Proposal: Towards Apoptosis Ontology?

Andrei Zinovyev, Laurence Calzone, Simon Fourquet
“Computational Systems Biology of Cancer”
U900 Institute Curie/INSERM/Ecole de Mine Paritech, Paris, France

http://bioinfo.curie.fr/sysbio
Functional annotation of high-throughput data

High-throughput data analysis → Gene list

Gene Ontology:
Set of terms and their relations + Association of individual genes to terms
Annotation of mathematical models
• Gene Ontology resource is an important and most used bridge between the world of biology and the world of bioinformatics/mathematical modeling

• Question: how adequate cell death modalities are represented in GO (needed for all data analysis in APO-SYS)?
Gene Ontology resource for cell death

- GO:0008219 : cell death [2802 gene products]
- GO:0019835 : cytolysis [46 gene products]
- GO:0070265 : necrotic cell death [12 gene products]
- GO:0060548 : negative regulation of cell death [944 gene products]
- GO:0010942 : positive regulation of cell death [950 gene products]
- GO:0012501 : programmed cell death [2592 gene products]
- GO:0010941 : regulation of cell death [1982 gene products]

FADD, FASL, TNF, RIPK1, TMEM123

necroptosis

<table>
<thead>
<tr>
<th>Term Information</th>
<th>Term Inference</th>
<th>External references</th>
<th>0 gene product associations</th>
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Accession: GO:0070266
Ontology: biological process
Synonyms: exact: programmed necrotic cell death
Definition: A necrotic cell death process that results from the activation of endogenous cellular processes, such as signaling involving death domain receptors and Toll-like receptors. [source: GO:6881, PMID:19846107]
Comment: None
Subset: None
Community: There have been 9 comments for this term. If you would like to view or participate in the community annotation, please continue to the GONUTS page.
Gene Ontology resource for cell death

- GO:0012501: programmed cell death [2592 gene products]
  - GO:0006915: apoptosis [2324 gene products]
    - GO:0048102: autophagic cell death [80 gene products]
    - GO:0070268: cell death [0 gene products]
    - GO:0010623: developmental programmed cell death [63 gene products]
    - GO:0034050: host programmed cell death induced by symbiont [39 gene products]
    - GO:0010421: hydrogen peroxide-mediated programmed cell death [4 gene products]
    - GO:0070270: mitotic catastrophe [0 gene products]
    - GO:0043069: negative regulation of programmed cell death [942 gene products]
    - GO:0043068: positive regulation of programmed cell death [945 gene products]
    - GO:0070269: pyroptosis [0 gene products]
    - GO:0043067: regulation of programmed cell death [1977 gene products]
    - GO:0010343: single oxygen-mediated programmed cell death [1 gene product]
  - GO:0006919: activation of caspase activity [127 gene products]
  - GO:0008633: activation of pro-apoptotic gene products [43 gene products]
  - GO:0043275: anoikis [0 gene products]
  - GO:007059: apoptosis in response to endoplasmic reticulum stress [9 gene products]
  - GO:0060561: apoptosis involved in morphogenesis [4 gene products]
  - GO:0008537: apoptotic mitochondrial changes [75 gene products]
  - GO:0030262: apoptotic nuclear changes [77 gene products]
  - GO:0006921: cell structure disassembly during apoptosis [73 gene products]
  - GO:0034349: glial cell apoptosis [1 gene product]
  - GO:0006925: inflammatory cell apoptosis [5 gene products]
  - GO:0070227: lymphocyte apoptosis [46 gene products]
  - GO:0010557: muscle cell apoptosis [15 gene products]
  - GO:0033023: myeloid cell apoptosis [26 gene products]
  - GO:0043065: negative regulation of apoptosis [907 gene products]
  - GO:0051402: neuron apoptosis [235 gene products]
  - GO:0045478: nurse cell apoptosis [8 gene products]
  - GO:0001552: ovarian follicle atresia [2 gene products]
  - GO:0043065: positive regulation of apoptosis [394 gene products]
  - GO:0042981: regulation of apoptosis [1865 gene products]
  - GO:0006927: transformed cell apoptosis [12 gene products]
  - GO:0006926: virus-infected cell apoptosis [8 gene products]
  - GO:0014332: modulation by organism of apoptosis in other organism during development [7 gene products]
  - GO:0043066: negative regulation of apoptosis [907 gene products]
    - GO:0043065: positive regulation of apoptosis [894 gene products]
    - GO:0043281: regulation of caspase activity [204 gene products]
    - GO:0034350: regulation of glial cell apoptosis [1 gene product]
    - GO:0070228: regulation of lymphocyte apoptosis [24 gene products]
    - GO:0010660: regulation of muscle cell apoptosis [15 gene products]
    - GO:0033032: regulation of myeloid cell apoptosis [21 gene products]
    - GO:0043523: regulation of neuron apoptosis [212 gene products]
    - GO:0045477: regulation of nurse cell apoptosis [5 gene products]
Gene Ontology resource

• Some limitations of GO:
  – Disease associated functions is out of the scope of GO
  – Molecular interactions are out of the scope of GO
  – Environment and expression are out of the scope of GO
  – GO only considers subsumption (is_a) and partonomic inclusion (part_of)
Cell Cycle Ontology (CCO) (FP6 project DIAMONDS)
http://www.cellcycleontology.org

Sample: “Cyclin B (what) is located in Cytoplasm (where) during Interphase (when)”

- What is a X-type CDK?
- What is Y-type cyclin?
- In what events is CDK Z involved?
- In what events does Rb participate?
- Which CDKs are involved in the endoreduplication process?

Software

The Cell Cycle Ontology: an application ontology for the representation and integrated analysis of the cell cycle process

Erick Antezana¹,², Mikel Egaña³, Ward Blondé⁴, Aitzol Illarramendi⁵, Iñaki Bilbao⁵, Berna⁴, Robert Stevens³, Vladimir Mironov⁶ and Martin Kuiper⁶

1 Department of Plant Systems Biology, VIB, Technologiepark 927, B-9052 Gent, Belgium
2 Department of Molecular Genetics, Ghent University, Technologiepark 927, B-9052 Gent, Belgium
3 School of Computer Science, University of Manchester, Oxford Road, Manchester M13 9PL, UK
4 Department of Applied Mathematics, Biometrics and Computer Science, Ghent University, Couderie links 653, B-9000 Gent, Belgium
5 Noray Bioinformatics, SL Parque Tecnologico 301 A, 29, 48160 Derio (Bizkaia), Spain
6 Department of Biology, Norwegian University of Science and Technology, Hågskoleringen 5, NO-7491 Trondheim, Norway

© author email, ‡ corresponding author email


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Protégé software
Conclusion (questions)

• Improve Gene Ontology ‘cell death’ branch using expertise from APO-SYS project?
• Develop ‘APO-SYS approved’ Ontology for genes and processes easily exploitable?
• Cell Cycle Ontology project from FP6 as a template?
• Using APO-SYS Intranet site for flexible and rapid collaborative effort?