

Prospects of formamide as nitrogen source in biotechnological production processes

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Tab. #S1 List of abbreviations used in Fig. #3 with identifiers, enzyme names, organisms, and amino acid sequence identity similarities. *n.s.s. = no significant similarity detectable by BLAST alignment.

Label	Identifier	Enzyme	Organism	Amino acid similarity [%]
AERPE	TR:Q9YEQ1	Formamidase	<i>Aeropyrum pernix</i> (strain ATCC 700893 / DSM 11879 / JCM 9820 / NBRC 100138 / K1)	*n.s.s.
AGRSK	SP:P60327	<i>N</i> -carbamoyl-D-amino acid hydrolase	<i>Agrobacterium</i> sp. (strain NK712)	24
ALCBS	SP:Q0VN20	Aliphatic amidase	<i>Alcanivorax borkumensis</i> (strain ATCC 700651 / DSM 11573 / NCIMB 13689 / SK2)	36
ALLAM	SP:B9K1J4	Formamidase	<i>Allorhizobium ampelinum</i> (strain ATCC BAA-846 / DSM 112012 / S4)	45
ARATH1	SP:Q8H183	Beta-ureidopropionase	<i>Arabidopsis thaliana</i>	28
ARATH2	SP:Q8VYF5	<i>N</i> -carbamoylputrescine amidase	<i>Arabidopsis thaliana</i>	28
ARATH3	SP:Q8VYF5-1	<i>N</i> -carbamoylputrescine amidase	<i>Arabidopsis thaliana</i>	27
ARATH4	SP:P46010	Nitrilase 3	<i>Arabidopsis thaliana</i>	34
ARATH5	SP:P32962	Nitrilase 2	<i>Arabidopsis thaliana</i>	32
ARATH6	SP:P32961	Nitrilase 1	<i>Arabidopsis thaliana</i>	30
ARATH7	SP:P32961-2	Nitrilase 1	<i>Arabidopsis thaliana</i>	30
ARATH8	SP:P46011	Bifunctional nitrilase/nitrile hydratase NIT4	<i>Arabidopsis thaliana</i>	28
BACAA	SP:C3P6U6	Formamidase	<i>Bacillus anthracis</i> (strain A0248)	77
BACAH	SP:A0RHV8	Formamidase	<i>Bacillus thuringiensis</i>	77
BACAN	SP:P59700	Formamidase	<i>Bacillus anthracis</i>	77
BACC0	SP:B7JK27	Formamidase	<i>Bacillus cereus</i> (strain AH820)	77
BACC2	SP:B7IVH6	Formamidase	<i>Bacillus cereus</i> (strain G9842)	77
BACC3	SP:C1EPV3	Formamidase	<i>Bacillus cereus</i> (strain 03BB102)	77
BACC4	SP:B7H6S5	Formamidase	<i>Bacillus cereus</i> (strain B4264)	77
BACCQ	SP:B9IW18	Formamidase	<i>Bacillus cereus</i> (strain Q1)	77
BACCR	SP:P59701	Formamidase	<i>Bacillus cereus</i> (strain ATCC 14579 / DSM 31 / CCUG 7414 / JCM 2152 / NBRC 15305 / NCIMB 9373 / NCTC 2599 / NRRL B-3711)	77
BACCZ	SP:Q635Y7	Formamidase	<i>Bacillus cereus</i> (strain ZK / E33L)	77
BACHK	SP:Q6HEM5	Formamidase	<i>Bacillus thuringiensis</i> subsp. <i>konkukian</i> (strain 97-27)	77
BACSP	SP:Q9L543	Aliphatic amidase	<i>Bacillus</i> sp.	37
BACSU	SP:P54608	Hydrolase YhcX	<i>Bacillus subtilis</i> (strain 168)	22
BOVIN	SP:Q2T9R6	Omega-amidase NIT2	<i>Bos taurus</i>	24
BRADU1	SP:Q89H51	Formamidase	<i>Bradyrhizobium diazoefficiens</i> (strain JCM 10833 / BCRC 13528 / IAM 13628 / NBRC 14792 / USDA 110)	44

