Examining the genes identified as significantly, differentially expressed by RNA-Seq in PATRIC

Differential expression using PATRIC's new RNA-Seq pipeline has characterized the *Acinetobacter baumannii* genes below as being significantly expressed. In this exercise you will learn how to examine information that might be related to these genes in PATRIC.

Q value < 0.05

fig|1310581.3.peg.696 fig|1310581.3.peg.1428 fig|1310581.3.rna.90 fig|1310581.3.peg.89 fig|1310581.3.peg.1468 fig|1310581.3.peg.2426 fig|1310581.3.peg.3061 fig|1310581.3.peg.3660 fig|1310581.3.peg.3045 fig|1310581.3.peg.1171 fig|1310581.3.peg.1944 fig|1310581.3.peg.2174 fig|1310581.3.rna.91 fig|1310581.3.peg.295 fig|1310581.3.peg.1156 fig|1310581.3.rna.53 fig|1310581.3.rna.52 fig|1310581.3.peg.33 fig|1310581.3.peg.112 fig|1310581.3.peg.2173 fig|1310581.3.peg.379 fig|1310581.3.peg.730 fig|1310581.3.peg.2031

0.05<Q value <0.01

fig|1310581.3.peg.3020 fig|1310581.3.peg.3001 fig|1310581.3.peg.2601 fig|1310581.3.peg.2607 fig|1310581.3.peg.2507 fig|1310581.3.peg.3430 fig|1310581.3.peg.2479 fig|1310581.3.peg.1185 fig|1310581.3.peg.2155 fig|1310581.3.peg.2327 fig|1310581.3.peg.2185 fig|1310581.3.peg.2185 fig|1310581.3.peg.2156 fig|1310581.3.peg.3232

I. Searching for information on individual genes

1. Enter the first locus tag into the global search box and hit return.



2. This will return the search results page. You can see that fig|1310581.3.peg.696 has been annotated as Bacterioferritin-associated ferredoxin. Click on that name

Showing results for <i>fig 1310581.3.peg.696</i>
Features (1)
Bacterioferritin-associated ferredoxin
Acinetobacter baumannii 34654
CDS fig 1310581.3.peg.696 J480_0720 VBIAciBau288419_0696
Genomes
Taxonomy
Experiments

3. This takes you to the landing page for that gene. It is in the *A. baumannii* 34654 genome.

Bacteria • Pro	Sacteria • Proteobacteria • Gammaproteobacteria • Pseudomonadales • Moraxellaceae • Acinetobacter • Acinetobacter baumannii 34654 •											
fig 131058	1.3.peg.696	J480_0720	VBIA	ciBau28841	L9_0696	Bacterio	ferritin-asso	ociated ferr	edoxin 🗉			
Overview	Genome Browser	Compare Region Viewer	Pathway	ys Transcrip	tomics Int	eractions	Correlated Genes	Literature				
Add PATRI	Add PATRIC Feature to Workspace Gene ID PATRIC ID: fig 1310581.3.peg.696 RefSeq: J480_0720 Alt Locus Tag: VBIAciBau288419_0696											
View NT Sec	quence		Pr	rotein ID	RefSeq:	EXD25842.1	1					
View AA Sec	quence											
External To	ools											
The SEED Vi	iewer			nnotation	Locus Tar		Start	End	NT Length	AA Length	Product	
NCBI CDD S	earch		0		C VOIA-ID2		6 1E4E12	154706	10F	AR Length	Product	ated formadouin
STRING: Pro	otein-Protein I	Interactions	P/	ATRIC .	KIC VBIACIBAU28		0 154512	154700	195	04	Bacterioremun-associ	ated refredoxin
STITCH: Che	emical-Proteir	Interaction	S	erSeq	J480_0720		154512	154706	195	64	BFD-like [2Fe-25] bin	ling domain protein
Recent Pul	bMed Articl	es	Fu	Inctional P	ropertie	S						
			G	O Assignments	5	-						
No pubmed	d record is avai	lable.	EC	C Assignments		-						
Please try F	PMC or Google	Scholar	FI	(Gfam Assignm	ients	FIG00627	108					
			Pa	athway Assign	ments	-						

4. There is not any experimental evidence associated with this genome, but you should click through the tabs and associated links to see what information is available. You can click on the Genome Browser tab.



5. This allow you to compare the PATRIC (blue) and RefSeq (green) annotations.

rview Brow	ser Viewer	Pathways	Transcriptomics 1	Interactions	Correlated Genes	Literature					_		
	File View	Help							_				ee Lin
	0 20,00	00 40	0,000 60,	000	80,000	100,000	120,000	140,000	60,000	180,000	200,000	220,000	240,000
			<	\rightarrow	Q	ર 🔍 🕀	JEZL0100000	3 - JEZL01000	003:1535131	55707 (2.2 Kb)	Go ⊿		
	00		154,000	0			154,500		15	5,000		155,	500
	Reference s	equence	nde	Zo	om in to see :	sequence	z	oom in to see seq	uence	Z	oom in to see sequ	ence	Zoc
	O PATRIC Ann	otation	fig 13105	81.3.peg.6	95	•	fig 131058	1.3.peg.696	fi	g 1310581.3.pe	g.697	•	
												+ fig	1310581.3.peg
	C RefSeq Ann	etation	3480_071	9		•	3480_0720	•	J.	180_0721			
												- 148	0 0722

6. You can also look at associated information in other resources by clicking on the names of the sites under External Tools. As an example, click on "NCBI CDD Search."



