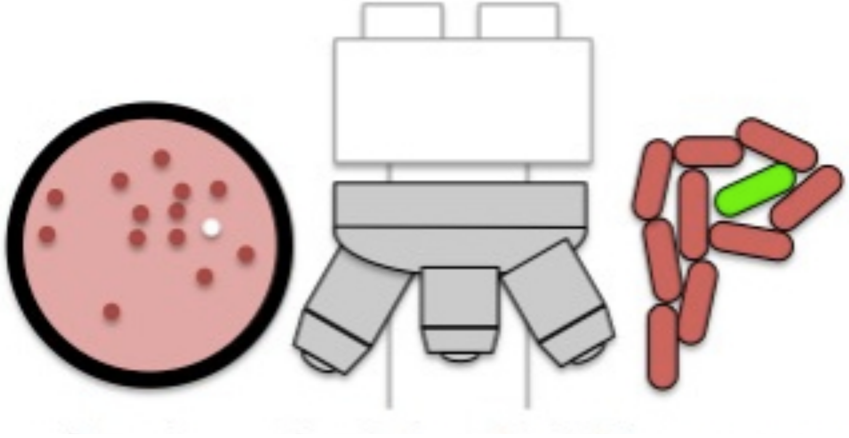


OMP: Ontology for Microbial Phenotypes

Debby Siegele
Biology Dept.
Texas A&M University

CTSOG 2017 Microbiology for the CTSA: Ontological Approaches

OMP team

Texas A&M University

Jim Hu
Debby Siegele
Suzi Aleksander
Sandra LaBonte
Peter Wu

Univ. of Maryland Medical School–Institute for Genomic Sciences

Michelle Gwinn Giglio
Marcus Chibucos
Suvarna Nadendla

URLs

OMP downloads and issue tracker: github.com/microbialphenotypes

OMPwiki: microbialphenotypes.org

The OMPwiki includes both the OMP ontology and phenotype annotations made using OMP.

Goals

- common phenotype ontology for all microbes
    - Bacteria
    - Archaea
    - Fungi
    - Protists
    - Viruses and phage

