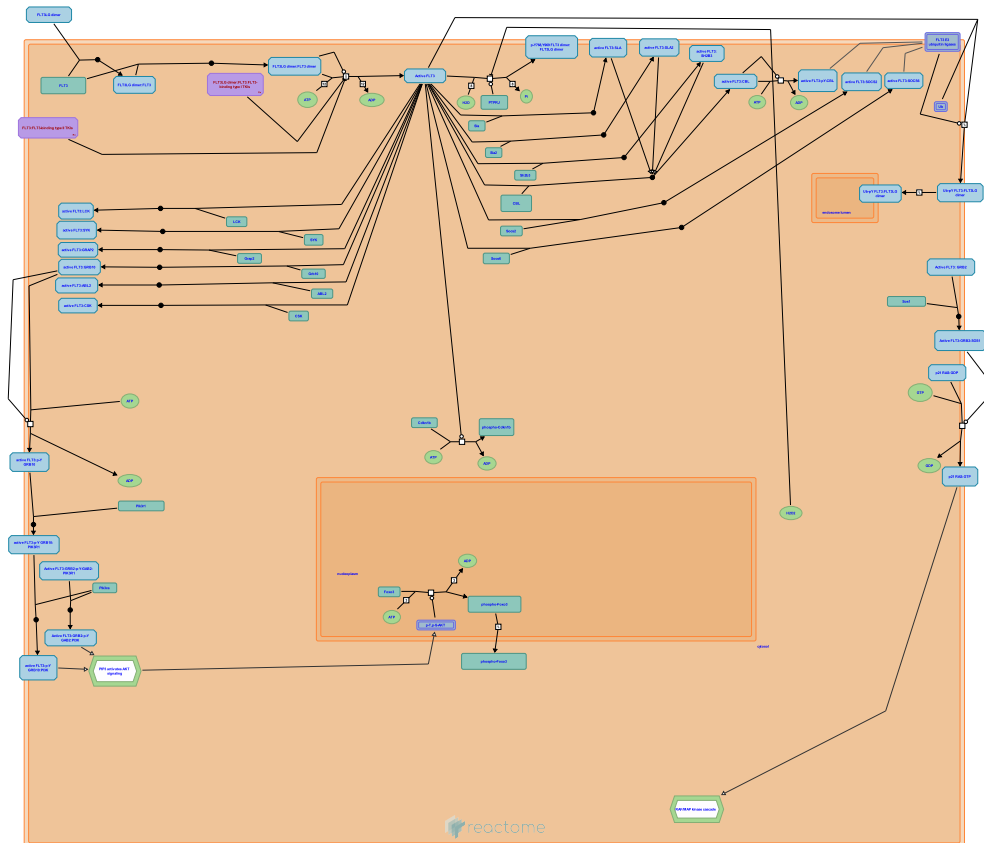
This document contains 3 pathways and 14 reactions ([see Table of Contents](#))

FLT3 Signaling ↗

Stable identifier: R-MMU-9607240

Compartments: cytosol, extracellular region, plasma membrane

Inferred from: FLT3 Signaling (Homo sapiens)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

FLT3LG dimer binds FLT3 ↗

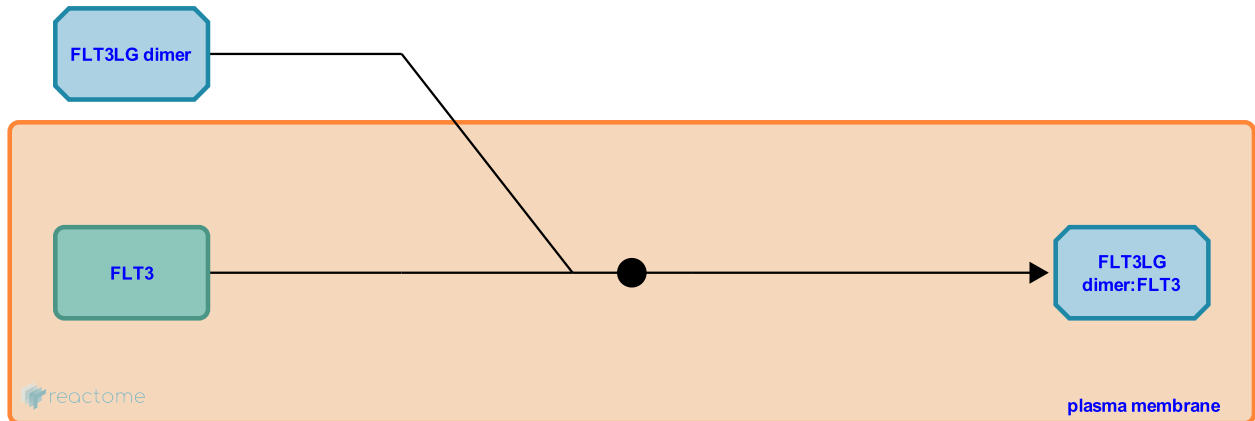
Location: [FLT3 Signaling](#)

Stable identifier: R-MMU-6786789

Type: binding

Compartments: plasma membrane, extracellular region

Inferred from: [FLT3LG dimer binds FLT3 \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](#) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Followed by: [FLT3LG dimer:FLT3 binds FLT3](#)

