

Table 2. List of phylogenetically useful genes (PUG)

PA Number	Gene	Alt gene	Functional Annotation	Functional Category	Parsimony-Informative Sites
PA2002	<i>atoE</i>		conserved hypothetical protein	b	4
PA4372			hypothetical protein	b	4
PA5386			probable 3-hydroxyacyl-CoA dehydrogenase	b	4
PA1164			conserved hypothetical protein	c	4
PA1421	<i>gbuA</i>	<i>speB2</i>	guanidinobutyrase	e	4
PA3792	<i>leuA</i>		2-isopropylmalate synthase	e	4
PA1475	<i>ccmA</i>	<i>helA/cycV</i>	heme exporter protein CcmA	h	4
PA2408		<i>znuC</i>	probable ATP-binding component of ABC transporter	h	4
PA2711	<i>potF4</i>		probable periplasmic spermidine/putrescine-binding protein	h	4
PA0130		<i>mmsA</i>	probable aldehyde dehydrogenase	i	4
PA0773	<i>pdxJ</i>		pyridoxal phosphate biosynthetic protein PdxJ	j	4
PA3625	<i>surE</i>		survival protein SurE	k	4
PA3548	<i>algI</i>		alginate o-acetyltransferase AlgI	n	4
PA4956	<i>rhdA</i>		thiosulfate:cyanide sulfurtransferase	q	4
PA1524	<i>xdhA</i>		xanthine dehydrogenase	r	4
PA4720	<i>trmA</i>		tRNA (uracil-5-)-methyltransferase	zB	4
PA4693	<i>pssA</i>		phosphatidylserine synthase	b	5

PA Number	Gene	Alt gene	Functional Annotation	Functional Category	Parsimony-Informative Sites
PA3897			hypothetical protein	d	5
PA1162	<i>dapE</i>		succinyl-diaminopimelate desuccinylase	e	5
PA3666	<i>dapD</i>		tetrahydrodipicolinate succinylase	e	5
PA3814	<i>iscS</i>		L-cysteine desulfurase (pyridoxal phosphate-dependent)	e	5
PA1651			probable transporter	h	5
PA2341	<i>mtlK</i>		probable ATP-binding component of ABC maltose/mannitol transporter	h	5
PA5095		<i>proW</i>	probable permease of ABC transporter	h	5
PA4438		<i>yhcM</i>	conserved hypothetical protein	i	5
PA2826			probable glutathione peroxidase	k	5
PA2843			probable aldolase	o	5
PA1687	<i>speE</i>		spermidine synthase	q	5
PA5260	<i>hemC</i>	<i>popE</i>	porphobilinogen deaminase	q	5
PA0441	<i>dht</i>	<i>hyuA</i>	dihydropyrimidinase	r	5
PA0590	<i>apaH</i>		bis(5'-nucleosyl)-tetraphosphatase	r	5
PA3751	<i>purT</i>		phosphoribosylglycinamide formyltransferase 2	r	5
PA5387			conserved hypothetical protein	c	6
PA0229	<i>pcaT</i>	<i>kgtP</i>	dicarboxylic acid transporter PcaT	d	6

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PA0392		<i>yggT</i>	conserved hypothetical protein	d	6
PA0440	<i>dypA</i>		probable oxidoreductase	e	6
PA3108	<i>purF</i>		amidophosphoribosyltransferase	e	6
PA5373	<i>betB</i>		betaine aldehyde dehydrogenase	e	6
PA5451	<i>wzm</i>		membrane subunit of A-band LPS efflux transporter	g	6
PA0301	<i>spuE</i>	<i>potF3</i>	polyamine transport protein	h	6
PA1207	<i>kefB</i>	<i>trkB/kefC</i>	glutathione-regulated potassium-efflux system protein KefB	h	6
PA3865		<i>hisJ</i>	probable amino acid binding protein	h	6
PA5479	<i>gltP</i>		proton-glutamate symporter	h	6
PA2776	<i>ordL</i>		conserved hypothetical protein	i	6
PA0182		<i>yjgI</i>	probable short-chain dehydrogenase	j	6
PA4606	<i>cstA</i>		conserved hypothetical protein	k	6
PA3970	<i>amn</i>		AMP nucleosidase	r	6
PA0211	<i>mdcD</i>		malonate decarboxylase beta subunit	s	6
PA5028			conserved hypothetical protein	y	6
PA2545	<i>xthA</i>		exodeoxyribonuclease III	a	7
PA1640			conserved hypothetical protein	b	7
PA2001	<i>atoB</i>		acetyl-CoA acetyltransferase	b	7
PA0240	<i>opdF</i>		probable porin	d	7
PA2751		<i>yfkH</i>	conserved hypothetical protein	d	7
PA5172	<i>arcB</i>		ornithine carbamoyltransferase,	e	7

