

## Supplemental file – Rule Testing

**Note:** This supplemental document provides the information of how we evaluated the inference rules generated in the manuscript. The description about these inference rules can be found in the manuscript text.

These inference rules were tested using Protégé OWL editor version 4.3 or 5.0. The HermiT (version 1.3.8) reasoner on the Protégé editor was used to test these inference rules.

### Inference Rule 1 (IR1):

If (a agent\_in p,  $\cap$  b agent\_in p),  $\cap$  p is\_a biological\_process,  $\cap$  (a part\_of A,  $\cap$  b part\_of B),  $\cap$  (A is\_a (host organism  $\cup$  host cell),  $\cap$  B is\_a Brucella), then p is\_a 'host-Brucella interaction'

Rule implemented in Protégé OWL editor (a simplified version):

```
biological_process(?p),  
agent_in(?a,?p),  
agent_in(?b,?p),  
part_of(?a,?A),  
part_of(?b,?B),  
Brucella(?B),  
'Brucella host'(?A)  
-> 'host-Brucella interaction'(?p)
```

### Inference Rule 2 (IR2):

If c initially participates in p2,  $\cap$  c begins\_to\_exist\_during p1, then p2 starts\_during p1

Rule implemented in Protégé OWL editor:

```
'molecular entity'(?c),  
biological_process(?p1),  
biological_process(?p2),  
'initially participates in'(?c, ?p2),  
'begins to exist during'(?c, ?p1)  
-> starts_during(?p2, ?p1)
```

### Inference Rule 7 (IR7):

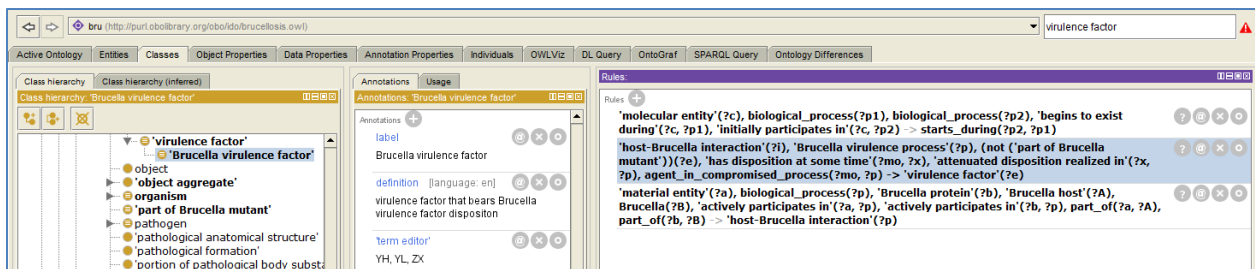
Note: IR7 incorporates the IR3-IR6 rules.

IF ( $mo$  'has disposition at some time' 'attenuated disposition'  $\cap$  'attenuated disposition' 'realized in'  $i$ )  $\cap mo$  (not 'has part')  $e$ ,  $\cap (mo$  agent\_in\_compromised\_process  $p \cap p$  is\_a 'pathogen virulence process'), THEN  $e$  is\_a 'virulence factor'

Rule implemented in Protégé OWL editor:

```
agent_in_compromised_process(?mo,?p),
'Brucella virulence process'(?p),
host-Brucella interaction(?i),
(not ('part of Brucella mutant'))(?e),
'has disposition at some time'(?mo,'attenuated disposition')
-> 'virulence factor'(?e)
```

**Protégé Screenshot:**



**Note:** To include the Rules view on Protégé, first open IDOBRU in Protégé, then on the Protégé menu, click using the following order: Windows → Views → Ontology views → Rules.

**Consistent tests:**

On 03/24/2015:

- Running environment: Proege 5.0, HermiT 1.3.8 classified in 2583685ms,
- Testing result: The ontology was consistent