FLT3LG dimer:FLT3 binds FLT3 ↗

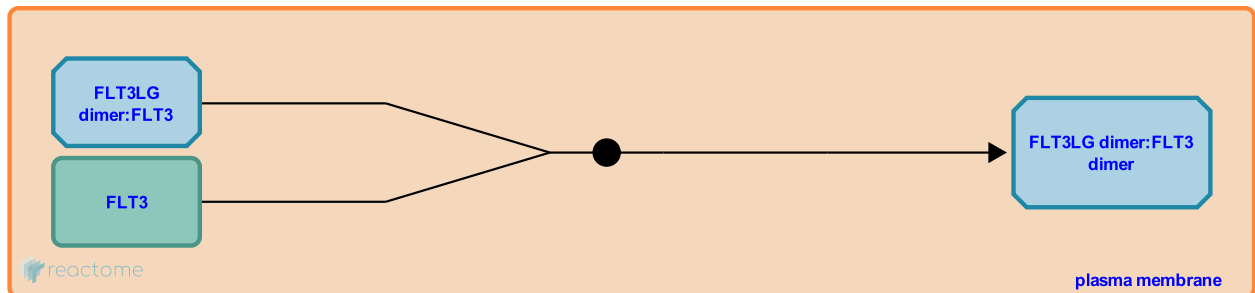
Location: [FLT3 Signaling](#)

Stable identifier: R-MMU-8854736

Type: binding

Compartments: plasma membrane, extracellular region

Inferred from: [FLT3LG dimer:FLT3 binds FLT3 \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](#) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Preceded by: [FLT3LG dimer binds FLT3](#)

Followed by: [FLT3LG dimer:FLT3 dimer autophosphorylates](#)

FLT3LG dimer:FLT3 dimer autophosphorylates ↗

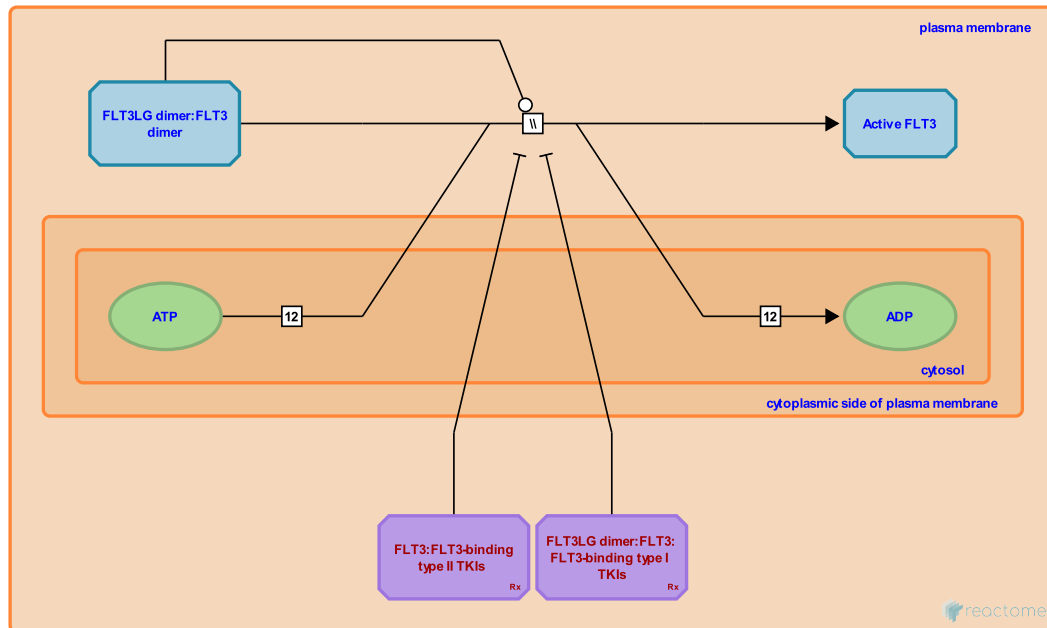
Location: FLT3 Signaling

Stable identifier: R-MMU-9604767

Type: omitted

Compartments: plasma membrane

Inferred from: FLT3LG dimer:FLT3 dimer autophosphorylates (Homo sapiens)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Preceded by: FLT3LG dimer:FLT3 binds FLT3