- compatibility with existing microbial phenotype ontologies

- connect phenotypes to GO biological processes

OMP in the context of BFO, PATO, and GO

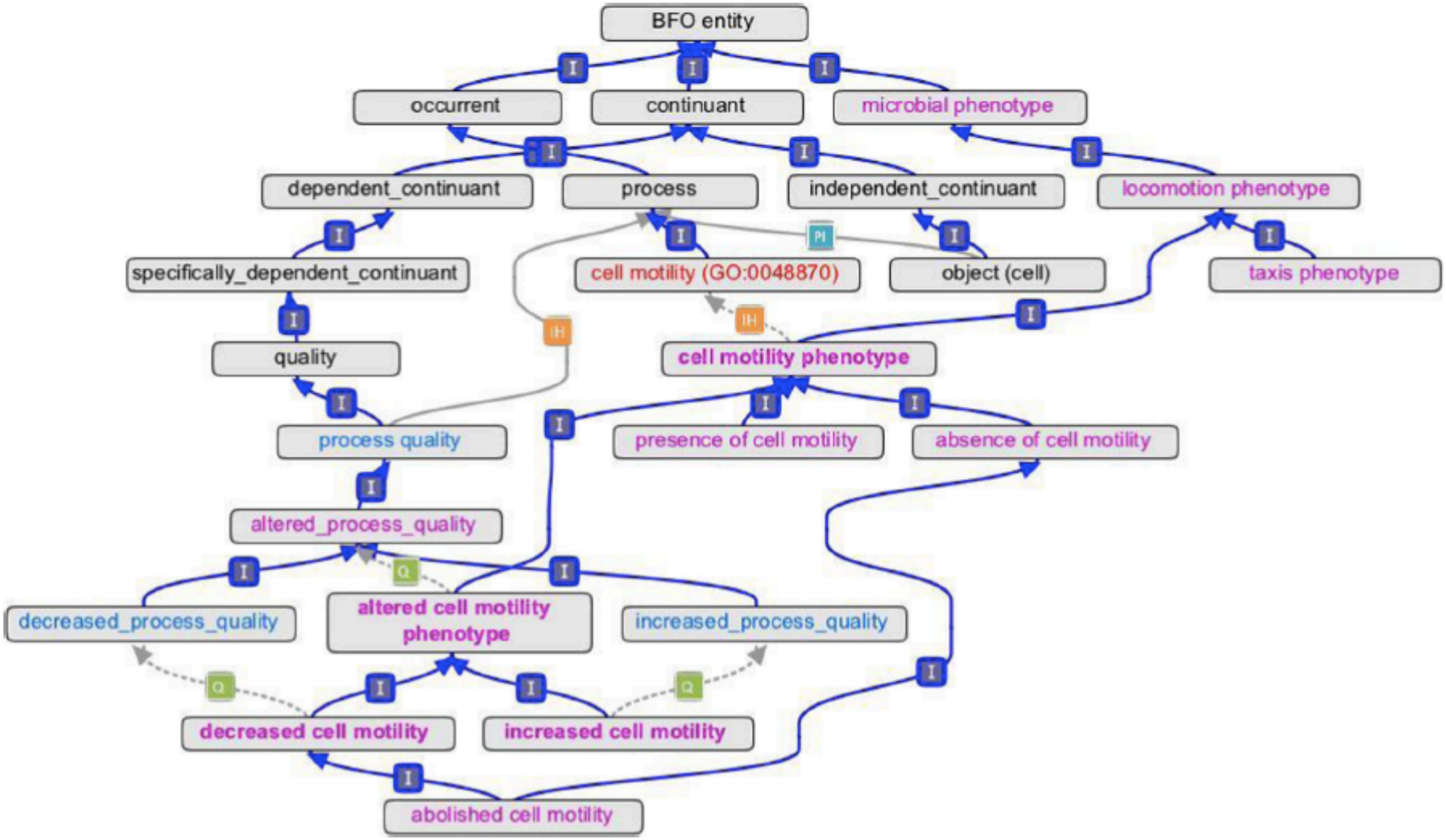


Figure 2 Ontology of Microbial Phenotypes (OMP) in the context of Basic Formal Ontology (BFO), Phenotypic Quality Ontology (PATO), and Gene Ontology (GO). Terms from respective ontologies are rendered in different color type: BFO, black; PATO, blue; GO, red; and OMP, purple. (Note that "quality" exists in both BFO and PATO, and PATO instantiates the concept of "process quality".) Asserted relationships are indicated by solid lines, and relationships inferred by a reasoner are indicated by dotted lines. Abbreviations: I, is_a; IH, inheres_in; PI, participates_in; Q, has_quality.

From: Chibucos et al. BMC Microbiology (2014) 14:294. DOI 10.1186/s12866-014-0294-3

No “normal” or “abnormal”

Independent phenotype:	• observation of one genotype in one environment
Relative phenotypes:	• comparison of one genotype in in two environments • comparison of two genotypes in the same environment