7. This opens a page at Conserved Domain Database for this particular gene. You can see that the top hit is to Bacterioferritin-associated ferredoxin, which confirms the product description.

Con	served d	lomains on [VBIAciBau288419_0696 J480_0720 Bacterioferritin-associated ferredoxin]	Standard Res	ults 🛊 ?
Local qu	ery sequence			
Graphical su	ımmary 🔲	Zoom to residue level show extra options »		?
Query seq.	NYVCLCF	10 20 50 60 FOR STREET ST	64 A A	
Non-specific		Bfd		
hits		Fer2_BFD		
		PRK10509		
Superfamilies		Fer2_BFD superfamily		
Multi-domains		NirB		
		nitri_red_nirB		
		PRK14989		
		Search for similar domain architectures C Refine search		
List of doma	in hits			?
+ Name	Accession	Description	Interval	E-value
[+] Bfd	COG2906	Bacterioferritin-associated ferredoxin [Inorganic ion transport and metabolism];	1-57	3.90e-14
[+] Fer2_BFD	pfam04324	BFD-like [2Fe-2S] binding domain; The two Fe ions are each coordinated by two conserved	1-53	1.38e-11
[+] PRK10509	PRK10509	bacterioferritin-associated ferredoxin; Provisional	1-56	1.19e-10
[+] NirB	COG1251	NAD(P)H-nitrite reductase, large subunit [Energy production and conversion];	3-55	4.99e-06
[+] nitri_red_nirB	TIGR02374	nitrite reductase [NAD(P)H], large subunit; [Central intermediary metabolism, Nitrogen	3-55	5.86e-04
[+] PRK14989	PRK14989	nitrite reductase subunit NirD; Provisional	3-54	1.24e-03

Assignment: Thirty-six genes were identified by the RNA-Seq as being significantly differentially expressed. Examine each of those genes in PATRIC, clicking on the tabs and links to the external resources. In particular, pay attention to the name given at PATRIC and how they are described in those resources.

II. Saving a list of genes to private workspace.

Sometimes it is easier to upload an entire gene list into your PATRIC workspace so that you can either examine it, or refer to it at a later time. The following steps show you how to save an entire list of genes into your private workspace.

1. Click on the TOOLS tab and then click on "ID Mapping."

TOOLS	ABOUT						
Complete List of All Tools							
Specialized Searches:							
Antibiotic Resistance Search							
BLAST							
• Featur	e Finder						
Genon	ne Finder						
• ID Ma	pping						

2. This will open up the ID Mapping tool.

he ID Mapping Tool enables researchers to locate synonymous identifiers across multiple-source databases. For further explanation, please see ID N								
0 IDs	ID Types							
	FROM ID Type:	PATRIC ID	~					
	TO ID Type:	UniProtKB-ID	~					
	Search							

3. Cut and paste the first set of IDs into the ID text box.

IDs	
fig 1310581.3.peg.33 fig 1310581.3.peg.112 fig 1310581.3.peg.2173 fig 1310581.3.peg.379 fig 1310581.3.peg.730 fig 1310581.3.peg.2031	2

4. Under ID Types, click on the down arrow that follows "UniProtKB-ID."

ID Types		
FROM ID Type:	PATRIC ID	~
TO ID Type:	UniProtKB-ID	~
Search		

5. This will open up a box that shows all the available IDs. Scroll up to the top of the box to find PATRIC ID. Click on that.

	PATRIC Identifier
REBASE	
Reactome	PATRIC ID
RefSeq_NT	Feature ID
STRING	Alt Locus Tag
TCDB	RefSeq Identifiers
TubercuList	RefSeq
UniGene	RefSeq Locus Tag
UniParc	Gene ID
UniPathway	GI
UniProtKB-Accession	Other Identifiers
UniProtKB-ID	
UniProtKB-ID	UniProtKB-ID

6. Once you have put the IDs in and changed the To ID Type to PATRIC ID, click on the blue Search button.

IDs	ID Types		
fig 1310581.3.peg.33 fig 1310581.3.peg.112 fig 1310581.3.peg.2173 fig 1310581.3.peg.379 fig 1310581.3.peg.730 fig 1310581.3.peg.2031	FROM ID Type: TO ID Type: Search	PATRIC ID PATRIC ID	•

