Datums: a knowledge base and representation system for experimental findings concerning cellular response to stimuli.

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What is a datum?
- a formal, computable representation of experimental findings
- a manageable chunk of information, sufficient to unambiguously describe an experimental finding, expressed using concepts readily understood by biologists

Two types of Datum
- a state datum describes the state of something (protein, gene) in a defined system
  - present/absent, active/inactive
  - a protein-protein interaction
- a change datum describes the change in the state of something in a system in response to a stimulus.

An Example of a State Datum

An Example of a Change Datum with an Extra
xS6k1[Ab]IP phos(T412)[phosAb] is increased irt Tnf (30 min)

Information that this datum supplies:
(1) The phosphorylation of expressed S6k1 on T389 is increased in response to the addition of TNF to quiescent MCF7 cells for 30 min.
(2) The response described in (1) is abrogated by removal of Ikk2 by RNAi.
(3) Quiescent MCF7 cells overexpressing S6k1 in medium without serum express endogenous Ikk2.

Using Datums as input to design of Experiments
Q1: What proteins have been shown to be directly phosphorylated by Mekk1?
Result: Stat3, Mek1, Erk2, and Mkk4

Q2: Is expressed Ikk2 constitutively active?
Result: No

Q3: What proteins have been shown to be required for the activation of 3jk kinase activity in response to IL1?
Result: Ikk2, Ikk1, Mkk7, Myd88, Tak1, Traf6

Q4: What proteins have been shown to NOT be required for the activation of 3jk kinase activity in response to IL1?
Result: Rpp1, Tab2, Traf2, Traf5,

Q5: How long should I treat cells with IL1 to maximize 3jk phosphorylation?
Result: between 10 and 15 minutes

Q6: What stimulus turn on Jun-gene transcription?
Result: Egf, Ngf, PMA, Il2, Serum, Lps, Hypoxia, IL3, and UV

Q7: Do untreated HELA cells express endogenous Myp?
Result: Yes

Q8: Where is endogenous Atf2 located in untreated cells?
Result: in the nucleus and cytoplasm

Q9: What proteins have been shown to coprecipitate with Trka?
Result: Csk, Rgs19op1, Shc1, Matk, Arms, Pik3r1, Plcg1, Rgs19, RasGrf1, Ptpv1

Rule 1615 from the Tnf Signaling Network

Using Datums as evidence for rules in signal transduction networks

Selected Evidence for Rule 1615
Requirement for Ikk2
xS6k1[Ab]IP phos(T412)[phosAb] is increased irt Tnf (30 min)
cells: MCF7 xS6k1 in BMLS
reqs: Ikk2 [RNAi]
source: 17693255-Fig-3f

Requirement for Mtor
xS6k1[phosAb] phos(T412) xphosAb is increased irt Tnf (30 min)
cells: MCF7 xS6k1 in BMLS
reqs: Mtor [RNAi]
source: 17693255-Fig-1c

Requirement for Nemo
xS6k1[Ab]IP phos(T412)[phosAb] is increased irt Tnf (30 min)
cells: MCF7 xS6k1 in BMLS
reqs: Nemo [RNAi]
source: 17693255-Fig-2g

Other Possible Uses for Datums
- a notebook to record and organize results of literature search
- input for computing influence diagrams
- a way to categorize experimental results stored in databases

Searching the Datum Knowledge Base
http://pl.csl.sri.com/datumkb.html
A searchable database of more than 39k datums collected as evidence for models of signal transduction in response to external stimuli

Protein Lookup

Sample Query
What proteins are required for an increase in phosphorylation of S6k1 on T412 in response to Tnf treatment in MCF7 cells?