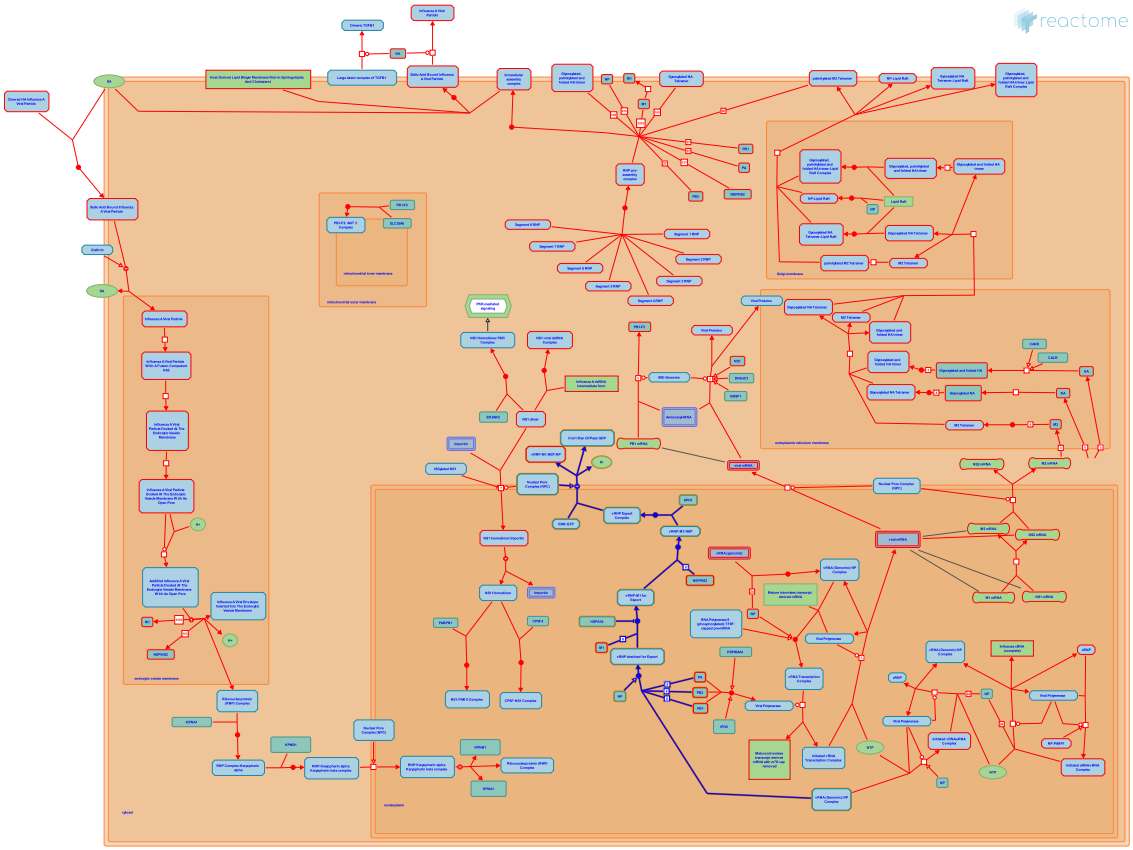
Export of Viral Ribonucleoproteins from Nucleus



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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.