BRADU2	SP:Q89VS2	Aliphatic amidase	<i>Bradyrhizobium diazoefficiens</i> (strain JCM 10833 / BCRC 13528 / IAM 13628 / NBRC 14792 / USDA 110)	39
BRASB	SP:A5EDA7	Aliphatic amidase	<i>Bradyrhizobium</i> sp. (strain BTAi1 / ATCC BAA-1182)	38
BRASO1	SP:A4Z3G9	Formamidase	<i>Bradyrhizobium</i> sp. (strain ORS 278)	46
BRASO2	SP:A4Z057	Aliphatic amidase	<i>Bradyrhizobium</i> sp. (strain ORS 278)	38
BURCH	SP:A0B137	Aliphatic amidase	<i>Burkholderia cenocepacia</i> (strain HI2424)	37
BURO0	SP:B1K2X7	Aliphatic amidase	<i>Burkholderia orbicola</i>	36
BURO1	SP:Q1BP24	Aliphatic amidase	<i>Burkholderia orbicola</i> (strain AU 1054)	37
CUPNE	TR:A0A7T4FZZ8	Formamidase	<i>Cupriavidus necator</i>	46
DANRE	SP:Q4VBV9	Omega-amidase NIT2	<i>Danio rerio</i>	25
DELAS	SP:A9C011	Aliphatic amidase	<i>Delftia acidovorans</i> (strain DSM 14801 / SPH-1)	38
DESVH	SP:Q72CW9	Formamidase	<i>Desulfovibrio vulgaris</i> (strain ATCC 29579 / DSM 644 / NCIMB 8303 / VKM B-1760 / Hildenborough)	74
DESVV	SP:A1VEP0	Formamidase	<i>Desulfovibrio vulgaris</i> subsp. <i>vulgaris</i> (strain DP4)	74
DICDI	SP:Q557J5	Deaminated glutathione amidase	<i>Dictyostelium discoideum</i>	24
EMEND	TR:Q9C453	Formamidase	<i>Emericella nidulans</i>	*n.s.s.
ENSAD	SP:Q5S260	N-carbamoyl-D-amino acid hydrolase	<i>Ensifer adhaerens</i>	24
FRATT	SP:Q5NHL7	Citrullinase	<i>Francisella tularensis</i> subsp. <i>tularensis</i> (strain SCHU S4 / Schu 4)	24
GEOSE	SP:Q9RQ17	Aliphatic amidase	<i>Geobacillus stearothermophilus</i>	38
HELAH1	SP:Q17WY3	Formamidase	<i>Helicobacter acinonychis</i> (strain Sheeba)	99
HELAH2	SP:Q17YA2	Aliphatic amidase	<i>Helicobacter acinonychis</i> (strain Sheeba)	37
HELP21	SP:B6JN78	Formamidase	<i>Helicobacter pylori</i> (strain P12)	99
HELP22	SP:B6JKM3	Aliphatic amidase	<i>Helicobacter pylori</i> (strain P12)	37
HELPG1	SP:B5Z8N3	Formamidase	<i>Helicobacter pylori</i> (strain G27)	99
HELPG2	SP:B5ZA60	Aliphatic amidase	<i>Helicobacter pylori</i> (strain G27)	37
HELPH1	SP:Q1CS25	Formamidase	<i>Helicobacter pylori</i> (strain HPAG1)	99
HELPH2	SP:Q1CUK9	Aliphatic amidase	<i>Helicobacter pylori</i> (strain HPAG1)	37
HELPI1	SP:Q9ZJY8	Formamidase	<i>Helicobacter pylori</i> (strain J99 / ATCC 700824)	99
HELPI2	SP:Q9ZME1	Aliphatic amidase	<i>Helicobacter pylori</i> (strain J99/ ATCC 700824)	37
HELPS1	SP:B2UV01	Formamidase	<i>Helicobacter pylori</i> (strain Shi470)	99
HELPS2	SP:B2USC5	Aliphatic amidase	<i>Helicobacter pylori</i> (strain Shi470)	37
HELPI1	SP:O25836	Formamidase	<i>Helicobacter pylori</i> (strain ATCC 700392 / 26695)	100
HELPI2	SP:O25067	Aliphatic amidase	<i>Helicobacter pylori</i> (strain 700392 / 26695)	37
HUMAN	SP:Q9UBR1	Beta-ureidopropionase	<i>Homo sapiens</i>	25
LUPAN1	SP:Q3LRV4	Bifunctional nitrilase/nitrile hydratase NIT4A	<i>Lupinus angustifolius</i>	28