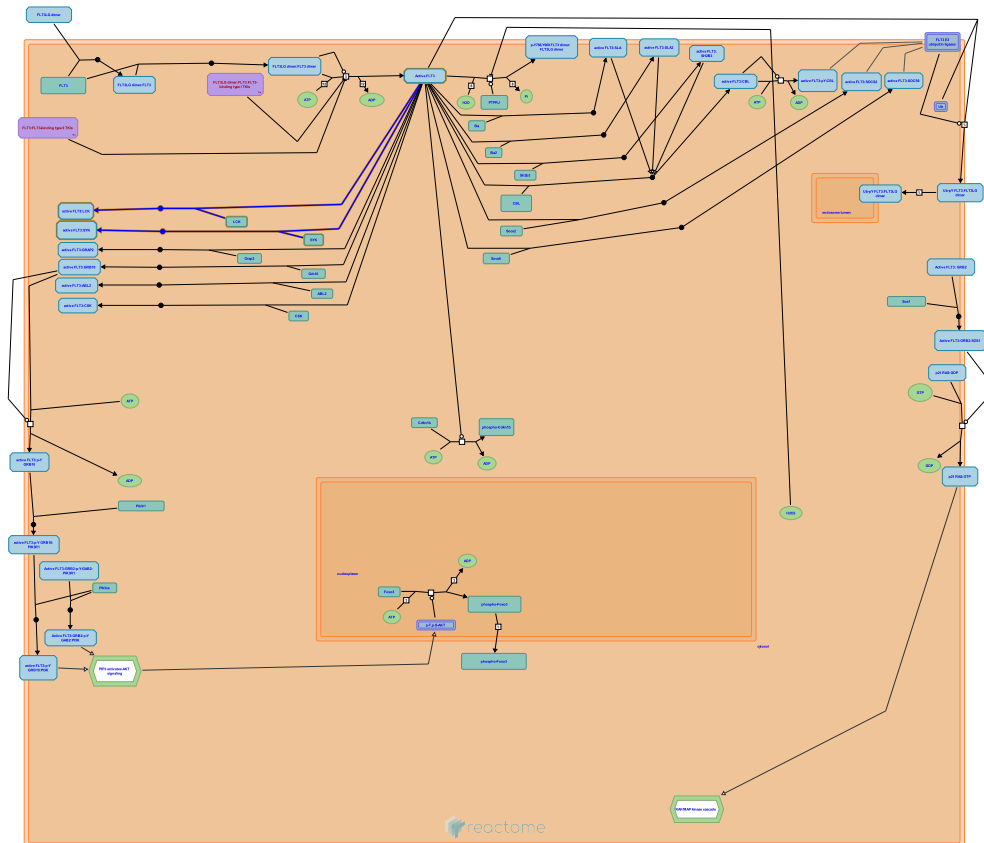
Followed by: Active FLT3 phosphorylates CDKN1B, Active FLT3 binds to GRAP2, Active FLT3 binds to GRB10

FLT3 signaling through SRC family kinases ↗

Location: FLT3 Signaling

Stable identifier: R-MMU-9706374

Inferred from: FLT3 signaling through SRC family kinases (Homo sapiens)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](http://www.pantherdb.org/about.jsp) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Active FLT3 binds to GRAP2 ↗

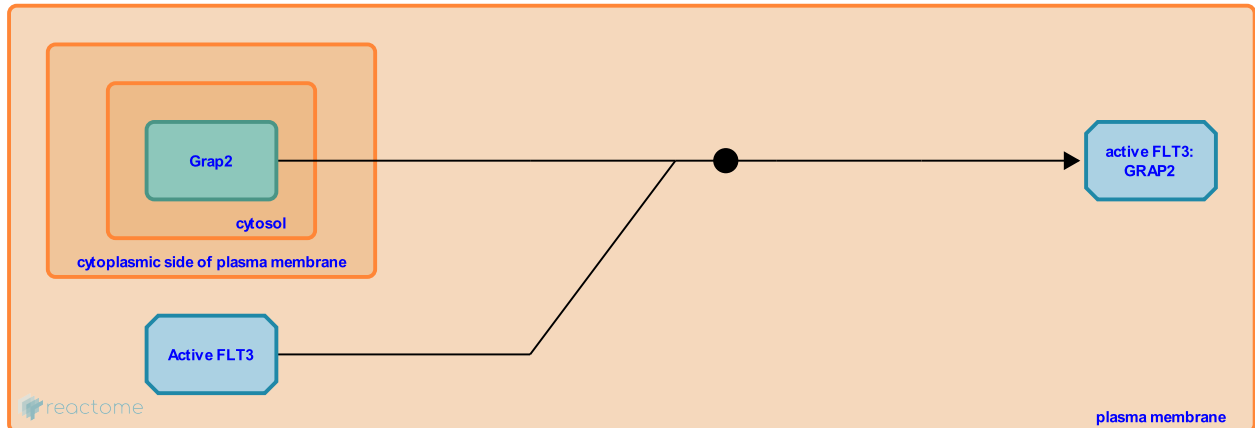
Location: [FLT3 Signaling](#)

Stable identifier: R-MMU-9706304

Type: binding

Compartments: plasma membrane, cytosol

Inferred from: [Active FLT3 binds to GRAP2 \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](#) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Preceded by: [FLT3LG dimer:FLT3 dimer autophosphorylates](#)