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			catabolic		
PA2278	<i>arsB</i>		ArsB protein	h	7
PA3920		<i>yvgX</i>	probable metal transporting P-type ATPase	h	7
PA1318	<i>cyoB</i>		cytochrome o ubiquinol oxidase subunit I	i	7
PA5192	<i>pckA</i>		phosphoenolpyruvate carboxykinase	i	7
PA0500	<i>bioB</i>		biotin synthase	j	7
PA2611	<i>cysG</i>		siroheme synthase	j	7
PA0181		<i>yeaT</i>	probable transcriptional regulator	l	7
PA4367			conserved hypothetical protein	m	7
PA2823			conserved hypothetical protein	o	7
PA4974	<i>opmH</i>		probable outer membrane protein precursor	x	7
PA1528	<i>zipA</i>		cell division protein ZipA	y	7
PA3617	<i>recA</i>		RecA protein	a	8
PA3164			3-phosphoshikimate 1-carboxyvinyltransferase	e	8
PA4696	<i>ilvI</i>		acetolactate synthase large subunit	e	8
PA3047	<i>dacB</i>	<i>pbp</i>	probable D-alanyl-D-alanine carboxypeptidase	g	8
PA3186	<i>oprB</i>		Glucose/carbohydrate outer membrane porin OprB precursor	h	8

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PA2623	<i>icdA</i>		isocitrate dehydrogenase	i	8
PA5034	<i>hemE</i>		uroporphyrinogen decarboxylase	j	8
PA4184			probable transcriptional regulator	l	8
PA5550	<i>glmR</i>		GlmR transcriptional regulator	l	8
PA3828		<i>yjgP</i>	conserved hypothetical protein	d	9
PA4370	<i>icmP</i>		Insulin-cleaving metalloproteinase outer membrane protein precursor	d	9
PA2249	<i>bkdB</i>		branched-chain alpha-keto acid dehydrogenase (lipoamide component)	e	9
PA2309			hypothetical protein	h	9
PA2250	<i>lpdV</i>		lipoamide dehydrogenase-Val	i	9
PA4470	<i>fumC1</i>		fumarate hydratase	i	9
PA2903	<i>cobJ</i>	<i>cbiH</i>	precorrin-3 methylase CobJ	j	9
PA5237		<i>yigC</i>	conserved hypothetical protein	j	9
PA4398			probable two-component sensor	m	9
PA2494	<i>mexF</i>		Resistance-Nodulation-Cell Division (RND) multidrug efflux	zA	9
PA2840	<i>deaD</i>		probable ATP-dependent RNA helicase	zB	9
PA0507		<i>fad?</i>	probable acyl-CoA dehydrogenase	b	10
PA5546			conserved hypothetical protein	b	10

