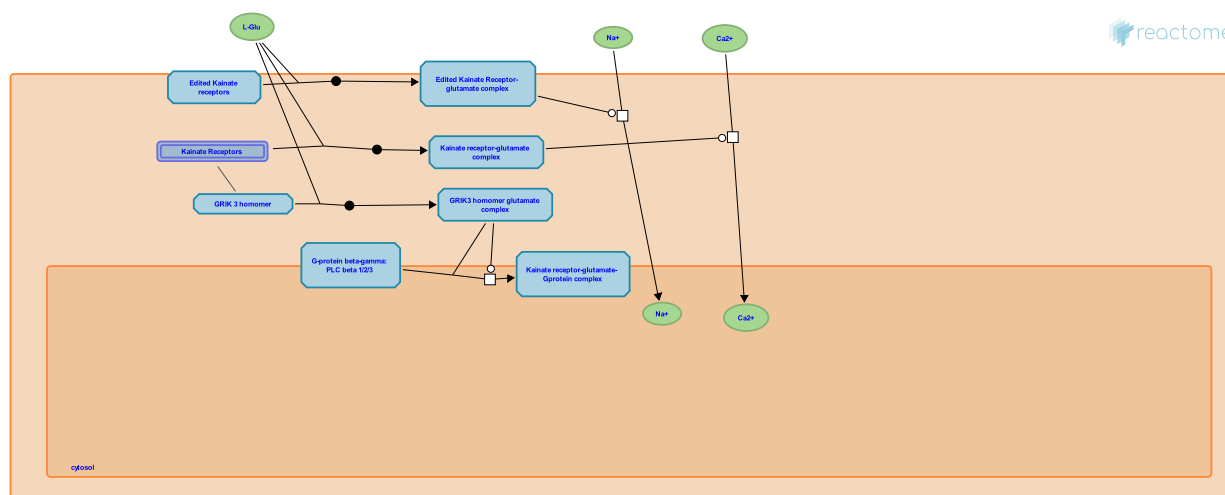


Activation of kainate receptors upon glutamate binding



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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).

17/05/2024

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.

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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. [↗](#)

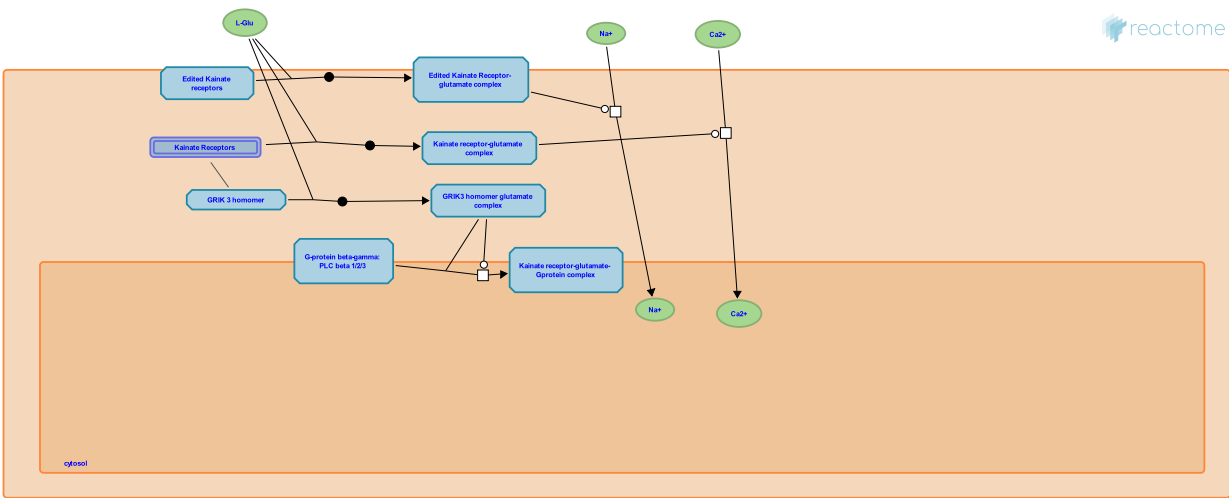
Reactome database release: 88

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

Activation of kainate receptors upon glutamate binding ↗

Stable identifier: R-HSA-451326

Compartments: cytosol, extracellular region, plasma membrane



Kainate receptors are found both in the presynaptic terminals and the postsynaptic neurons. Kainate receptor activation could lead to either ionotropic activity (influx of Ca^{2+} or Na^{+} and K^{+}) in the postsynaptic neuron or coupling of the receptor with G proteins in the presynaptic and the postsynaptic neurons. Kainate receptors are tetramers made from subunits GRIK1-5 or GluR5-7 and KA1-2. Activation of kainate receptors made from GRIK1 or KA2 release Ca^{2+} from the intracellular stores in a G protein-dependent manner. The G protein involved in this process is sensitive to pertussis toxin.

