Nuclear Envelope (NE) Reassembly

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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.

16/11/2022

https://reactome.org
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


Reactome database release: 82

This document contains 4 pathways (see Table of Contents)
Nuclear Envelope (NE) Reassembly

Stable identifier: R-HSA-2995410

Reassembly of the nuclear envelope (NE) around separated sister chromatids begins in late anaphase and is completed in telophase (reviewed by Wandke and Kutay 2013). Characteristic proteins of the inner nuclear membrane and nuclear lamina accumulate at the reforming NE (reviewed by Wandke and Kutay 2013). Concurrently, nuclear pore complexes (NPCs) assemble and insert into the reforming NE, and the NE becomes sealed to reestablish the nucleocytoplasmic diffusion barrier (reviewed by Otsuka and Ellenberg 2018).

Literature references


Editions

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https://reactome.org
Initiation of Nuclear Envelope (NE) Reformation

Location: Nuclear Envelope (NE) Reassembly

Stable identifier: R-HSA-2995383

Reassembly of the nuclear envelope (NE) is initiated at late anaphase/early telophase when BANF1 (BAF), which is dispersed throughout the cytoplasm during metaphase, accumulates on the surfaces of coalesced chromosomes. This is coordinated with the chromatin association of membranes and inner nuclear membrane proteins that include EMD (emerin), TMPO (LAP2beta), LEMD3 (MAN1) and LEMD2 (LEM2), and laminas (Haraguchi et al. 2008, reviewed by Wandke and Kutay 2013). The DNA-cross-bridging activity of BANF1 is required for individual chromosomes to properly coalesce for enclosure in a single nucleus (Samwer et al. 2017).

Literature references


Editions

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The NPC is reassembled during late anaphase/telophase when nascent nuclear membranes associate with the chromatin surfaces (reviewed by Wandke and Kutay 2013). Assembly of specific NPC proteins (nucleoporins) into the reforming NPC occurs in a temporally ordered fashion (reviewed by Otsuka and Ellenberg 2018). The GTPase RAN plays a central role in regulating NPC assembly during telophase, as well as earlier events in mitosis, such as mitotic spindle assembly (reviewed by Zierhut and Funabiki 2015). The active form of RAN (RAN:GTP), which is generated by the chromatin-associated RAN guanine nucleotide exchange factor RCC1, is converted to the inactive form (RAN:GDP) by the cytoplasmically localized RAN GTPase activating protein RANGAP1. During telophase, the elevated RAN:GTP near chromatin releases nucleoporins from complexes with nuclear transport receptors, including KPNB1/KPNA (importin alpha/beta) and TPNO1 (transportin), thereby liberating the nucleoporins for NPC assembly (reviewed by Forbes et al. 2015).

**Literature references**


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During telophase, the double membrane of the reforming NE, which is derived from fenestrated sheets and tubules of the mitotic ER, is sealed to reestablish the nucleocytoplasmic permeability barrier (reviewed by Otsuka and Ellenberg 2018). Some of the holes in the reforming nuclear envelope close around forming nuclear pore complexes (NPCs) (reviewed by Otsuka and Ellenberg 2018). Other fenestrations are sealed by the formation of filamentous ESCRT-III assemblies and their disassembly by the AAA+ ATPase VPS4 (VPS4A/VPS4B) (reviewed by Schoneberg et al. 2017). The ESCRT-III/VPS4 machinery has a general role in “reverse topology” membrane scission (i.e., involving the fusion of cytoplasmic membrane surfaces (reviewed by Schoneberg et al. 2017). In concert with these events, microtubules connected to the kinetochore and to other chromosomal regions are severed (reviewed by Schoneberg et al. 2017).

**Literature references**


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