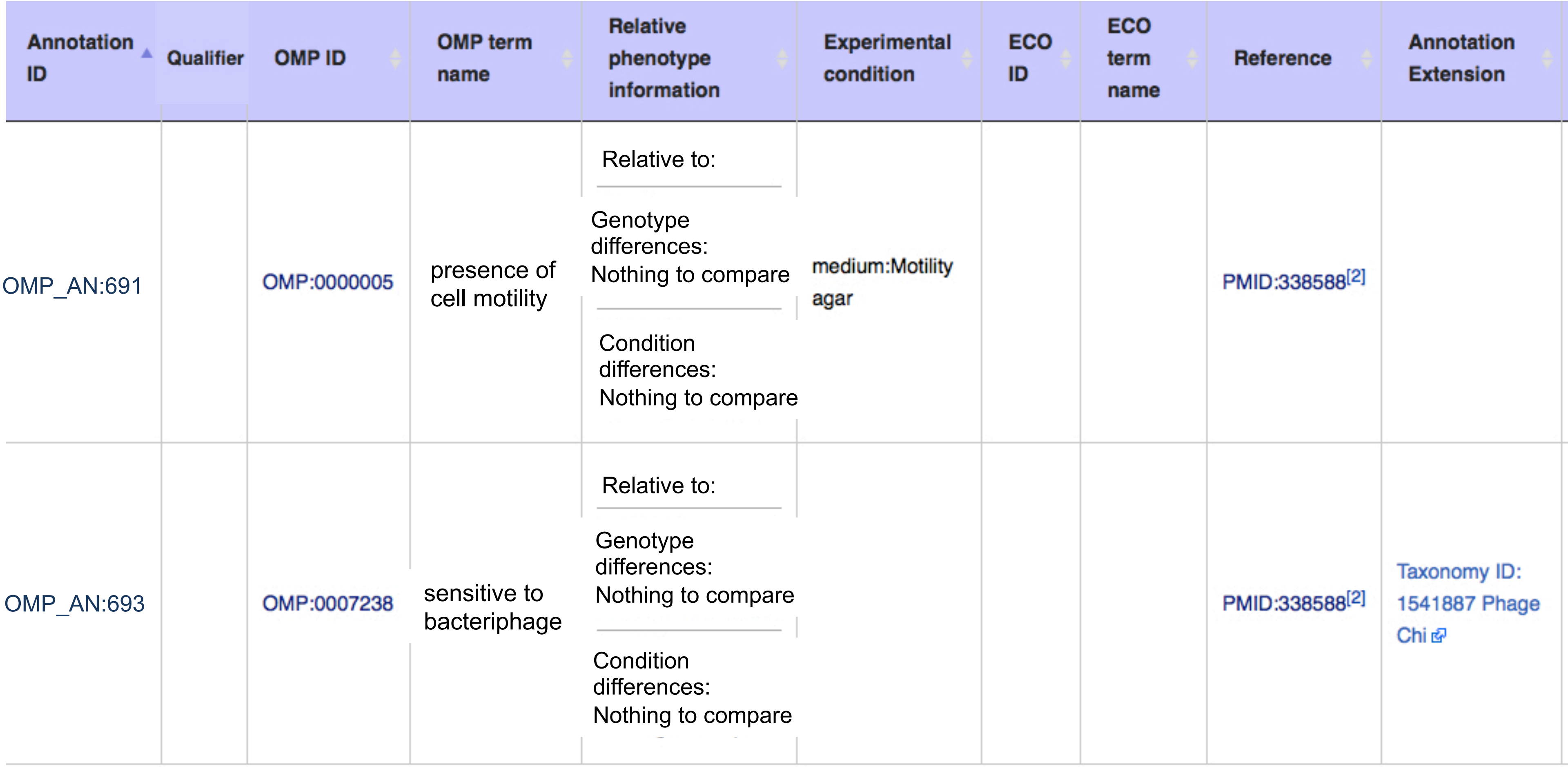
Annotation system

- genotypes/environments
- link annotations together
- highlight the relevant differences

Independent annotations

E. coli K-12 substr. YK102

Genotype: F^{-} Lambda^{-} *uvrC34 hisG4(Oc) rfbC1 mgl-51 rpsL31(SmR) kdgK51 xylA5 mtl-1 argE3(Oc) thiE1 thyA galU51 pyrC46 nalA*