Active FLT3 binds to GRB10 ↗

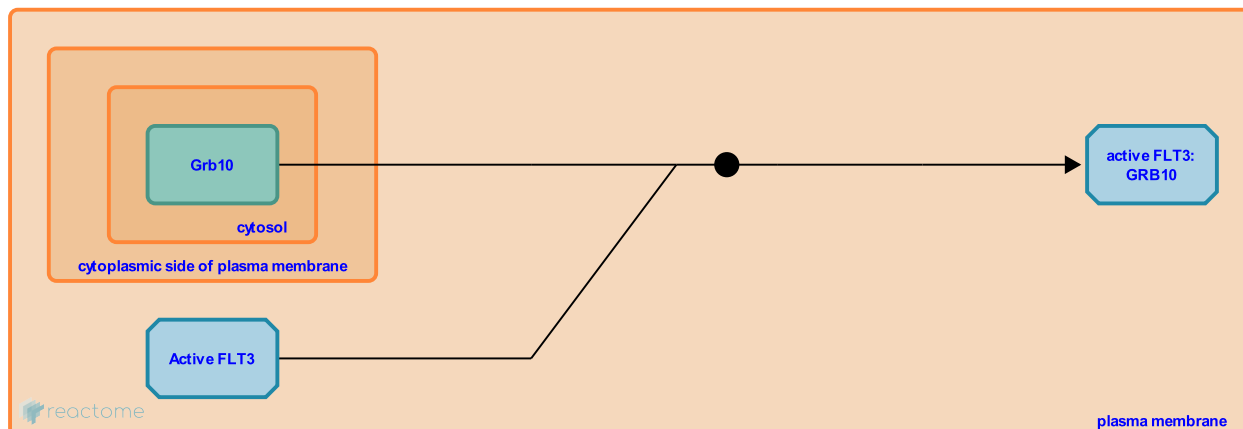
Location: [FLT3 Signaling](#)

Stable identifier: R-MMU-9706308

Type: binding

Compartments: plasma membrane, cytosol

Inferred from: [Active FLT3 binds to GRB10 \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](#) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Preceded by: [FLT3LG dimer:FLT3 dimer autophosphorylates](#)

Followed by: [FLT3 phosphorylates GRB10](#)

FLT3 phosphorylates GRB10 ↗

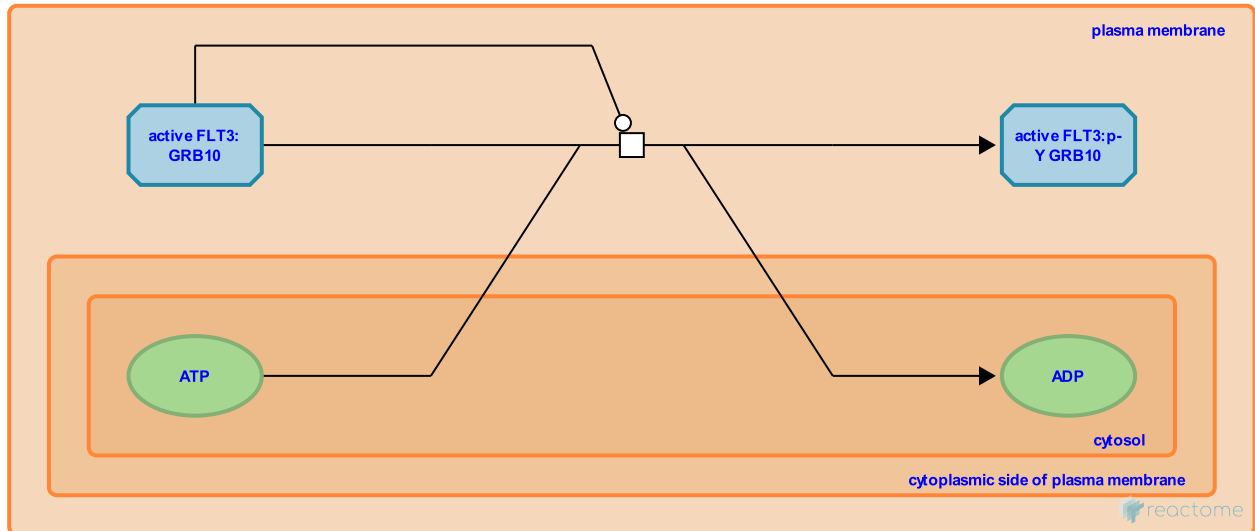
Location: [FLT3 Signaling](#)

Stable identifier: R-MMU-9706344

Type: transition

Compartments: plasma membrane, cytosol

Inferred from: [FLT3 phosphorylates GRB10 \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](#) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Preceded by: [Active FLT3 binds to GRB10](#)

Followed by: [Active FLT3:p-Y-GRB10 binds PIK3R1](#)

Active FLT3:p-Y-GRB10 binds PIK3R1 ↗

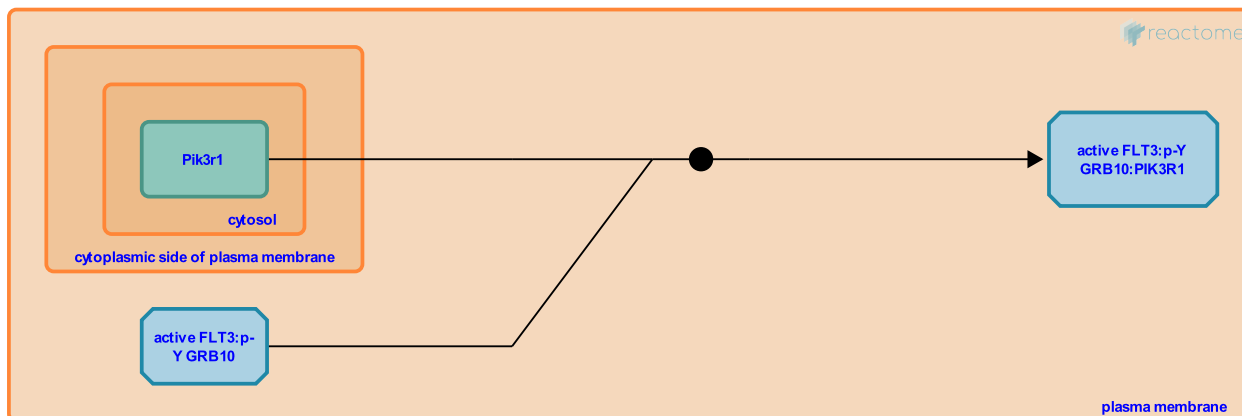
Location: [FLT3 Signaling](#)

