#### Reactome



# Export of BioPax and SBML from Reactome

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#### Rationale – Journal information

#### Nature 407(6805):770-6. The Biochemistry of Apoptosis.

"Caspase-8 is the key initiator caspase in the death-receptor pathway. Upon ligand binding, death receptors such as CD95 (Apo-1/Fas) aggregate and form membrane-bound signalling complexes (Box 3). These complexes then recruit, through adapter proteins, several molecules of procaspase-8, resulting in a high local concentration of zymogen. The induced proximity model posits that under these crowded conditions, the low intrinsic protease activity of procaspase-8 (ref. 20) is sufficient to allow the various proenzyme molecules to mutually cleave and activate each other (Box 2). A similar mechanism of action has been proposed to mediate the activation of several other caspases, including caspase-2 and the nematode caspase CED-3 (ref. 21)."

# How can I access the pathway described here and reuse it?



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Reactome: a database of biological pathways www.reactome.org





#### Events – reactions and regulations

Boxes are proteins, protein sets, mixed sets or complexes. Ovals are small molecules (or sets of) Green boxes are proteins or sets, blue are complexes.



#### **Events - pathways**



At the center of the mammalian circadian clock is a negative transcription/translation-based feedback loop: The BMAL1:CLOCK/NPAS2 heterodimer transactivates CRY and PER genes by binding E-box elements in their promoters; the CRY and PER proteins then inhibit transactivation by BMAL1:CLOCK/NPAS2. BMAL1:CLOCK/NPAS2 activates transcription of CRY, PER, and several other genes in the morning. Levels of PER and CRY proteins rise during the day and inhibit expression of CRY, PER, and other BMAL1:CLOCK/NPAS2-activated genes in the afternoon and evening. During the night CRY and PER proteins are targeted for degradation by phosphorylation and polyubiquitination, allowing the cycle to commence C

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Reactome: a database of biological pathways



#### Manually laid-out pathway diagrams



Reactome: a database of biological pathways

EMBL-EBI 🎒 🖗

# Coverage

- Apoptosis
- Cell cycle
- DNA repair
- Transcription, mRNA processing, translation, posttranslational modification
- Signaling pathways (insulin, NOTCH, opioid, NGF, EGFR, FGFR, Rho GTPases II, Opioid, Wnt)
- Hemostasis
- Metabolism (energy, amino acid, lipid, nucleotide, xenobiotic)
- Synaptic transmission
- Lipoproteins HDL and VLDL

#### **BioPax Output**

- BioPax level 2 and level 3 provided.
- Available for single pathways or for the whole database.
- OWL format dump files.
- Under level 3, the following are exported:
  - bp:Pathway (pathway name)
  - > bp:pathwayComponent (reactions)
  - > bp:comment (text description)
  - > bp:xref (Pubmed references)
  - bp:cellularLocation
  - bp:entityReference (Protein UniProt ID)
  - > bp:UnificationXref (GO terms)



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#### New SBML Output

- SBML level 2.3.
- Available for single pathways or for the whole database.
- Uses MIRIAM-compliant URIs for references to UniProt etc.
- The following are included in the SBML:
- Coordinates for reactions, using layout extension.
- > listOfSpecies
- > ListOfCompartments
- > ListOfReactions
- > UniProt IDs, ChEBI IDs, GO Ids, PubMed IDs
- > Curated text summaries for reactions & pathways



#### **Future Plans**

- RESTful API to allow custom query of Reactome, results returned as BioPax or SBML.
- Import reaction dynamics from other databases.
- Optional collapse of reactions.
- Interactive construction of SBML or BioPax based on user data.
- CellDesigner SBML
- Integration with systems biology packages, e.g. SBW??



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### Interactactive export of SBML or BioPax I

Home	About	Content	Documentation	Tools	Download	Contact Us	Outreach	
		Gen	erate SBI	ML fr	om a lis	st of Ide	ntifiers	
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akes a lis	st of Reactor	ne reaction DE	3_IDs and generates t	he correspo	onding SBML. M	ore	2	
Paste o	r upload you	ur data:						Example
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# Interactactive export of SBML or BioPax II

Optional parameter settings and filters								
Choose SBML level and version numbers	Choose layout							
Level: 2 0 Version: 3 0	LayoutExtension SBGN CellDesigner							
Pathway inclusion filter	Pathway exclusion filter							
Apoptosis	Apoptosis							
Compartment inclusion filter	Compartment exclusion filter							
cytosol 🗘 add	cytosol 🗘 add							
Organism inclusion filter	Organism exclusion filter							
Homo sapiens 😂 add	Homo sapiens 😂 add							
	N. O'							



# Interactactive export of SBML or BioPax III

Select format to download this table: Microsoft Xcel									
Pathway name 💌	Species 💌	Total number of proteins 🔻	Matching proteins in data	% in data 🔻	Click button to view pathway				
ABC-family proteins mediated transport	Homo sapiens	15	0	0%	View				
Adaptive Immunity Signaling	Homo sapiens	0	0	0%	View				
Advanced glycosylation endproduct receptor signaling	Homo sapiens	13	1	7%	View				
Amyloids	Homo sapiens	28	3	10%	View				
APC/C-mediated degradation of cell cycle proteins	Homo sapiens	79	39	49%	View				
Apoptosis	Homo sapiens	0	0	0%	View				
Apoptotic execution phase	Homo sapiens	48	3	6%	View				
Aquaporin-mediated transport	Homo sapiens	30	0	0%	View				
Asparagine N-linked glycosylation	Homo sapiens	85	1	1%	View				
Axon guidance	Homo sapiens	00	0	0%	View				
Base Excision Repair	Homo sapiens	19	18	94%	View				
Bile acid and bile salt metabolism	Homo sapiens	27	1	3%	View				



#### ...er...should I try a live demo?

#### www.reactome.org/ReactomeGWT/entrypoint.html#SBMLR etrievalPage