03/05/2024

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. ↗

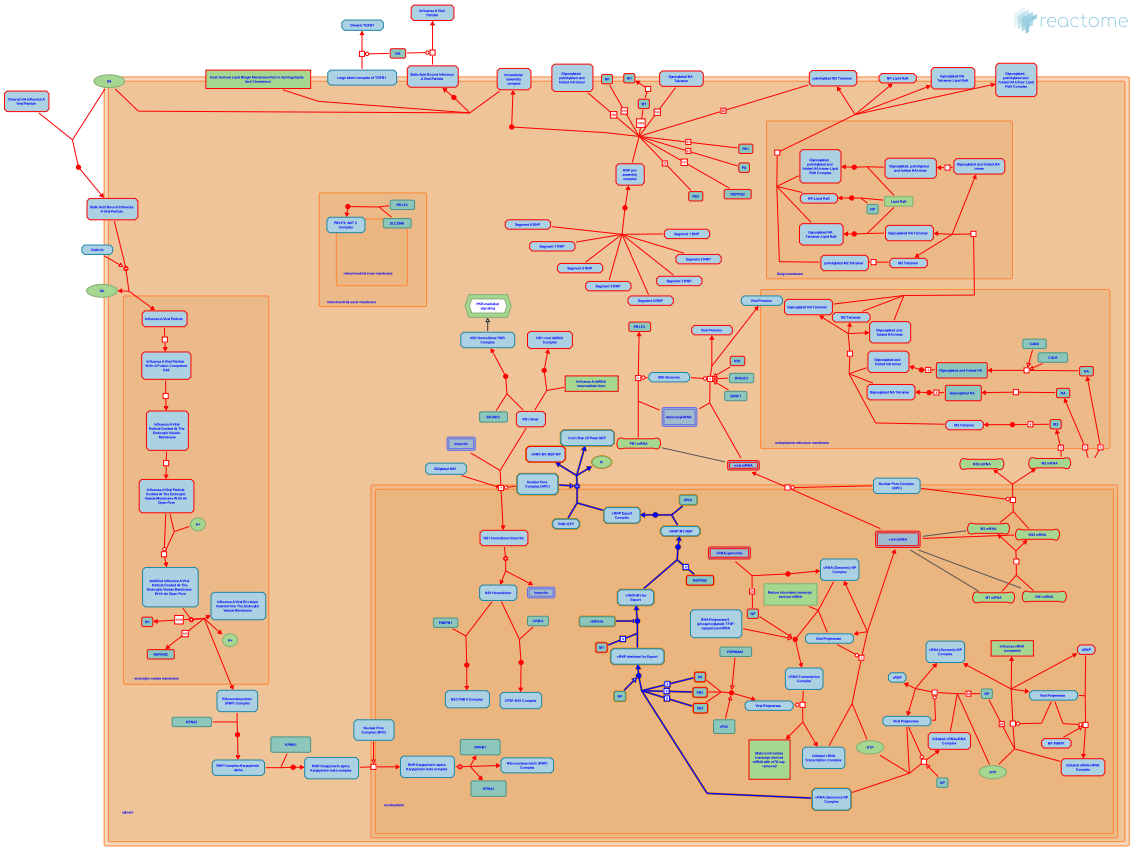
Reactome database release: 88

This document contains 3 pathways (see Table of Contents)

Export of Viral Ribonucleoproteins from Nucleus ↗

Stable identifier: R-HSA-168274

Diseases: influenza



Influenza genomic RNA (vRNA), synthesized in the nucleus of the infected host cell, is packaged into ribonucleoprotein (RNP) complexes containing viral polymerase proteins and NP (nucleocapsid). NP trimers bind the sugar phosphate backbone of the vRNA. As influenza viral RNP complexes are too large for passive diffusion out of the nucleus, utilization of the cellular nuclear export machinery is achieved by viral adaptor proteins. Matrix protein (M1) is critical for export of the complex from the nucleus, mediating the interaction of the RNP complex with the viral NEP/NS2 protein, which in turn interacts with host cell CRM1/exportin-1 nuclear export protein (Martin, 1991; O'Neill, 1998; Neumann et al., 2000; Elton, 2001; Cros, 2003; Ye, 2006; reviewed in Boulo, 2006).

Literature references

Baudin, F., Ruigrok, RW., Akarsu, H., Boulo, S. (2006). Nuclear traffic of influenza virus proteins and ribonucleoprotein complexes. *Virus Res, 124*, 12-21. ↗

Neumann, G., Hughes, MT., Kawaoka, Y. (2000). Influenza A virus NS2 protein mediates vRNP nuclear export through NES-independent interaction with hCRM1. *EMBO J, 19*, 6751-8. ↗

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Editions

2007-02-13	Authored	Garcia-Sastre, A., Bortz, E.
2007-02-13	Reviewed	Squires, B.