Stable identifier: R-MMU-9706340

Type: binding

Compartments: plasma membrane, cytosol

Inferred from: [Active FLT3:p-Y-GRB10 binds PIK3R1 \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](#) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Preceded by: [FLT3 phosphorylates GRB10](#)

Followed by: [Active FLT3:p-Y GRB10:PIK3R1 binds PIK3CA](#)

Active FLT3:p-Y GRB10:PIK3R1 binds PIK3CA ↗

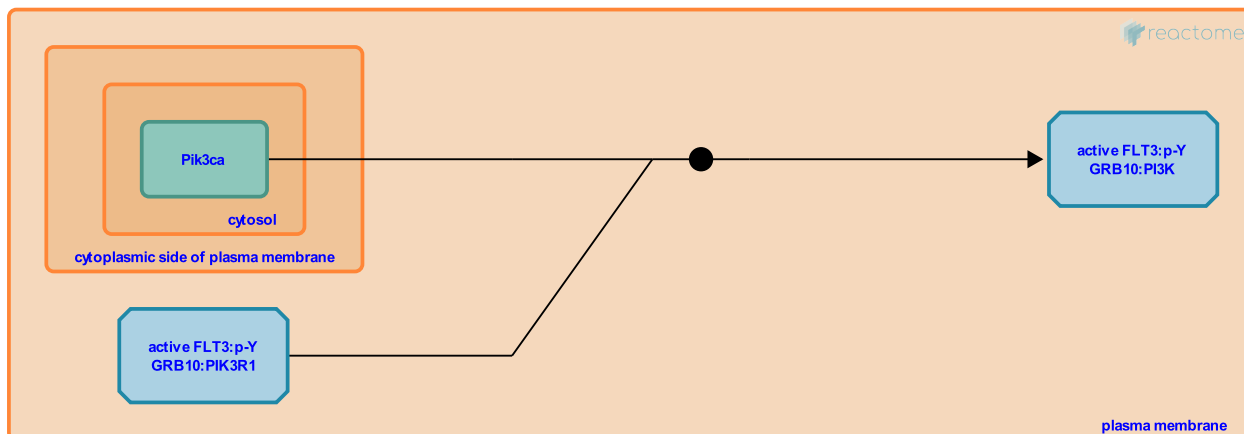
Location: [FLT3 Signaling](#)

Stable identifier: R-MMU-9706345

Type: binding

Compartments: plasma membrane, cytosol

Inferred from: [Active FLT3:p-Y GRB10:PIK3R1 binds PIK3CA \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](#) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Preceded by: [Active FLT3:p-Y-GRB10 binds PIK3R1](#)

Active FLT3:GRB2 binds SOS1 ↗

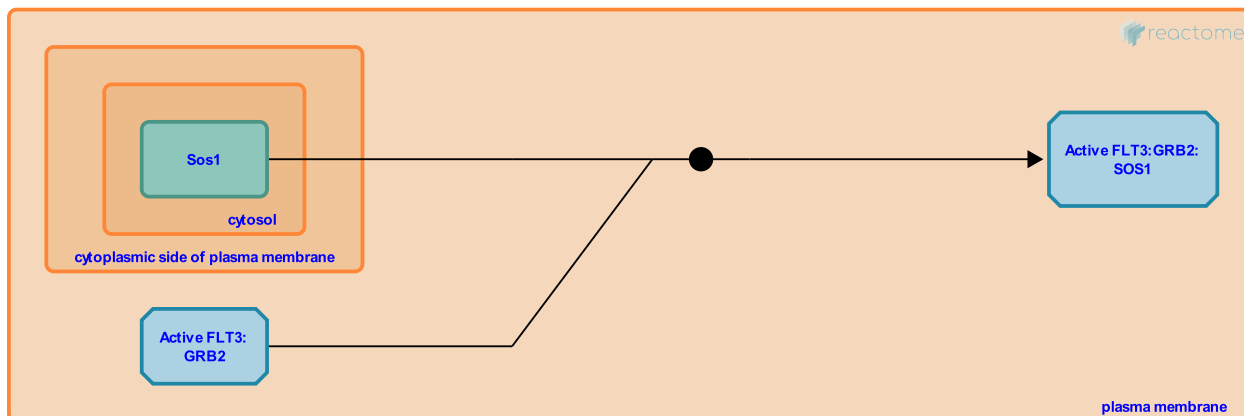
Location: [FLT3 Signaling](#)

