

## IMG Networks

IMG networks consist of IMG part lists and IMG pathways. Each part list or pathway is defined by a set of IMG terms. For rationale and more detailed explanation, please refer to the following two documents:

- IMG Terms, Pathways, and Parts Lists (<https://img.jgi.doe.gov/mer/imgterms.html>)
- [PLoS ONE 8\(2\): e54859. doi:10.1371/journal.pone.0054859](https://doi.org/10.1371/journal.pone.0054859)

## IMG Network Browser

IMG networks are organized hierarchically with each network consisting of component (child) networks, IMG parts lists, or IMG pathways, as shown in Figure 1(i). Component IMG pathways can be selected and included into the Function Cart for further analysis. For each IMG network, the IMG Network Detail page provides information on the network and its component pathways, as shown in Figure 1(ii). Each parts list or pathway can be examined in more detail (to be discussed below).

### IMG Network Browser

IMG networks organize IMG pathways and parts lists.

(i)

- 01 [NETWORK-00063](#) Amino acid synthesis
- 02 [NETWORK-00112](#) Synthesis of D-amino acids
- 03 [NETWORK-00065](#) D-alanine synthesis  
  - 04  [IPWAY-00264](#) D-alanine synthesis from D-asparagine by transamination
  - 04  [IPWAY-00262](#) D-alanine synthesis from D-aspartate by transamination
  - 04  [IPWAY-00258](#) D-alanine synthesis from D-glutamate by transamination
  - 04  [IPWAY-00256](#) D-alanine synthesis from L-aspartate by transamination
- 03 [NETWORK-00443](#) ken test
- 03 [NETWORK-00070](#) D-aspartate synthesis  
  - 04  [IPWAY-00263](#) D-aspartate synthesis from D-alanine by transamination
  - 04  [IPWAY-00260](#) D-aspartate synthesis from D-glutamate by transamination
  - 04  [IPWAY-00265](#) D-aspartate synthesis from L-aspartate
- 03 [NETWORK-00068](#) D-glutamate synthesis  
  - 04  [IPWAY-00113](#) D-glutamate synthesis from D-aspartate by transamination

### IMG Network Detail

(ii)

Network OID	00070
Name	D-aspartate synthesis
EQN Grammar	
Description	
Comments	
Image ID	
Add Date	2005-07-27
Modify Date	2005-07-27
Modified By	Iain Anderson ( <a href="mailto:IAnderson@lbl.gov">IAnderson@lbl.gov</a> )

**IMG Network Subtree Structure**

- 03 D-aspartate synthesis
  - [IPWAY-00263](#) D-aspartate synthesis from D-alanine by transamination
  - [IPWAY-00260](#) D-aspartate synthesis from D-glutamate by transamination
  - [IPWAY-00265](#) D-aspartate synthesis from L-aspartate

**Figure 1.** IMG Network Browser.

## IMG Parts List

IMG Parts Lists organize components involved in various cellular processes (see Figure 2(i)). Each IMG Part List is defined by a set of IMG Terms as shown in Figure 2(ii). IMG terms can be selected to add to the Function Cart for further analysis.

The screenshot displays the 'IMG Parts List' interface. It features a main header 'IMG Parts List' and a sub-header 'Parts list organizes components involved in various cellular processes.' Below this are three buttons: 'Add Selected to Function Cart', 'Select All', and 'Clear All'. A filter section includes a dropdown for 'Parts List Name' and a text input for 'Filter'. There are also 'Export', 'Page 1 of 1', and navigation buttons. A table lists parts lists with columns for 'Select', 'Parts List ID', and 'Parts List Name'. The table includes entries for 'Aminoacyl-tRNA synthetase', 'Anti/Anti-Anti Sigma factor', 'Archaeal Core Signaling', 'Archaeal Ribonuclease', 'Archaeal Transcription Initiation', 'Archaeal translation elongation', and 'Archaeal translation initiation'. An 'IMG Parts List Details' panel for ID 27 shows fields for 'Name', 'Definition', 'Add Date', 'Modify Date', and 'Modified By'. Below this is the 'IMG Terms' section, which includes a filter and a table of terms with columns for 'Select', 'Term ID', and 'Term Name'. The terms listed are 'Archaeal DNA-directed RNA polymerase', 'TATA binding protein of transcription factor TFIID', and 'TBP-interacting protein TIP49'.

