

A Tool to Link and Establish Confidence in Evidence Used to Construct SBML Models

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[^] Simomics Ltd

Motivation

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- Models increasingly used to explore mechanisms of action and reduce R&D cost
 - Yet key design decisions often opaque to all but the model's author
-  model authors encouraged to incorporate persistent links to resources:
 - Using  **Identifiers.org**
 -  **Guidance** (*Minimum Information Required in the Annotation of Models*)
 - For consistent annotation and curation

Our Platform

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- Web Based Model Evidencing Platform

- Facilitates



knowledge retention



communication



reusability



curation

EVIDENCE COVERAGE

438_KA_NoAnnotation

```
96 <unitDefinition>
97   <ofUnitDefinitions>
98     <fCompartment>
99       <compartment id="default" metaid="default" units="volume" size="1"/>
100     </fCompartment>
101     <fSpecies>
102       <cies id="s1" charge="0" initialAmount="1E-5" hasOnlySubstanceUnits="true"
103         <cies id="s19" charge="0" initialAmount="1E-6" hasOnlySubstanceUnits="true"
104         <cies id="s3" charge="0" initialAmount="0" hasOnlySubstanceUnits="true"
105         <cies id="s4" initialConcentration="5E-6" charge="0" name="3OC12HSL" meta
106         <cies id="s16" charge="0" initialAmount="1E-5" hasOnlySubstanceUnits="true"
107         <cies id="s17" charge="0" initialAmount="0" name="A plux" metaid="s17" co
108         <cies id="s5" initialAmount="0" name="sa6 degraded" metaid="s5" compartme
109         <cies id="s42" initialAmount="0" name="LasR/AHL" metaid="s42" compartmen
110         <cies id="s2" charge="0" initialAmount="0" hasOnlySubstanceUnits="true"
111         <cies id="s45" initialAmount="0" name="GFP" metaid="s45" compartment="de
112     </fSpecies>
113     <fReactions>
114       <reaction id="re3" metaid="re3" reversible="false" fast="false">
115         <listOfReactants>
116           <speciesReference species="s19" metaid="CDMT00008"/>
117         </listOfReactants>
118         <listOfProducts>
119           <speciesReference species="s3" metaid="CDMT00009"/>
120         </listOfProducts>
121         <listOfModifiers>
122           <modifierSpeciesReference species="s19" metaid="df6f5dba_d493_47ef_9fba
123         </listOfModifiers>
124         <ineticLaw metaid="CDMT00010">
125           <math xmlns="http://www.w3.org/1998/Math/MathML">
126             <apply>
127               <times/>
128               <ci> Y2 </ci>
129               <ci> s19 </ci>
130             </apply>
131           </math>
132           <listOfParameters>
133             <parameter id="Y2" name="degradation rate of LasR" metaid="Y2" value=
```

Associated Evidence

s19
Yes

Tags

Disassociated Evidence

Evidencing Platform

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- Permits attachment of Identifiers.org links and additional evidence to SBML components.
 - Using Identifiers.org services

Add Source

PUBLICATION FILE IMAGE WEBSITE TEXT MIRIAM

Name: UniProt Transcriptional activator protein LasR 48 / 128

Collection: UniProt Knowledgebase

Resource: UniProt through NCBI

Item: P25084 6 / 128

URL: <https://www.ncbi.nlm.nih.gov/protein/P25084>

Quality: Medium

Summary: Evidence for inclusion of species s19, LasR

CANCEL SUBMIT

Source

Add Evidence

Name: UniProt Evidence for s19 LasR 29 / 128

Sources: UniProt Transcriptional activator protein LasR

Belief:

No

Contentious

Insufficient Data

Yes

CANCEL SUBMIT

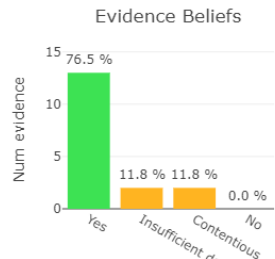
Evidence

```
92 <unitDefinition id="time" name="time" metaid="time">
93   <listOfUnits>
94     <unit metaid="CDMT00035" kind="second"/>
95   </listOfUnits>
96 </unitDefinition>
97 </listOfUnitDefinitions>
98 <listOfCompartments>
99   <compartment id="default" metaid="default" units="volume" s
100 </listOfCompartments>
101 <listOfSpecies>
102   <species id="s1" charge="0" initialAmount="1E-5" hasOnlySubs
103     <species id="s19" charge="0" initialAmount="1E-6" hasOnlySubs
104     <species id="s3" charge="0" initialAmount="0" hasOnlySubstar
105     <species id="s4" initialConcentration="5E-6" charge="0" name
106     <species id="s16" charge="0" initialAmount="1E-5" hasOnlySub
107     <species id="s17" charge="0" initialAmount="0" name="A plux'
108     <species id="s5" initialAmount="0" name="sa6_degraded" metai
109     <species id="s42" initialAmount="0" name="LasR/AHL" metaid="
110     <species id="s2" charge="0" initialAmount="0" hasOnlySubstar
111     <species id="s45" initialAmount="0" name="GFP" metaid="s45"
112 </listOfSpecies>
```