Stable identifier: R-MMU-9607301

Type: binding

Compartments: plasma membrane, cytosol

Inferred from: [Active FLT3:GRB2 binds SOS1 \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](#) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Followed by: [SOS1-mediated nucleotide exchange of RAS downstream of FLT3](#)

SOS1-mediated nucleotide exchange of RAS downstream of FLT3 [↗](#)

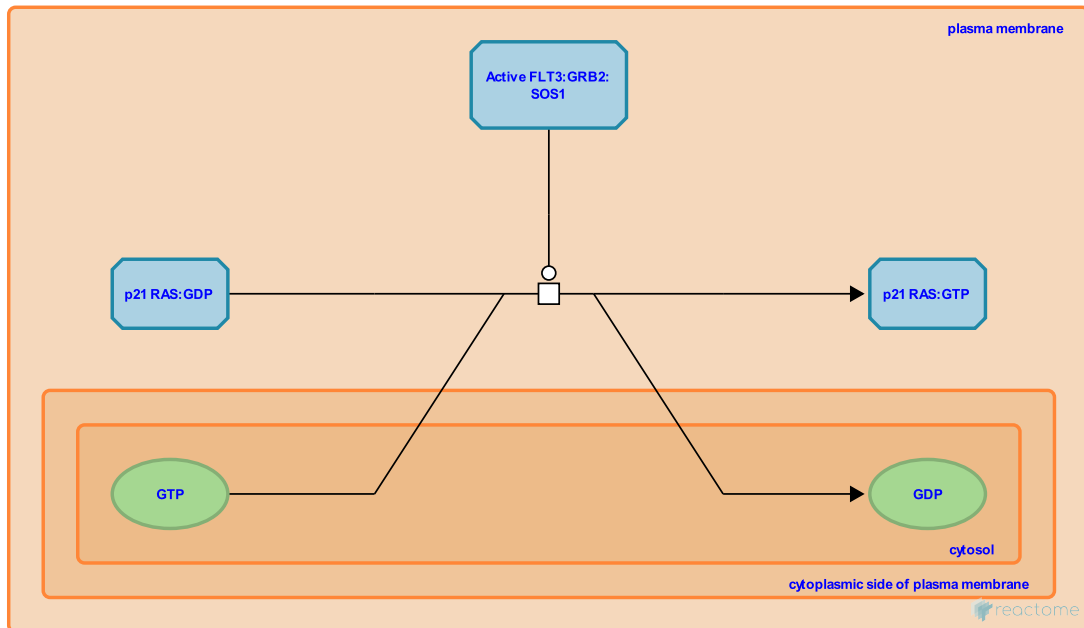
Location: [FLT3 Signaling](#)

Stable identifier: R-MMU-9607304

Type: transition

Compartments: plasma membrane, cytosol

Inferred from: [SOS1-mediated nucleotide exchange of RAS downstream of FLT3 \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](#) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Preceded by: [Active FLT3:GRB2 binds SOS1](#)

Active FLT3:GRB2:p-GAB2:PIK3R1 binds PIK3CA ↗

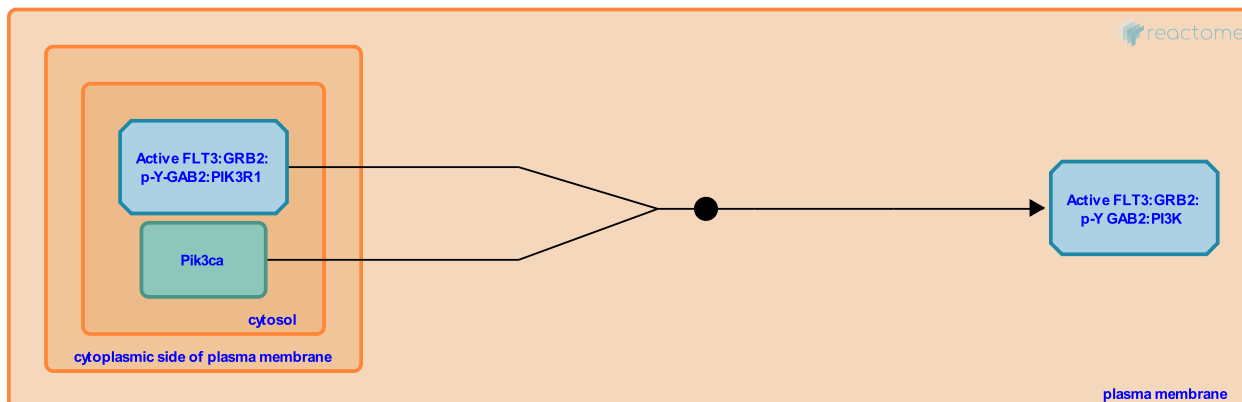
Location: [FLT3 Signaling](#)

Stable identifier: R-MMU-9698170

Type: binding

Compartments: plasma membrane, cytosol

Inferred from: [Active FLT3:GRB2:p-GAB2:PIK3R1 binds PIK3CA \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](#) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

AKT phosphorylates FOXO3 downstream of FLT3 [↗](#)

