Dual Taxon Annotation

Biological processes involving more than one organism are represented in GO by the terms in the 'interaction between organisms' node. The species in the interaction can be recorded in an annotation by using terms from this node and entering two taxon IDs in the 'taxon' column. This poster provides a brief guide to annotating interactions between organisms.

From the GO Annotation Guide

Taxon column: taxonomic identifier(s)
For cardinality 1, the ID of the species encoding the gene product.
For cardinality 2, to be used only in conjunction with terms that have the term 'interaction between organisms' as an ancestor. The first taxon id should be that of the organism encoding the gene or gene product, and the taxon id after the pipe should be that of the other organism in the interaction.
this field is mandatory, cardinality 1, 2; for cardinality 2, use a pipe to separate entries (e.g. taxon:1|taxon:1000)

Questions and Answers

Q: What is a symbiont in GO?
A: GO defines a symbiont as the smaller organism in a symbiotic interaction; the larger organism is called the host. If the two organisms are the same size, use the generic 'other organism' term.

Q: My bacterial gene product regulates the ethylene-mediated signaling pathway in plants. Can I annotate to 'regulation of ethylene mediated signaling pathway ; GO:0010104' using dual taxon annotation?
A: No. The term needs to explicitly state that the process involves two organisms and it should have parentage under 'interaction between organisms'. You should request a new term 'regulation of ethylene mediated signaling pathway in other organism'.

Q: What about annotating processes where another organism subverts an existing process, e.g. the transcription of viral DNA by host transcription machinery? Could I annotate host proteins to 'transcription of symbiont DNA'?
A: At the moment, no, because this is considered a pathological process. However, this is important information which wouldn't be captured otherwise. This might be worth discussing further.

The 'Interaction Between Organisms' Node

(many child terms omitted for brevity)

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biological_process
  ⓘ interaction between organisms
     ⓘ behavioral interaction between organisms
     ⓘ biofilm formation
     ⓘ conjugation
     ⓘ flocculation
     ⓘ genetic transfer
     ⓘ interspecies interaction between organisms
        ⓘ competition with another organism
        ⓘ symbiosis, encompassing mutualism through parasitism
           ⓘ acquisition of nutrients from other organism during symbiotic interaction
           ⓘ adhesion to other organism during symbiotic interaction
           ⓘ avoidance of defenses of other organism during symbiotic interaction
           ⓘ dissemination or transmission of organism from other organism during symbiotic interaction
           ⓘ entry into other organism during symbiotic interaction
           ⓘ growth on or near surface of other organism during symbiotic interaction
           ⓘ growth within other organism during symbiotic interaction
           ⓘ interaction with host
           ⓘ interaction with symbiont
           ⓘ intracellular protein transport in other organism during symbiotic interaction
           ⓘ modification of morphology or physiology of other organism during symbiotic interaction
           ⓘ movement within other organism during symbiotic interaction
           ⓘ multi-species biofilm formation
           ⓘ nodulation
           ⓘ pathogenesis
           ⓘ recognition of other organism during symbiotic interaction
           ⓘ translocation of molecules into other organism during symbiotic interaction
     ⓘ intraspecies interaction between organisms
     ⓘ physiological interaction between organisms
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Examples of Dual Taxon Annotation

Performing A Process With Another Organism

Nod factor export proteins transfer nod factors out of *Sinorhizobium meliloti* into the surrounding soil, where they are detected by LysM nod factor receptor kinases in *Medicago truncatula* roots and initiate the process of nodulation.

Nod factor export ATP-binding protein I from *S. meliloti*

suggest a new term 'induction of nodule morphogenesis in host'

> nodulation ; GO:0009877
> Ⓟ induction of nodule morphogenesis in host ; GO:00new01

Sinorhizobium meliloti taxonomy ID: 382
Medicago truncatula taxonomy ID: 3880

protein name: Nod factor export ATP-binding protein I
GO term: induction of nodule morphogenesis in host ; GO:00new01
taxon column: taxon:3880|taxon:382

LysM receptor kinase LYK3 precursor from *M. truncatula*

suggest a new term 'induction of nodule morphogenesis by symbiont'

> nodulation ; GO:0009877
> Ⓟ induction of nodule morphogenesis by symbiont ; GO:00new02

Medicago truncatula taxonomy ID: 3880
Sinorhizobium meliloti taxonomy ID: 382

protein name: LysM receptor kinase LYK3 precursor
GO term: induction of nodule morphogenesis by symbiont ; GO:00new02
taxon column: taxon:382|taxon:3880

In annotation file format, this would be:

DB	DB_Object_ID	DB_Object_Symbol	Qualifier	GO ID	DB:Reference	Evidence	With	Aspect	DB_Object_Name	DB_Object_Synonym	DB_Object_Type	taxon	Date	Assigned_by
UniProt	O52618	@		GO:00new01	PMID:11481432	TAS		P	Nod factor export ATP-binding protein I		protein	taxon:3880|taxon:382	20060314	UniProt
UniProt	Q8L4H4	@		GO:00new02	PMID:11481432	TAS		P	LysM receptor kinase LYK3 precursor		protein	taxon:382|taxon:3880	20060314	UniProt

Performing A Process In More Than One Species

The protein cardiotoxin from the southern Indonesian spitting cobra *Naja sputatrix* kills mammalian cells by cytolysis.

Annotation of cardiotoxin precursor, from *N. sputatrix*

use the GO term 'cytolysis of cells of another organism ; GO:0051715'

Naja sputatrix taxonomy ID: 33626 ; Mammalia taxonomy ID: 40674

protein name: cardiotoxin precursor
GO term: cytolysis of cells of another organism ; GO:0051715
taxon column: taxon:33626|taxon:40674

Regulating A Process In Another Organism

Mosquito saliva contains D7 proteins, which bind biogenic amines in order to suppress hemostasis in humans.

Annotation of D7 protein long form, from *A. gambiae*

suggest a new term 'negative regulation of hemostasis in host'

> evasion of host defense response ; GO:0030682
> ⓘ negative regulation of hemostasis in host ; GO:00new03

Anopheles gambiae taxonomy ID: 7165 ; *Homo sapiens* taxonomy ID: 9606

protein name: D7 protein long form
GO term: negative regulation of hemostasis in host ; GO:00new03
taxon column: taxon:7165|taxon:9606