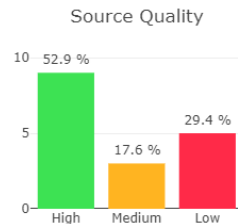
Code Attachment

Evidencing Platform

- Accompanying value indicates author confidence in attached evidence
- Aim to follow MIRIAM-Compliance guidance while adding evidence coverage and summary statistics
 - For assessing overall confidence and knowledge gaps



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www.simomics.com

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@kieranjalden

Uploading Model File

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 KISMET


Select Project ▼


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 Project Summary

 Files

 Evidence

 Sources

 Overview

 Stats

Please select or create a project from above

Sources of Evidence

With Author Indicated Measure of Quality

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Quorum_Sensing_SBML...

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```
<?xml version='1.0' encoding='UTF-8' standalone='no'?>
<!-- This model was downloaded from BioModels Database -->
<!-- http://www.ebi.ac.uk/biomodels/ -->
<!-- Mon May 21 11:07:42 BST 2018 -->
<sbml xmlns="http://www.sbml.org/sbml/level2/version4" level="2" metaid="
<model id="MODEL1301110000" name="Saeidi2012 - Quorum sensing device t
<annotation>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#" xml
<rdf:Description rdf:about="#Saeidi2012">
<dc:creator>
<rdf:Bag>
<rdf:li rdf:parseType="Resource">
<vCard:N rdf:parseType="Resource">
<vCard:Family>Chelliah</vCard:Family>
<vCard:Given>Vijayalakshmi</vCard:Given>
</vCard:N>
<vCard:EMAIL>viji@ebi.ac.uk</vCard:EMAIL>
<vCard:ORG rdf:parseType="Resource">
<vCard:Orgname>EMBL-EBI</vCard:Orgname>
</vCard:ORG>
</rdf:li>
<rdf:li rdf:parseType="Resource">
<vCard:N rdf:parseType="Resource">
<vCard:Family>Saeidi</vCard:Family>
<vCard:Given>Nazanin</vCard:Given>
</vCard:N>
<vCard:EMAIL>nazaninsaeidi@ntu.edu.sg</vCard:EMAIL>
<vCard:ORG rdf:parseType="Resource">
```

Associated Evidence

Tags

Disassociated Evidence

Attaching of Evidence

Linking to Model Code with Author's Confidence Measure

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Quorum_Sensing_SBML...

```
86 </unitDefinition>
87 <unitDefinition id="length" name="length" metaid="length">
88 <listOfUnits>
89   <unit metaid="CDMT00034" kind="metre"/>
90 </listOfUnits>
91 </unitDefinition>
92 <unitDefinition id="time" name="time" metaid="time">
93 <listOfUnits>
94   <unit metaid="CDMT00035" kind="second"/>
95 </listOfUnits>
96 </unitDefinition>
97 </listOfUnitDefinitions>
98 <listOfCompartments>
99   <compartment id="default" metaid="default" units="volume" size="1
100 </listOfCompartments>
101 <listOfSpecies>
102   <species id="s1" charge="0" initialAmount="1E-5" hasOnlySubstance
103   <species id="s19" charge="0" initialAmount="1E-6" hasOnlySubstance
104   <species id="s3" charge="0" initialAmount="0" hasOnlySubstanceUni
105   <species id="s4" initialConcentration="5E-6" charge="0" name="30C
106   <species id="s16" charge="0" initialAmount="1E-5" hasOnlySubstance
107   <species id="s17" charge="0" initialAmount="0" name="A pLux" met
108   <species id="s5" initialAmount="0" name="sa6_degraded" metaid="s5
109   <species id="s42" initialAmount="0" name="LasR/AHL" metaid="s42"
110   <species id="s2" charge="0" initialAmount="0" hasOnlySubstanceUni
111   <species id="s45" initialAmount="0" name="GFP" metaid="s45" comp
112 </listOfSpecies>
113 <listOfReactions>
114   <reaction id="re3" metaid="re3" reversible="false" fast="false">
115     <listOfReactants>
116       <speciesReference species="s19" metaid="CDMT00008"/>
```

Associated Evidence

Tags

Disassociated Evidence

Evidence Coverage

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Quorum_Sensing_SBML...