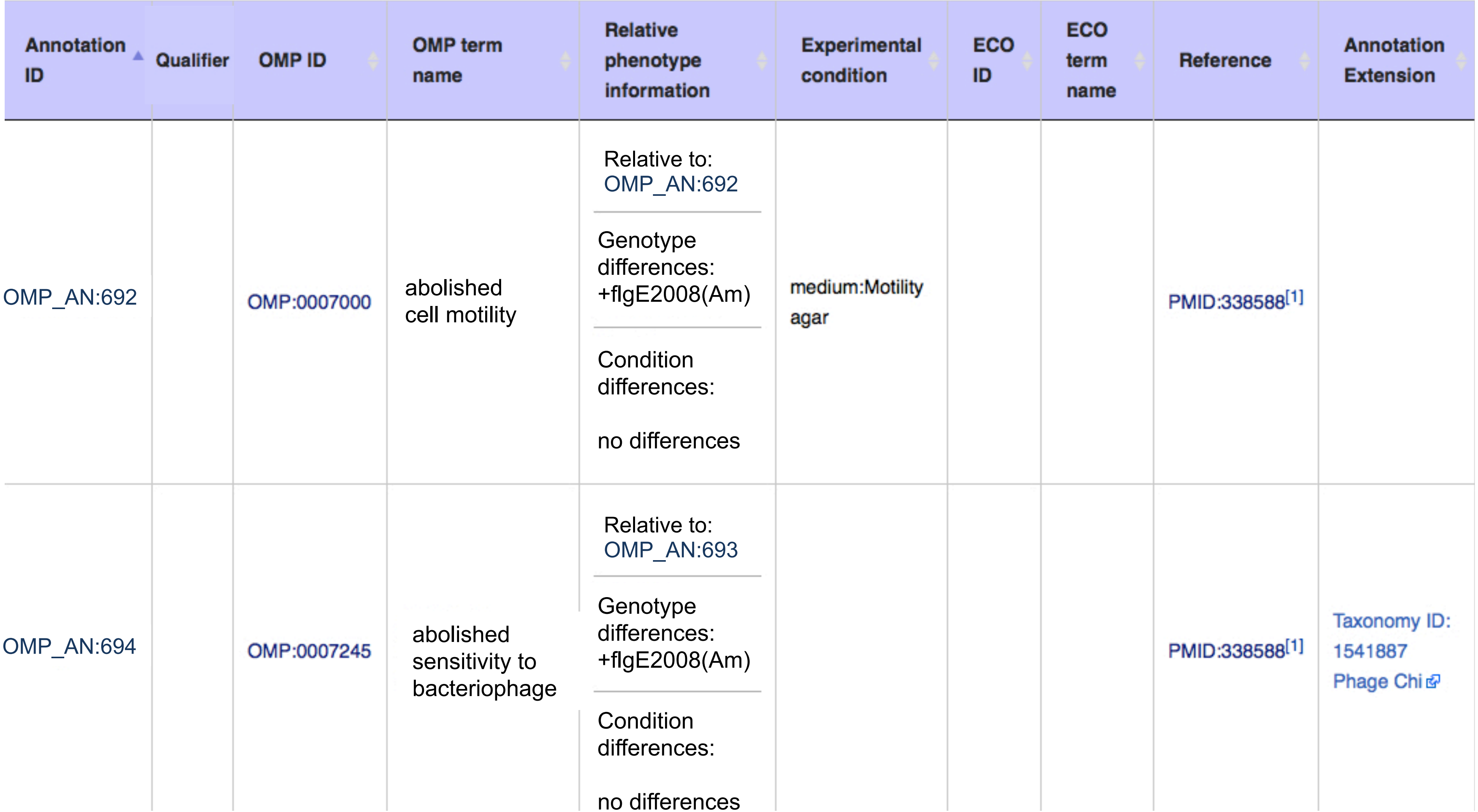


Annotation ID	Qualifier	OMP ID	OMP term name	Relative phenotype information	Experimental condition	ECO ID	ECO term name	Reference	Annotation Extension
OMP_AN:691		OMP:0000005	presence of cell motility	Relative to: Genotype differences: Nothing to compare Condition differences: Nothing to compare	medium:Motility agar			PMID:338588[2]	
OMP_AN:693		OMP:0007238	sensitive to bacteriophage	Relative to: Genotype differences: Nothing to compare Condition differences: Nothing to compare				PMID:338588[2]	Taxonomy ID: 1541887 Phage Chi

Relative: mutant to wild-type

E. coli K-12 substr. YK2008

Genotype: F^- Lambda$^-$ *uvrC34 hisG4(Oc) rfbC1 mgl-51 rpsL31(SmR) kdgK51 xylA5 mtl-1 argE3(Oc) thiE1 thyA galU51 pyrC46 nalA flgE2008(Am)*

