Platelet homeostasis

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20/03/2022
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: 79

This document contains 5 pathways and 2 reactions (see Table of Contents)
Platelet homeostasis

Stable identifier: R-HSA-418346

Compartments: plasma membrane

Under normal conditions the vascular endothelium supports vasodilation, inhibits platelet adhesion and activation, suppresses coagulation, enhances fibrin cleavage and is anti-inflammatory in character. Under acute vascular trauma, vasoconstrictor mechanisms predominate and the endothelium becomes prothrombotic, procoagulatory and proinflammatory in nature. This is achieved by a reduction of endothelial dilating agents: adenosine, NO and prostacyclin; and by the direct action of ADP, serotonin and thromboxane on vascular smooth muscle cells to elicit their contraction (Becker et al. 2000).

Cyclooxygenase-2 (COX-2) and endothelial nitric oxide synthase (eNOS) are primarily expressed in endothelial cells. Both are important regulators of vascular function. Under normal conditions, laminar flow induces vascular endothelial COX-2 expression and synthesis of Prostacyclin (PGI2) which in turn stimulates endothelial Nitric Oxide Synthase (eNOS) activity. PGI2 and NO both oppose platelet activation and aggregation, as does the CD39 ecto-ADPase, which decreases platelet activation and recruitment by metabolizing platelet-released ADP.

Literature references


Editions

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https://reactome.org
Prostacyclin (PGI2) is continuously produced by healthy vascular endothelial cells. It inhibits platelet activation through interaction with the Gs-coupled receptor PTGIR, leading to increased cAMP, a consequent increase in cAMP-dependent protein kinase activity which prevents increases of cytoplasmic [Ca2+] necessary for activation (Woulfe et al. 2001). PGI2 is also an effective vasodilator. These effects oppose the effects of thromboxane (TXA2), another eicosanoid, creating a balance of blood circulation and platelet activation.

**Literature references**


**Editions**

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**Nitric oxide stimulates guanylate cyclase**

**Location:** Platelet homeostasis

**Stable identifier:** R-HSA-392154

**Compartments:** cytosol

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Nitric Oxide (NO) inhibits smooth muscle cell proliferation and migration, oxidation of low-density lipoproteins, and platelet aggregation and adhesion. It can stimulate vasodilatation of the endothelium, disaggregation of preformed platelet aggregates and inhibits activated platelet recruitment to the aggregate. NO is synthesized from L-arginine by a family of isoformic enzymes known as nitric oxide synthase (NOS). Three isoforms, namely endothelial, neuronal, and inducible NOS (eNOS, nNOS, and iNOS, respectively), have been identified. The eNOS isoform is found in the endothelium and platelets. NO regulation of cyclic guanosine-3,5-monophosphate (cGMP), via activation of soluble guanylate cyclase, is the principal mechanism of negative control over platelet activity. Defects in this control mechanism have been associated with platelet hyperaggregability and associated thrombosis.

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Binding of ATP to P2X receptors

Location: Platelet homeostasis

Stable identifier: R-HSA-419490