**IMG Parts List** (i)

Parts list organizes components involved in various cellular processes.

**IMG Parts List Details** (ii)

Select	Parts List ID	Parts List Name
<input type="checkbox"/>	13	Aminoacyl-tRNA synthetase
<input type="checkbox"/>	2	Anti/Anti-Anti Sigma factor
<input type="checkbox"/>	43	Archaeal Core Signaling
<input type="checkbox"/>	44	Archaeal Ribonuclease
<input type="checkbox"/>	27	Archaeal Transcription Initiation
<input type="checkbox"/>	23	Archaeal translation elongation
<input type="checkbox"/>	20	Archaeal translation initiation
<input type="checkbox"/>	26	Archaeal tRNA synthetase

Field	Value
Parts List OID	27
Name	Archaeal Transcription Initiation
Definition	
Add Date	2007-03-25
Modify Date	2007-03-25
Modified By	Nikos Kyrpides

**IMG Terms**

IMG terms specify components involved in the parts list.

Select	Term ID	Term Name
<input type="checkbox"/>	2682	Archaeal DNA-directed RNA polymerase
<input type="checkbox"/>	1960	TATA binding protein of transcription factor TFIID
<input type="checkbox"/>	2685	TBP-interacting protein TIP49

Figure 2. IMG Parts Lists.

## IMG Pathways

A list of IMG pathways is provided as shown in Figure 3(i). IMG pathways can be selected from this list and included into the Function Cart for further analysis. For each IMG pathway, the IMG Pathway Details page provides information on the pathway and its reactions, as shown in Figure 3(ii). Reactions are listed with a reaction order number, with alternates within a reaction shown with a suffix letter. For terms associated with reactions, the number of genomes that have genes associated with the term is provided; this number provides a link to the list of these genomes. The genomes that have genes associated with the pathway are listed after reactions as shown in Figure 3(iii). For each reaction in the pathway, the IMG terms associated with the reaction are also listed. Such terms usually describe an enzyme catalyzing the reaction or subunits involved in the formation of a protein complex.

**IMG Pathways (Alphabetical)**

IMG Paths: 908  
 IMG Parts Lists: 59  
 IMG Paths Connected to IMG Networks: 904  
 IMG Paths Not Connected to IMG Networks: 4  
 IMG Parts Lists Connected to IMG Networks: 55  
 IMG Parts Lists not Connected to IMG Networks: 4

Filter column: Pathway Name Filter: text Apply

Page 1 of 10 << first < prev 1 2 3 4 5 6 7 8 9 10 next > last >>

Column Selector Select Page Deselect Page

Select	Pathway ID	Pathway Name
<input type="checkbox"/>	519	(6-4) photoproduct photorepair
<input type="checkbox"/>	902	(R)-2-hydroxyisocaproate degradation
<input type="checkbox"/>	834	1,2-propanediol conversion to propanal
<input type="checkbox"/>	820	1,3-diaminopropylamine

**IMG Pathway Details**

Pathway OID: 458  
 Name: Alkane oxidation to fatty acids  
 Add Date: 2006-09-12  
 Modify Date: 2007-02-05  
 Modified By: Iain Anderson

Add this pathway to the function cart.