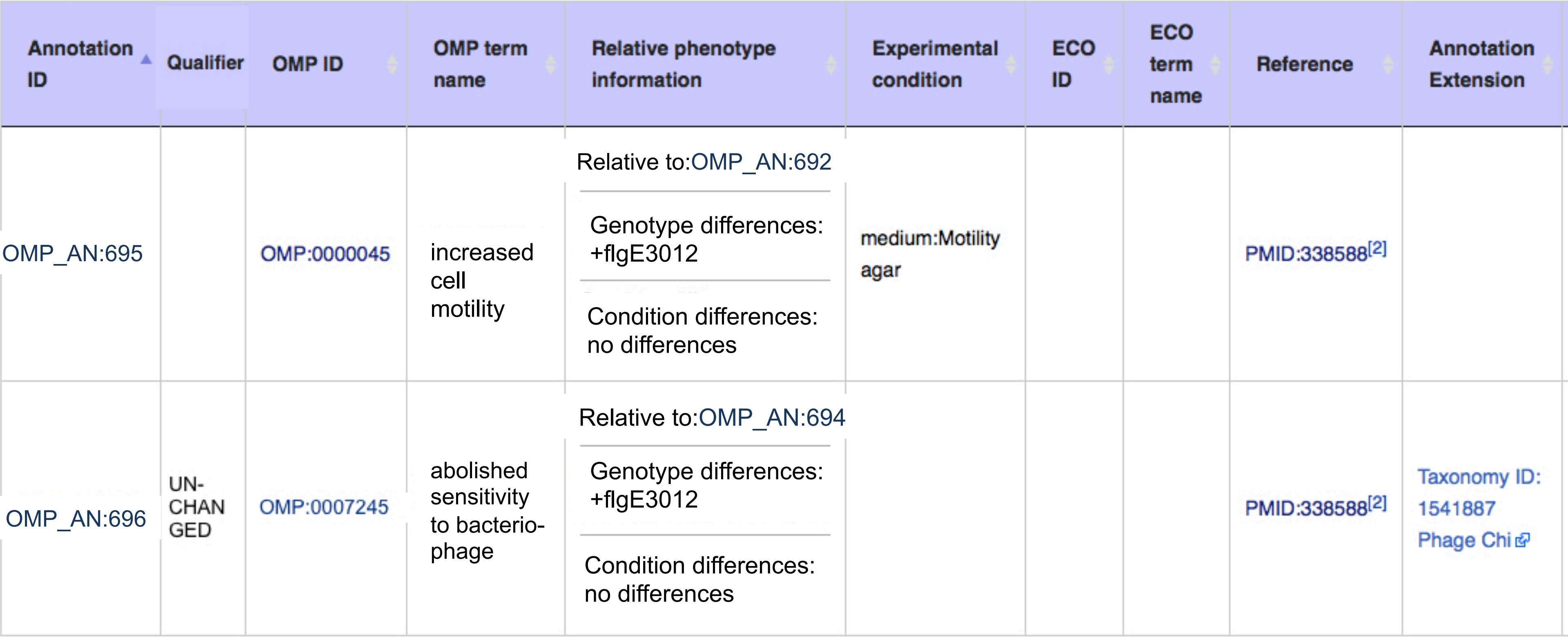


Annotation ID	Qualifier	OMP ID	OMP term name	Relative phenotype information	Experimental condition	ECO ID	ECO term name	Reference	Annotation Extension
OMP_AN:692		OMP:0007000	abolished cell motility	Relative to: OMP_AN:692 Genotype differences: +flgE2008(Am) Condition differences: no differences	medium:Motility agar			PMID:338588[1]	
OMP_AN:694		OMP:0007245	abolished sensitivity to bacteriophage	Relative to: OMP_AN:693 Genotype differences: +flgE2008(Am) Condition differences: no differences				PMID:338588[1]	Taxonomy ID: 1541887 Phage Chi