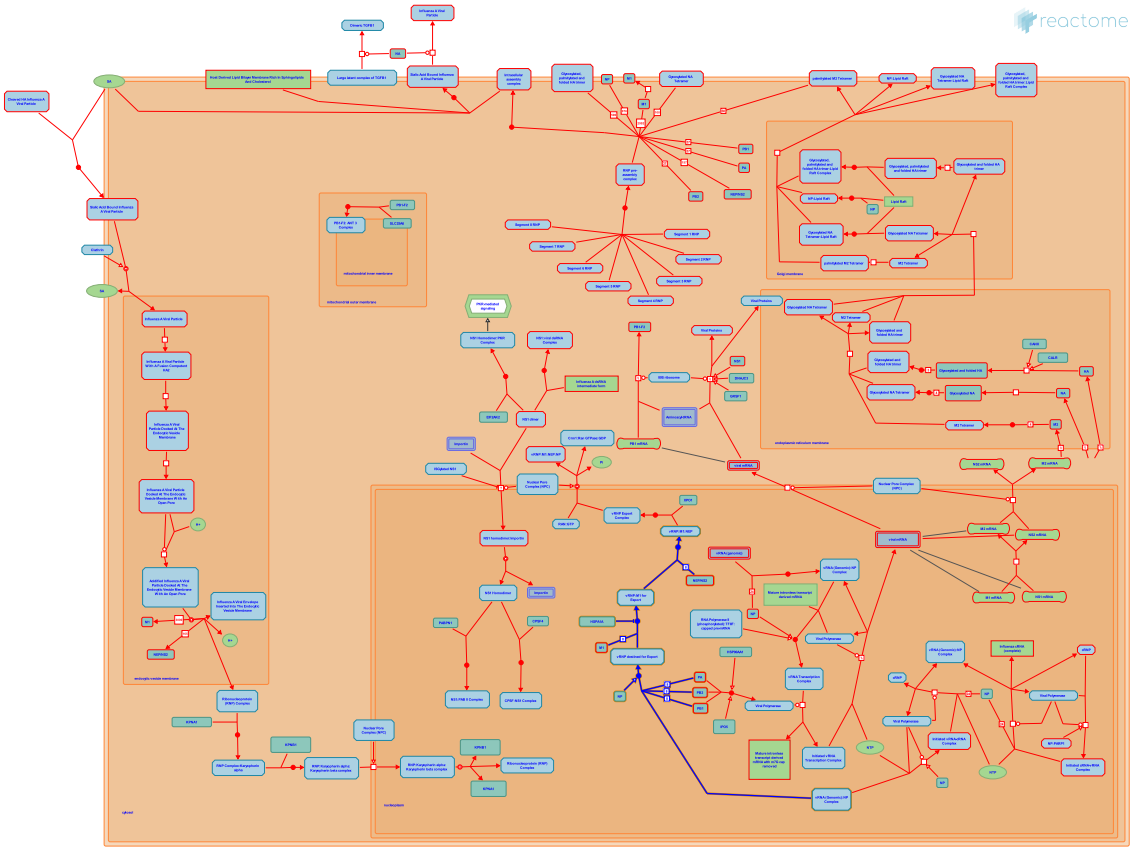
Viral RNP Complexes in the Host Cell Nucleus ↗

Location: Export of Viral Ribonucleoproteins from Nucleus

Stable identifier: R-HSA-168330

Compartments: nucleoplasm

Diseases: influenza



Viral RNP is assembled in the host cell nucleus through the interaction of full-length negative strand viral RNA (vRNA) and the viral nucleocapsid (NP) and matrix (M1) proteins. Studies of interactions of the purified components in vitro and of tissue culture model systems expressing various combinations of the components have established roles for both NP and M1 proteins in the assembly of a complex that has the physical properties of vRNP purified from virions and that can be exported from the host cell nucleus (Whittaker, 1996; Huang, 2001; Baudin, 2001). Viral RNP complexes have been found in the nucleoplasm, and also in the nuclear periphery, associated with the nuclear matrix or chromatin, particularly for vRNA-containing complexes and M1 protein (Elton, 2005; Garcia-Robles, 2005; Takizawa et al., 2006).

Literature references

Liu, T., Levandowski, RA., Muller, J., Huang, X., Ye, Z. (2001). Effect of influenza virus matrix protein and viral RNA on ribonucleoprotein formation and nuclear export. *Virology, 287*, 405-16. ↗