```
96 </unitDefinition>
97 </listOfUnitDefinitions>
98 <listOfCompartments>
99 <compartment id="default" metaid="default" units="volume" size="1"/>
100 </listOfCompartments>
101 <listOfSpecies>
102 <species id="s1" charge="0" initialAmount="1E-5" hasOnlySubstanceUnits="true" name="Ptet-LacI" metaid="s1" compartment="default"/>
103 <species id="s19" charge="0" initialAmount="1E-6" hasOnlySubstanceUnits="true" name="LasR" metaid="s19" compartment="default"/>
104 <species id="s3" charge="0" initialAmount="0" hasOnlySubstanceUnits="true" name="sa3_degraded" metaid="s3" compartment="default"/>
105 <species id="s4" charge="0" initialConcentration="5E-6" charge="0" name="30C12HSL" metaid="s4" compartment="default"/>
106 <species id="s16" charge="0" initialAmount="1E-5" hasOnlySubstanceUnits="true" name="pLuxR" metaid="s16" compartment="default"/>
107 <species id="s17" charge="0" initialAmount="0" name="A plux" metaid="s17" compartment="default"/>
108 <species id="s5" charge="0" initialAmount="0" name="sa6_degraded" metaid="s5" compartment="default"/>
109 <species id="s42" charge="0" initialAmount="0" name="LasR/AHL" metaid="s42" compartment="default"/>
110 <species id="s2" charge="0" initialAmount="0" hasOnlySubstanceUnits="true" name="mRNA(LasR)" metaid="s2" compartment="default"/>
111 <species id="s45" charge="0" initialAmount="0" name="GFP" metaid="s45" compartment="default"/>
112 </listOfSpecies>
113 <listOfReactions>
114 <reaction id="re3" metaid="re3" reversible="false" fast="false">
115 <listOfReactants>
116 <speciesReference species="s19" metaid="CDMT00008"/>
117 </listOfReactants>
118 <listOfProducts>
119 <speciesReference species="s3" metaid="CDMT00009"/>
120 </listOfProducts>
121 <listOfModifiers>
122 <modifierSpeciesReference species="s19" metaid="df6f5dba_d493_47ef_9fba_be4573b3cc49"/>
123 </listOfModifiers>
124 <kineticLaw metaid="CDMT00010">
125 <math xmlns="http://www.w3.org/1998/Math/MathML">
126 <apply>
127 <times/>
```

Associated Evidence

Tags

Disassociated Evidence

Overview & Statistics

Assist in Determining Overall Model Confidence

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Quorum_Sensing_SBML...

1

<?xml version='1.0' encoding='UTF-8' standalone='no'?>

2

<!-- This model was downloaded from BioModels Database -->

3

<!-- http://www.ebi.ac.uk/biomodels/ -->

4

<!-- Mon May 21 11:07:42 BST 2018 -->

5

<!-- Mon May 21 11:07:42 BST 2018 -->

6

<sbml xmlns="http://www.sbml.org/sbml/level2/version4" level="2" metaid="

7

<model id="MODEL1301110000" name="Saeidi2012 - Quorum sensing device t

8

<annotation>

9

<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#" xml

10

<rdf:Description rdf:about="#Saeidi2012">

11

<dc:creator>

12

<rdf:Bag>

13

<rdf:li rdf:parseType="Resource">

14

<vCard:N rdf:parseType="Resource">

15

<vCard:Family>Chelliah</vCard:Family>

16

<vCard:Given>Vijayalakshmi</vCard:Given>

17

</vCard:N>

18

<vCard:EMAIL>vij@ebi.ac.uk</vCard:EMAIL>

19

<vCard:ORG rdf:parseType="Resource">

20

<vCard:Orgname>EMBL-EBI</vCard:Orgname>

21

</vCard:ORG>

22

</rdf:li>

23

<rdf:li rdf:parseType="Resource">

24

<vCard:N rdf:parseType="Resource">

25

<vCard:Family>Saeidi</vCard:Family>

26

<vCard:Given>Nazanin</vCard:Given>

27

</vCard:N>

28

<vCard:EMAIL>nazaninsaeidi@ntu.edu.sg</vCard:EMAIL>

29

<vCard:ORG rdf:parseType="Resource">

30

<vCard:Orgname>NTU</vCard:Orgname>

31

</vCard:ORG>

32

</rdf:li>

33

</rdf:Bag>

34

</rdf:Description>

35

</annotation>

36

</model>

37

</sbml>

Associated Evidence

Tags

Disassociated Evidence

Accessing the Platform

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- Platform offers a Guest Login, with example model and evidence
 - Based on Quorum Sensing SBML model from BioModels*
- Alternative version of platform compatible with MATLAB and XML models



<https://evidence.simomics.com>

* Model 1301110000

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| @kieranjalden

Conclusion

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- Platform adoption offers benefit in increasing model:



Quality



Auditability



Confidence in Wider Application

- While ensuring retention of IP within institutions

Thank You

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www.simomics.com



<https://evidence.simomics.com>



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www.york.ac.uk/electronic-engineering

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Innovate UK