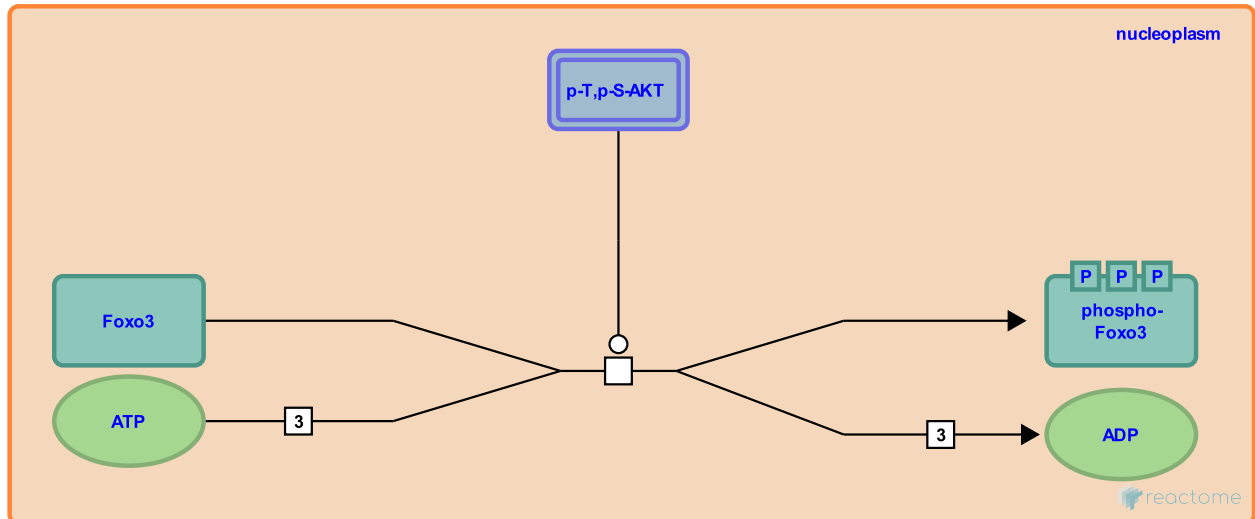
Location: [FLT3 Signaling](#)

Stable identifier: R-MMU-9699579

Type: transition

Compartments: nucleoplasm

Inferred from: [AKT phosphorylates FOXO3 downstream of FLT3 \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](#) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Followed by: [AKT-phosphorylated FOXO3 translocates to cytosol](#)

AKT-phosphorylated FOXO3 translocates to cytosol ↗

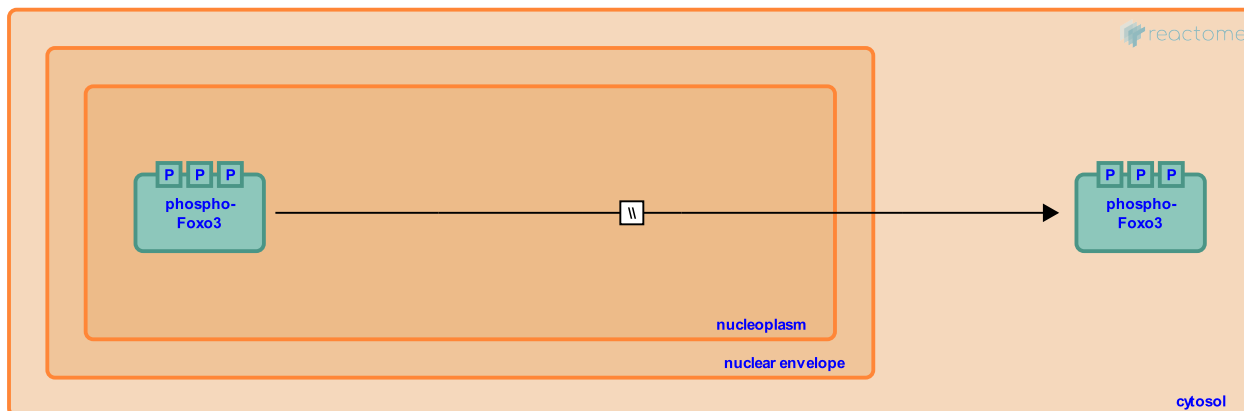
Location: [FLT3 Signaling](#)

Stable identifier: R-MMU-9699581

Type: omitted

Compartments: nucleoplasm, cytosol

Inferred from: [AKT-phosphorylated FOXO3 translocates to cytosol \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](#) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

Preceded by: [AKT phosphorylates FOXO3 downstream of FLT3](#)