Relative: suppressor to mutant

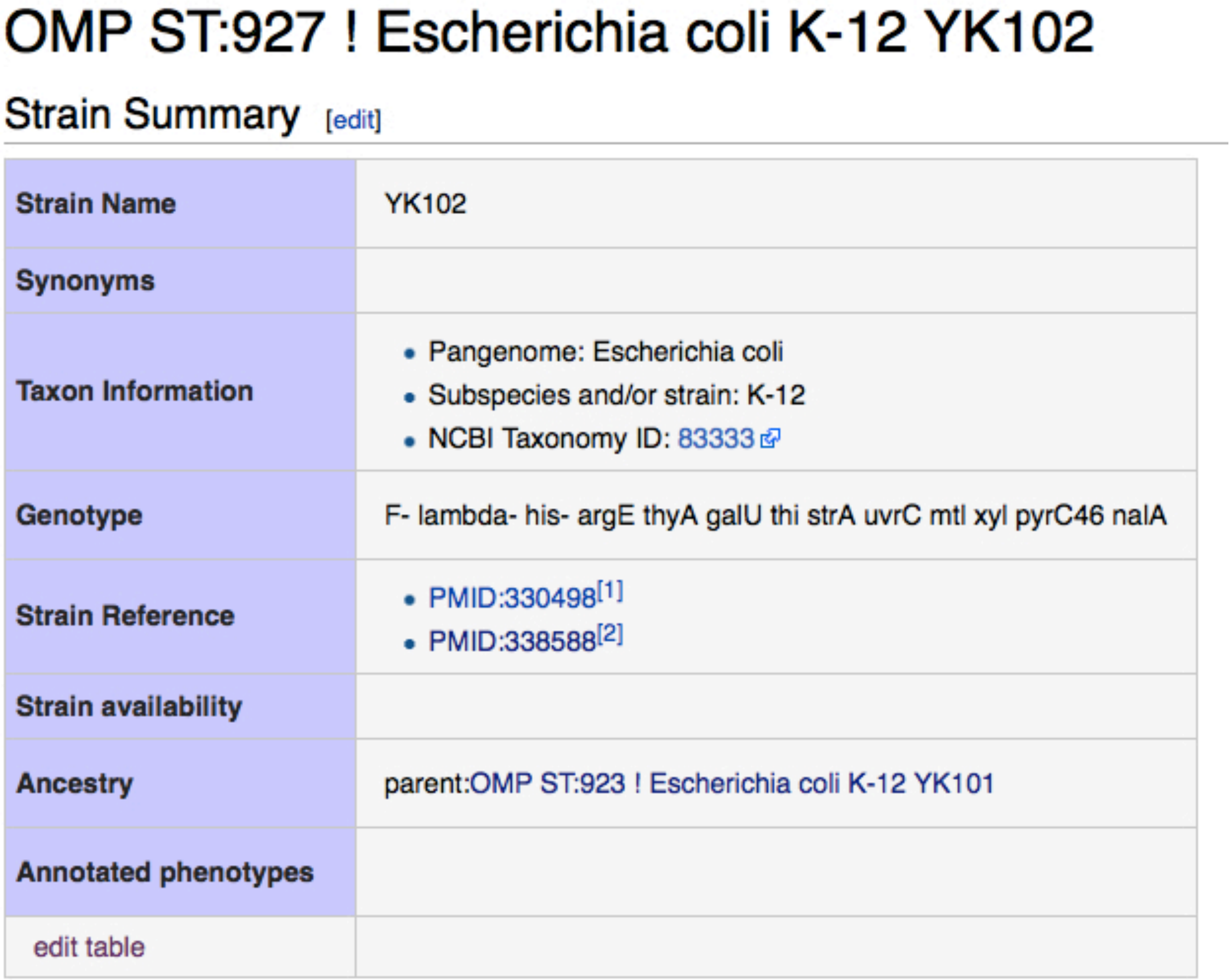
E. coli K-12 substr. YK3012

Genotype: F$^-$ Lambda$^-$ *uvrC34 hisG4(Oc) rfbC1 mgl-51 rpsL31(SmR) kdgK51 xylA5 mtl-1 argE3(Oc) thiE1 thyA galU51 pyrC46 nalA flgE2008(Am)flgE3012*



Annotation ID	Qualifier	OMP ID	OMP term name	Relative phenotype information	Experimental condition	ECO ID	ECO term name	Reference	Annotation Extension
OMP_AN:695		OMP:0000045	increased cell motility	Relative to:OMP_AN:692 Genotype differences: +flgE3012 Condition differences: no differences	medium:Motility agar			PMID:338588[2]	
OMP_AN:696	UN-CHANGED	OMP:0007245	abolished sensitivity to bacteriophage	Relative to:OMP_AN:694 Genotype differences: +flgE3012 Condition differences: no differences				PMID:338588[2]	Taxonomy ID: 1541887 Phage Chi

Strain pages



OMP ST:927 ! Escherichia coli K-12 YK102

Strain Summary [edit]

Strain Name	YK102
Synonyms	
Taxon Information	• Pangenome: Escherichia coli • Subspecies and/or strain: K-12 • NCBI Taxonomy ID: 83333
Genotype	F- lambda- his- argE thyA galU thi strA uvrC mtl xyl pyrC46 nalA
Strain Reference	• PMID:330498[1] • PMID:338588[2]
Strain availability	
Ancestry	parent:OMP ST:923 ! Escherichia coli K-12 YK101
Annotated phenotypes	
edit table	

Gene Pages – under construction

- will compile phenotype annotations associated with a particular gene and its orthologs in the pangenome