Editions

2007-02-13	Authored	Garcia-Sastre, A., Bortz, E.
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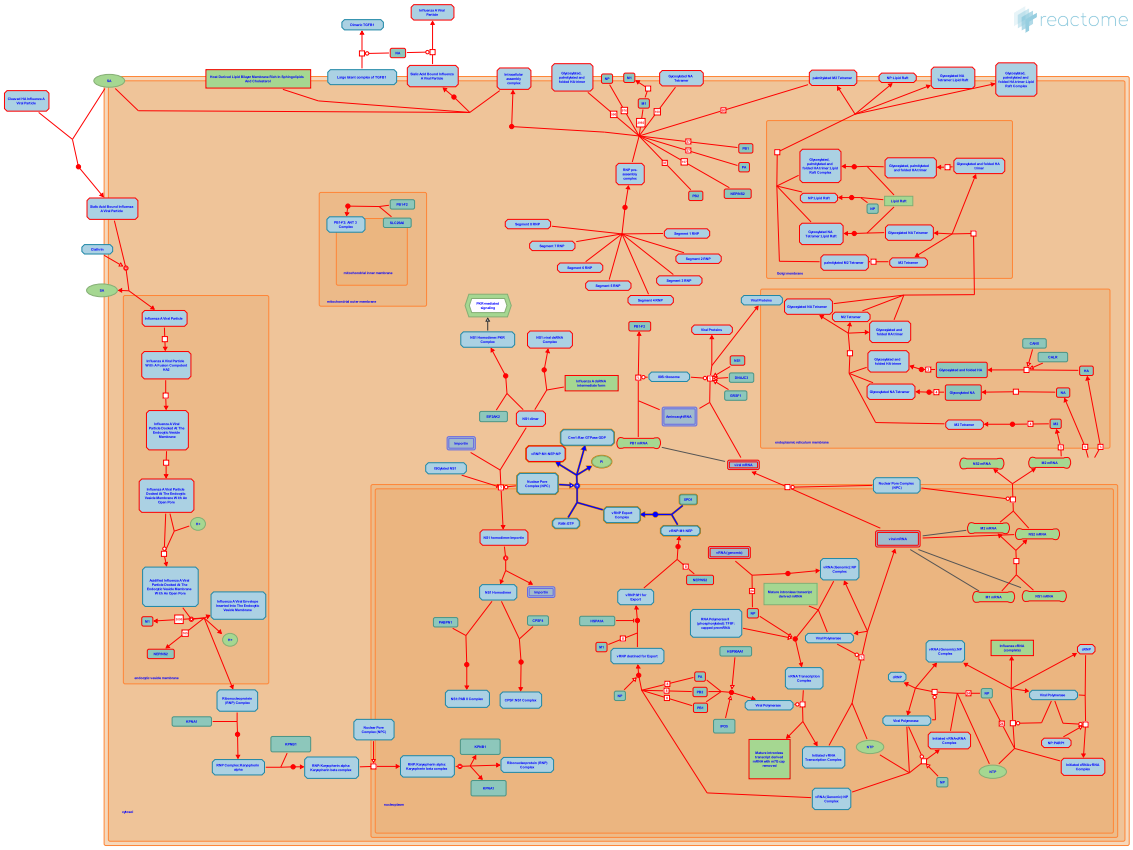
NEP/NS2 Interacts with the Cellular Export Machinery ↗

Location: Export of Viral Ribonucleoproteins from Nucleus

Stable identifier: R-HSA-168333

Diseases: influenza



The viral RNP complex is exported from the nucleus via the host cell CRM1 export pathway (Fukuda, 1997; Neumann, 2000; reviewed in Buolo, 2006). The vRNP complex does not interact directly with CRM1 to form an export complex. Rather, an additional viral protein, nuclear export protein (NEP/NS2), acts as an adaptor, binding the viral matrix M1 protein and CRM1, thus linking the viral RNP with CRM1 (Martin, 1991; O'Neill, 1998; Neumann, 2000; Akarsu, 2003). The CRM1/exportin-1 complex recruits additional host cell proteins, and traverses the nuclear pore into the cytosol.

Literature references

Baudin, F., Ruigrok, RW., Akarsu, H., Boulo, S. (2006). Nuclear traffic of influenza virus proteins and ribonucleoprotein complexes. *Virus Res, 124*, 12-21. ↗

Neumann, G., Hughes, MT., Kawaoka, Y. (2000). Influenza A virus NS2 protein mediates vRNP nuclear export through NES-independent interaction with hCRM1. *EMBO J, 19*, 6751-8. ↗

Petit, I., Baudin, F., Burmeister, WP., Muller, CW., Ruigrok, RW., Petosa, C. et al. (2003). Crystal structure of the M1 protein-binding domain of the influenza A virus nuclear export protein (NEP/NS2). *EMBO J, 22*, 4646-55. ↗

Editions

2007-02-13	Authored	Garcia-Sastre, A., Bortz, E.
2007-02-13	Reviewed	Squires, B.

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