Active FLT3 phosphorylates CDKN1B ↗

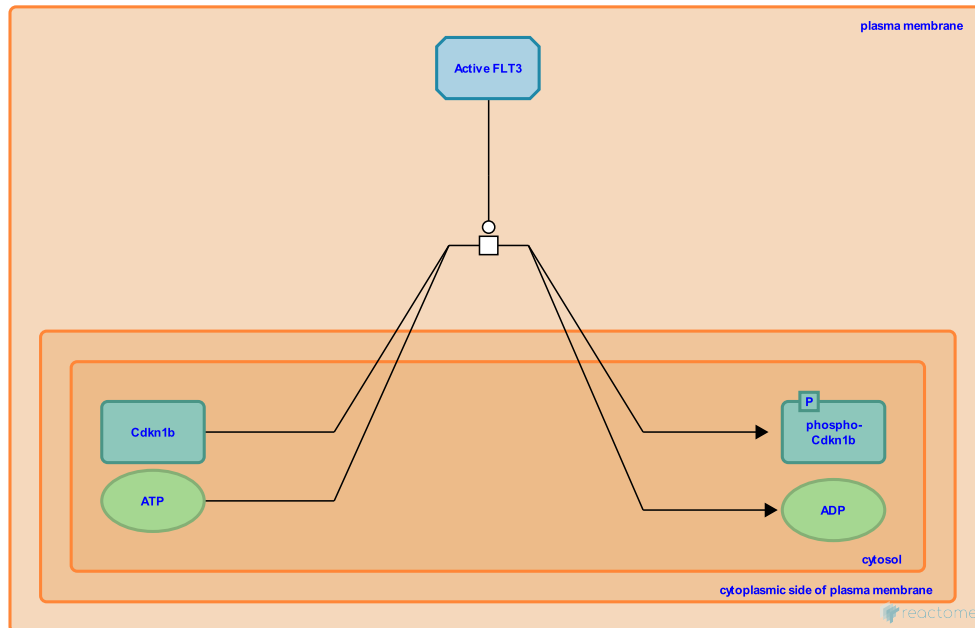
Location: [FLT3 Signaling](#)

Stable identifier: R-MMU-9699578

Type: transition

Compartments: plasma membrane, cytosol

Inferred from: [Active FLT3 phosphorylates CDKN1B \(Homo sapiens\)](#)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

[More details and caveats of the event inference in Reactome.](#) For details on PANTHER see also: <http://www.pantherdb.org/about.jsp>

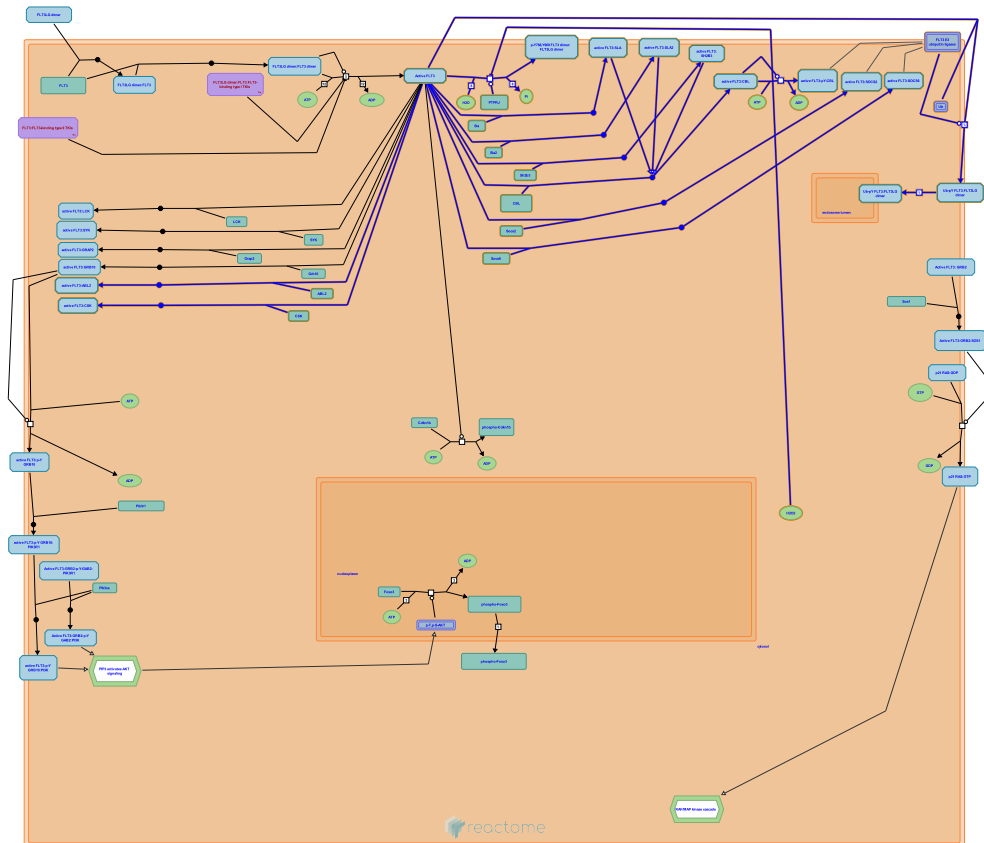
Preceded by: [FLT3LG dimer:FLT3 dimer autophosphorylates](#)

Negative regulation of FLT3 ↗

Location: FLT3 Signaling

Stable identifier: R-MMU-9706369

Inferred from: Negative regulation of FLT3 (Homo sapiens)



This event has been computationally inferred from an event that has been demonstrated in another species.

The inference is based on the homology mapping from PANTHER. Briefly, reactions for which all involved PhysicalEntities (in input, output and catalyst) have a mapped orthologue/paralogue (for complexes at least 75% of components must have a mapping) are inferred to the other species. High level events are also inferred for these events to allow for easier navigation.

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