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PA3424			hypothetical protein	e	10
PA3624	<i>pcm</i>		L-isoaspartate protein carboxylmethyltransferase type II	f	10
PA3824	<i>queA</i>		S-adenosylmethionine:trna ribosyltransferase-isomerase	f	10
PA0185	<i>atsB</i>		probable permease of ABC transporter	h	10
PA0281	<i>cysW</i>		sulfate transport protein CysW	h	10
PA3677			probable Resistance-Nodulation-Cell Division (RND) efflux membrane fusion protein precursor	h	10
PA2867			probable chemotaxis transducer	u	10
PA1730			conserved hypothetical protein	c	11
PA1566			conserved hypothetical protein	e	11
PA4548	<i>dada</i>	<i>yfiT</i>	probable D-amino acid oxidase	e	11
PA4344			probable hydrolase	f	11
PA0464	<i>creC</i>	<i>phoM</i>	two-component sensor CreC	m	11
PA2346			conserved hypothetical protein	o	11
PA3769	<i>guaA</i>		GMP synthase	r	11
PA4701			conserved hypothetical protein	c	12
PA1638		<i>yneH</i>	conserved hypothetical protein	e	12
PA5235	<i>glpT</i>		glycerol-3-phosphate transporter	h	12
PA4733	<i>acsB</i>		acetyl-coenzyme A synthetase	q	12
PA3950			probable ATP-dependent RNA	zB	12

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			helicase		
PA5443	<i>uvrD</i>	<i>recL/rad/pdeB/mutU</i>	DNA helicase II	a	13
PA0454		<i>yccS</i>	conserved hypothetical protein	d	13
PA3257	<i>prc</i>	<i>tsp</i>	periplasmic tail-specific protease	f	13
PA1946	<i>rbsB</i>		binding protein component precursor of ABC ribose transporter	h	13
PA3896			probable 2-hydroxyacid dehydrogenase	i	13
PA0757		<i>tctE</i>	probable two-component sensor	m	13
PA3710			probable GMC-type oxidoreductase	o	13
PA1101	<i>fliF</i>		Flagella M-ring outer membrane protein precursor	t	13
PA1886	<i>polB</i>	<i>dinA</i>	DNA polymerase II	a	14
PA1689			conserved hypothetical protein	d	14
PA1272	<i>cobO</i>	<i>cobA/btuR</i>	cob(I)alamin adenosyltransferase	j	14
PA3821	<i>secD</i>		secretion protein SecD	x	14
PA4483	<i>gatA</i>		Glu-tRNA(Gln) amidotransferase subunit A	f	15
PA3759			probable aminotransferase	g	15
PA3028	<i>moeA2</i>		molybdenum cofactor biosynthesis protein A2	j	15
PA4692			conserved hypothetical protein	o	15
PA3271		<i>flhS</i>	probable two-component sensor	m	16

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PA0559		<i>yhiN</i>	conserved hypothetical protein	d	17
PA5529			probable sodium/proton antiporter	h	17
PA1585	<i>sucA</i>		2-oxoglutarate dehydrogenase (E1 subunit)	i	17
PA4843			probable two-component response regulator	m	17
PA0183	<i>atsA</i>		arylsulfatase	q	17
PA1532	<i>dnaX</i>		DNA polymerase subunits gamma and tau	a	18
PA4115		<i>ygdH</i>	conserved hypothetical protein	o	21
PA3893			conserved hypothetical protein	x	22
PA2018	<i>mexH</i>	<i>amrB/mexY</i>	Resistance-Nodulation-Cell Division (RND) multidrug efflux	zA	23
PA5447	<i>wbpZ</i>		glycosyltransferase WbpZ	g	25
PA3297	<i>hrpA</i>		probable ATP-dependent helicase	a	26
PA4686			hypothetical protein	c	26
PA4772			probable ferredoxin	i	27
PA4513	<i>piuB</i>		probable oxidoreductase	o	29
PA3961	<i>hrpB</i>		probable ATP-dependent helicase	a	30
PA3258			hypothetical protein	o	31
PA5556	<i>atpA</i>	<i>papA/uncA</i>	ATP synthase alpha chain	i	55
PA2393			probable dipeptidase precursor	q	118
PA2403			hypothetical protein	d	138

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PA0595	<i>ostA</i>	<i>imp</i>	organic solvent tolerance protein OstA precursor	k	376