3. This will return a table with those IDs and other information.

To lear	12 reatures round For learn how to filer, sort, manipulate, refine, and save data within PATRIC feature tables, please see <u>Feature Table FAQs</u> .									
	Workspace	View		Download		Tools		Columns		
8	Add Feature(s)	FASTA DNA FASTA Prote	in 🔊	Table • FASTA •	A Pathway Summary	Multiple Seq Alignment	O	Show/Hide 👻	Default	
	Genome Name 🔺		P/	ATRIC ID	RefSeq Locus	Tag Alt Locu	s Tag		PATRIC ID	
	Acinetobacter bauma	annii 34654	fig 1310	581.3.peg.3061	<u>J480 3177</u>	VBIAciBau28	8419 3061	fig 131	.0581.3.peg	
	Acinetobacter bauma	annii 34654	fig 1310)581.3.peg.730	<u>1480 0758</u>	VBIAciBau28	8419 0730	fig 13	10581.3.pe	
	Acinetobacter bauma	annii 34654	fig 1310	581.3.peg.1171	<u>J480 1219</u>	VBIAciBau28	8419 1171	fig 131	0581.3.peg	
	Acinetobacter bauma	annii 34654	fig 1310	581.3.peg.1428	<u>J480 1490</u>	VBIAciBau28	8419 1428	fig 131	0581.3.peg	
	Acinetobacter bauma	annii 34654	fig 1310	581.3.peg.1468	<u>J480 1532</u>	VBIAciBau28	8419 1468	fig 131	.0581.3.peg	
	Acinetobacter bauma	annii 34654	fig 1310	581.3.peg.1944	<u>J480_2021</u>	VBIAciBau28	8419 1944	fig 131	.0581.3.peg	
	Acinetobacter bauma	annii 34654	fig 1310	581.3.peg.2031	<u>J480 2113</u>	VBIAciBau28	<u>8419 2031</u>	fig 131	0581.3.peg	
	Acinetobacter bauma	annii 34654	fig 1310	581.3.peg.2173	<u>J480_2266</u>	VBIAciBau28	<u>8419 2173</u>	fig 131	0581.3.peg	
	Acinetobacter bauma	annii 34654	fig 1310	581.3.peg.2174	<u>J480 2267</u>	VBIAciBau28	<u>8419 2174</u>	fig 131	0581.3.peg	
	Acinetobacter bauma	annii 34654	fig 1310	581.3.peg.2426	<u>J480_2523</u>	VBIAciBau28	8419 2426	fig 131	0581.3.peg	
	Acinetobacter bauma	annii 34654	fig 1310	581.3.peg.3045	<u>J480 3161</u>	VBIAciBau28	8419 3045	fig 131	.0581.3.peg	
	Acinetobacter bauma	annii 34654	fig 1310	581.3.peg.1156	<u>J480 1204</u>	VBIAciBau28	8419 1156	fig 131	.0581.3.peg	
	Acinetobacter bauma	annii 34654	fig 1310	581.3.peg.3660	<u>J480 3787</u>	VBIAciBau28	8419 3660	fig 131	.0581.3.peg	
	Acinetobacter bauma	annii 34654	fig 131	0581.3.peg.33	<u>J480 0034</u>	VBIAciBau28	8419 0033	fig 13	10581.3.pe	
	Acinetobacter bauma	annii 34654	fig 131	0581.3.peg.89	<u> 1480 0090</u>	VBIAciBau28	8419 0089	fig 13	10581.3.pe	
	Acinetobacter bauma	annii 34654	fig 1310	0581.3.peg.112	<u>J480 0113</u>	VBIAciBau28	8419 0112	fig 13	10581.3.pe	
	Acinetobacter bauma	annii 34654	fig 1310)581.3.peg.295	<u>J480_0308</u>	VBIAciBau28	8419 0295	fig 13	10581.3.pe	
	Acinetobacter bauma	annii 34654	fig 1310	0581.3.peg.379	<u>J480 0392</u>	VBIAciBau28	8419 0379	fig 13:	10581.3.pe	
	Acinetobacter bauma	annii 34654	fial 131	0581.3.rna.52		VBIAciBau28	8419 r052	fial 13	310581.3.rn	

4. You will need to resize the table to show all the results.

Show 22 per page

5. To select all the genes, click the box in front of the column named Genome Name.



6. This will open a pop-up window. Click the down arrow next to the box that contains the word "None."

Add Selected Feature(s) to Workspace							
Save as Fea	ature Group 💿 Save as Genome Group						
Add to group:	None	•					
	Save to Workspace Cancel						

7. Click on "Create New Group."



8. Give the group a unique name and then click the "Save to Workspace" button.

Add Selected Feature(s) to Workspace		×
Save as Feature 0	Group 💿 Save as Genome Group	
Add to group: Crea	te New Group	~
Q value <0.05		
Description		
	Save to Workspace Cancel	
J 1810 6.63	Save to workspace Calice	

Your gene group has now been saved to your private workspace.

Assignment: Create another gene group using the second set of genes.