LUPAN2	SP:Q5QGZ8	Bifunctional nitrilase/nitrile hydratase NIT4A	<i>Lupinus angustifolius</i>	30
METME	SP:Q50228	Formamidase	<i>Methylophilus methylotrophus</i>	*n.s.s.
MOUSE1	SP:Q8VDK1	Deaminated glutathione amidase	<i>Mus musculus</i>	22
MOUSE2	SP:Q8VDK1-2	Isoform 2 of Deaminated glutathione amidase	<i>Mus musculus</i>	22
MOUSE3	SP:Q9JHW2	Omega-amidase NIT2	<i>Mus musculus</i>	24
MYCSM	SP:Q50228	Formamidase	<i>Methylophilus methylotrophus</i>	*n.s.s.
NOCTA	SP:Q5Z1U0	Aliphatic amidase	<i>Nocardia farcinica</i> (strain IFM 10152)	39
ORYSJ1	SP:Q93XI4	N-carbamoylputrescine amidase	<i>Oryza sativa</i> subsp. <i>japonica</i>	28
ORYSJ2	SP:Q6H849	Bifunctional nitrilase/nitrile hydratase NIT4	<i>Oryza sativa</i> subsp. <i>japonica</i>	31
PAENI	SP:Q93NG1	2-oxoglutarate amidase	<i>Paenarthrobacter nicotinovorans</i>	23
PARBR	TR:A0A1E2XT43	Formamidase	<i>Paracoccidioides brasiliensis</i>	*n.s.s.
PHOLL	SP:Q7N278	Formamidase	<i>Photorhabdus laumondii</i> subsp. <i>laumondii</i> (strain DSM 15139 / CIP 105565 / TT01)	65
PONAB	SP:Q5R4L6	Omega-amidase NIT2	<i>Pongo abelii</i>	25
PSEA7	SP:A6V262	Aliphatic amidase	<i>Pseudomonas aeruginosa</i> (strain PA7)	37
PSEA8	SP:B7V2X1	Aliphatic amidase	<i>Pseudomonas aeruginosa</i> (strain LESB58)	37
PSEAB	SP:Q02QK0	Aliphatic amidase	<i>Pseudomonas aeruginosa</i> (strain UCBPP-PA14)	37
PSEAE	SP:P11436	Aliphatic amidase	<i>Pseudomonas aeruginosa</i> (strain / 1C / PRS 101 / PAO1)	37
PSEFS	SP:C3K9E6	Aliphatic amidase	<i>Pseudomonas fluorescens</i> (strain SBW25)	36
PSEP1	SP:A5W2C0	Aliphatic amidase	<i>Pseudomonas putida</i> (strain ATCC 700007 / DSM 6899 / BCRC 17059 / F1)	39
PSEPH	SP:P55176	Hydrolase in <i>pqqF</i> 5' region	<i>Pseudomonas protegens</i> (strain DSM 19095 / LMG 27888 / CFBP 6595 / CHA0)	24
PSESM	SP:Q887D9	Formamidase	<i>Pseudomonas syringae</i> pv. <i>tomato</i> (strain ATCC BAA-871 / DC3000)	44
PSESP	SP:Q75SP7	(R)-stereoselective amidase	<i>Pseudomonas</i> sp.	26
PSEU2	SP:Q4ZXA2	Formamidase	<i>Pseudomonas syringae</i> pv. <i>syringae</i> (strain B728a)	45
PYRAB	SP:Q9UYV8	Nitrilase	<i>Pyrococcus abyssi</i> (strain GE5 / Orsay)	27
RAT1	SP:Q03248	Beta-ureidopropionase	<i>Rattus norvegicus</i>	23
RAT2	SP:Q497B0	Omega-amidase NIT2	<i>Rattus norvegicus</i>	23
RHIFH	SP:G9AIU0	Aliphatic nitrilase	<i>Rhizobium fredii</i> (strain HH103)	29
RHIML	TR:H0G2A6	Formamidase	<i>Sinorhizobium meliloti</i> CCNWSX0020	*n.s.s.
RHIRD	SP:Q5S260	N-carbamoyl-D-amino acid hydrolase	<i>Ensifer adhaerens</i>	24
RHOE4	SP:C0ZNE8	Aliphatic amidase	<i>Rhodococcus erythropolis</i> (strain PR4 / NBRC 100887)	40
RHOER	SP:Q01360	Aliphatic amidase	<i>Rhodococcus erythropolis</i>	39

SCHPO1	SP:O59829	Probable nitrilase C965.09	<i>Schizosaccharomyces pombe</i> (strain 972 / ATCC 24843)	24
SCHPO2	SP:Q10166	Hydrolase C26A3.11	<i>Schizosaccharomyces pombe</i> (strain 972 / ATCC 24843)	24
SOLLC	SP:Q9XGI9	<i>N</i> -carbamoylputrescine amidase	<i>Solanum lycopersicum</i>	27
SOLTU	SP:Q3HVN1	<i>N</i> -carbamoylputrescine amidase	<i>Solanum tuberosum</i>	27
STAAU	SP:P55177	Hydrolase in <i>agr</i> operon	<i>Staphylococcus aureus</i>	25
STALU	SP:P55178	Hydrolase in <i>agr</i> operon (Fragment)	<i>Staphylococcus lugdunensis</i>	28
THISH	SP:B8GQ39	Aliphatic amidase	<i>Thioalkalivibrio sulfidophilus</i> (strain HL-EbGR7)	38
TOBAC1	SP:Q42966	Bifunctional nitrilase/nitrile hydratase NIT4B	<i>Nicotiana tabacum</i>	33
TOBAC2	SP:Q42965	Bifunctional nitrilase/nitrile hydratase NIT4A	<i>Nicotiana tabacum</i>	33
UKNPR	SP:Q6RWK4	Nitrilase 2	Unknown prokaryotic organism	29
VARPS	SP:C5CWZ4	Aliphatic amidase	<i>Variovorax paradoxus</i> (strain S110)	38
XENLA1	SP:Q6IR61	Omega-amidase NIT2-A	<i>Xenopus laevis</i>	25
XENLA2	SP:Q6INI7	Omega-amidase NIT2-B	<i>Xenopus laevis</i>	26
XENTR	SP:Q28IE5	Omega-amidase NIT2	<i>Xenopus tropicalis</i>	26
YEAST	SP:P49954	Omega-amidase NIT3	<i>Saccharomyces cerevisiae</i> (strain ATCC 204508 / S288c)	24