Literature references

Jane, DE., Lodge, D., Collingridge, GL. (2009). Kainate receptors: pharmacology, function and therapeutic potential. *Neuropharmacology*, 56, 90-113. ↗

Editions

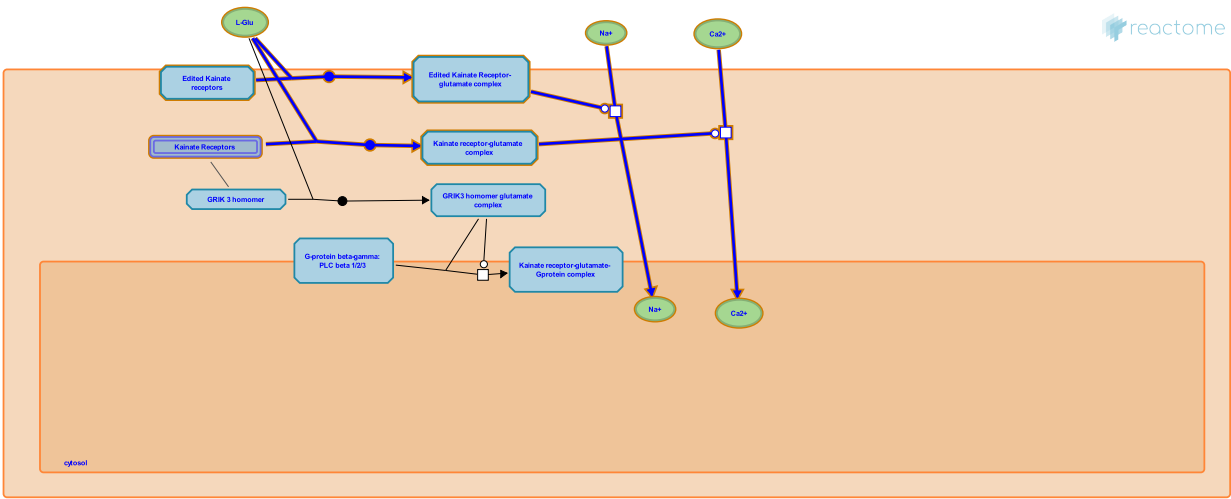
2009-11-18	Reviewed	Tukey, D.
2010-01-15	Authored	Mahajan, SS.
2010-02-06	Edited	Gillespie, ME.

Ionotropic activity of kainate receptors ↗

Location: [Activation of kainate receptors upon glutamate binding](#)

Stable identifier: R-HSA-451306

Compartments: plasma membrane, extracellular region, cytosol



Kainate receptors are either Ca²⁺ permeable or impermeable depending on the composition of the receptor and the editing status of subunits GluR5 and GluR6 (GRIK1 and 2).

Literature references

Mulle, C., Pinheiro, P. (2006). Kainate receptors. *Cell Tissue Res*, 326, 457-82. ↗

Editions

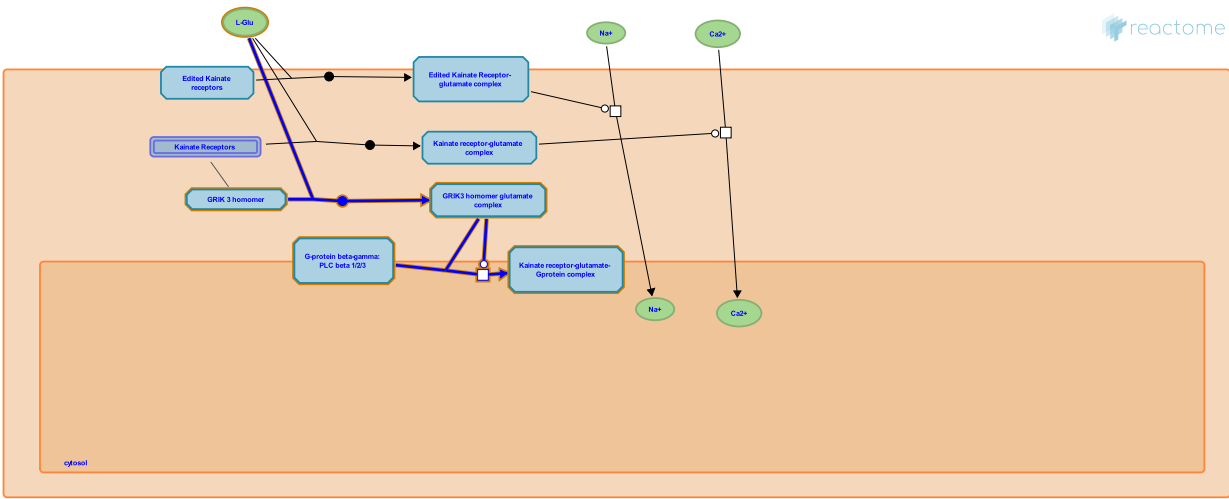
2009-11-18	Reviewed	Tukey, D.
2010-01-15	Authored	Mahajan, SS.
2010-02-06	Edited	Gillespie, ME.

Presynaptic function of Kainate receptors ↗

Location: Activation of kainate receptors upon glutamate binding

Stable identifier: R-HSA-500657

Compartments: plasma membrane, extracellular region, cytosol



Kainate receptors in the presynaptic neuron are involved in modulating the release of neurotransmitters like glutamate and gamma amino butyric acid (GABA). This activity of Kainate receptors is independent of ionic fluxes through the channel. Homomeric kainate receptors containing GRIK3 are shown to be involved in this process. Kainate receptors in these neurons bind G-protein coupled receptors that activate phospholipase C which eventually triggers the release of Ca^{2+} from the intracellular stores. The released Ca^{2+} further initiates the fusion and release of vesicles containing the neurotransmitter.

Literature references

Coussen, F., Perrais, D., Mulle, C. (2009). Atypical functional properties of GluK3-containing kainate receptors. *J Neurosci*, 29, 15499-510. ↗

Editions

2009-11-18	Reviewed	Tukey, D.
2010-01-15	Authored	Mahajan, SS.
2010-02-06	Edited	Gillespie, ME.

Table of Contents

Introduction	1
❖ Activation of kainate receptors upon glutamate binding	2
❖ Ionotropic activity of kainate receptors	3
❖ Presynaptic function of Kainate receptors	4
Table of Contents	5