**Pathway Reactions**

Reaction Order	Reaction ID	IMG Terms	Reaction Definition
1.	<a href="#">1359</a>	<input type="checkbox"/> <a href="#">1857</a> alkane 1-monoxygenase (EC 1.14.15.3)	Alkane + Reduced rubredoxin + Oxygen <=> Oxidized rubredoxin
2.	<a href="#">1360</a>	<input type="checkbox"/> <a href="#">1858</a> alkan-1-ol dehydrogenase (EC 1.1.99.20)	Primary alcohol + Acceptor <=> Aldehyde + Reduced acceptor
3.	<a href="#">1361</a>	<input type="checkbox"/> <a href="#">1859</a> aldehyde dehydrogenase (acceptor) (EC 1.2.99.3)	Aldehyde + Acceptor + H2O <=> Fatty acid + Reduced acceptor

**Associated Genomes**

The following genomes have at least one gene associated with the pathway.

**Phylogenetic Distribution**

Domains(D): \* = Microbiome.  
 B = Bacteria, A = Archaea, E = Eukarya, P = Plasmids, G = GFragment, V = Viruses.  
 Genome Completion(C): F = Finished, P = Permanent Draft, D = Draft.

Filter column: Domain Filter: text Apply

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Column Selector Select Page Deselect Page

Select	Domain	Status	Genome	Pathway Assertion
<input type="checkbox"/>	A	D	<a href="#">Candidatus_Thalassoarchaea_marina_composite_genome</a>	not asserted
<input type="checkbox"/>	A	D	<a href="#">Candidatus_Thalassoarchaea_mediterranei_composite_genome</a>	asserted
<input type="checkbox"/>	A	D	<a href="#">Halorcula_californiae_BJGH-2_ATCC_33799</a>	asserted
<input type="checkbox"/>	A	D	<a href="#">Halorcula_sinaiensis_BJSG-2</a>	asserted

**Figure 3.** IMG Pathway.

Each genome listed in the **Associated Genomes** list has a pathway assertion status to show whether the pathway is asserted for this genome or not. A genome is asserted if it has genes associated with each required reaction of the pathway. For alternative reaction steps, the genome only needs to have gene(s) associated with at least one of the alternatives. Users can click on the **Pathway Assertion** link to view pathway assertion details. To find out more information re. IMG pathway assertion, please refer to the following IMG paper: [PLoS ONE 8\(2\): e54859. doi:10.1371/journal.pone.0054859](https://doi.org/10.1371/journal.pone.0054859)

## IMG Terms

IMG terms provide a controlled vocabulary for the functional roles of genes within IMG. The list of IMG terms can be examined with the IMG Term Browser, as shown in Figure 4(i). IMG terms can be selected from this list and included into the Function Cart for further analysis. For each IMG term, the IMG Term Details page provides information on the term, related (parent or child) terms, related IMG pathways, reactions, and parts list, and the number of genes associated with the term, as shown in Figure 4(ii). The genomes that have genes associated with the term are listed as shown in Figure 4(iii).

**IMG Term Browser** (i)

Gene Product	<a href="#">4566</a>
IMG Terms connected to Pathways	<a href="#">2159</a>
IMG Terms connected to Parts Lists	<a href="#">1063</a>
IMG Terms not connected to Pathways or Parts Lists	<a href="#">1433</a>
IMG Terms not connected to Pathways	<a href="#">2407</a>
IMG Terms not connected to Parts Lists	<a href="#">3503</a>
IMG Terms not connected to Genes (missing genes)	<a href="#">200</a>
Modified Protein	<a href="#">169</a>
Protein Complex	<a href="#">446</a>

[Add Selected to Function Cart](#) [Select All](#)

[Alphabetical List](#)

(Term Tree Root)

- [5655](#) (1->4)-alpha-D-glucan 1-alpha-D-glucosylmutase (EC:5.4.9.15)
- [6421](#) (1->4)-alpha-D-glucan branching enzyme
- [6422](#) (1->4)-alpha-D-glucan synthase (ADP-glucose)
- [7458](#) (1->4)-alpha-D-glucan synthase (UDP-glucose)
- [7478](#) (2-(2,4-dihydroxy-6-methylphenyl)-2-oxoethyl)-4-hydroxy-2-pyrone synthase
- [6959](#) (2S)-methyleucosyl-CoA dehydrogenase
- [7471](#) (3S)-methyleucosyl-CoA dehydrogenase
- [7472](#) (3R)-methyleucosyl-CoA dehydrogenase

**IMG Term Details** (ii)

Term Information

Term Object ID	5655
Term	(1->4)-alpha-D-glucan 1-alpha-D-glucosylmutase (EC:5.4.9.15)
Type	GENE PRODUCT
Definition	
Pubmed ID	
Comments	
Enzymes	
Add Date	2008-09-09
Modify Date	2008-09-09
Modified By	Kostas Mavrommatis
Number of Synonyms	0
Number of Genes	<a href="#">26</a>

<input type="checkbox"/>	B	F	<a href="#">Brevibacterium flavum ATCC 15168 (unscreened)</a>	1
<input type="checkbox"/>	B	F	<a href="#">Corynebacterium crudilactis JZ16</a>	1
<input type="checkbox"/>	B	F	<a href="#">Corynebacterium glutamicum ATCC 13869</a>	1
<input type="checkbox"/>	B	F	<a href="#">Corynebacterium glutamicum ATCC 21831</a>	1
<input type="checkbox"/>	B	F	<a href="#">Corynebacterium glutamicum B253</a>	1

(iii)

**Figure 4.** IMG Term.

## IMG Compounds

In order to reach the IMG Compound List, a user should go to the IMG Network Browser page first, and then click the **IMG Compounds** link from there.

IMG Compound Browser page (Figure 5(i)) lists all chemical compounds in the IMG database. Users can click on the Compound OIDs to view detailed definition of each compound (see Figure 5(ii)), which includes compound name, external accession, formula, CAS number (if any), molecular weight, number of atoms in the compound, SMILES, InChI as well as chemical structure of the compound (see Figure 5(iii)).

**IMG Compound Browser (i)**

Filter column:  Filter

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Compound OID	Compound Name	PubChem CID	KEGG LIGAND	KEGG LIGAND	PubChem CID
<a href="#">002171</a>	4a-Hydroxytetrahydrobiopterin				
<a href="#">059625</a>	'Activated' tRNA		KEGG LIGAND	<a href="#">C02342</a>	
<a href="#">063960</a>	((R)-3-Hydroxybutanoyl)(n-2)		KEGG LIGAND	<a href="#">C06147</a>	
<a href="#">069953</a>	(+)-(1R,2R)-1,2-Diphenylethane-1,2-diol	<a href="#">853019</a>	KEGG LIGAND	<a href="#">C16015</a>	C14H14O2
<a href="#">054883</a>	(+)-(3S,4R)-cis-3,4-Dihydroxy-3,4-dihydrofluoren	<a href="#">441319</a>	KEGG LIGAND	<a href="#">C07721</a>	C13H12O2
<a href="#">052364</a>	(+)-(S)-Carvone				
<a href="#">066323</a>	(+)-12-(2-Cycloper-2-dodecanone				

**Chemical Structure (iii)**

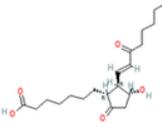


Image from [NCI/CADD](#). Source [url](#).

**IMG Compound Details (ii)**

**Compound Information**

Compound Object ID	059936
Compound Name	(13E)-11alpha-Hydroxy-9,15-dioxoprost-13-enoate
Common Name	
Ext Accession	<a href="#">C04654</a>
DB Source	KEGG LIGAND
Class	
Composition	
Formula	C20H32O5
CAS Number	
Status	
Mol. Weight	352.46508
Num of Atoms	25
SMILES	<chem>CCCCC(=O)C=CC1C(CC(=O)C1CCCCC(=O)O)O</chem>
InChI	InChI=1S/C20H32O5/c1-2-3-6-9-15(21)12-13-17-16(18(22)14-19(17)23)10-7-4-5-8-11-20(24)25/h12-13,16-17,19,2
InChI Key	<a href="#">VXPBDCBTMSKCKZ-XQHNHVHJSA-N</a>

Figure 5. IMG Compound.