

Supplemental Table 1: Transporter Proteins in *Hyphomonas neptunium* ATCC 15444^T
ATP-Dependent

[The ATP-binding Cassette \(ABC\) Superfamily](#)

PROTEIN			SUBSTRATE
ABC	membrane	binding protein	
HNE_1219	HNE_1218?		?
HNE_0205		HNE_0204	?
HNE_2920	HNE_3056 HNE_2921		?
HNE_2616	HNE_2615 HNE_2619		? (Fe-S assembly/SufBCD system)
HNE_0950			? (Uup homolog/duplicated ATPase)
HNE_0754			? (Uup homolog/duplicated ATPase)
HNE_2924			? (Uup homolog/duplicated ATPase)
HNE_3390	HNE_3391		cell division
HNE_1517	HNE_1516	HNE_1515	chelated ion
	HNE_1661* HNE_1660		CydC/CydD homolog
HNE_0186	HNE_0187		efflux
	HNE_3089*		efflux
	HNE_1242*		heavy metal tolerance?
HNE_3515	HNE_3517 HNE_3516		heme
HNE_1145	HNE_1144	HNE_1143	iron compound
HNE_2695	HNE_2694	HNE_2693	iron(III)
	HNE_1366*		lipid A export
HNE_0796	HNE_0795		lipopolysaccharide
HNE_1766	HNE_1765		lipoprotein releasing
	HNE_1647*		macrolide efflux
HNE_1881			multidrug
HNE_1534	HNE_1536 HNE_1535		multidrug
HNE_3509	HNE_3510		multidrug
	HNE_3241*		multidrug
	HNE_3192*		multidrug?
HNE_2232			nitrate
HNE_0172	HNE_2880 HNE_2879	HNE_2874	oligopeptide
HNE_2030	HNE_2032 HNE_2031	HNE_2990	phosphate
HNE_2460	HNE_2461	HNE_2459	phosphonate
HNE_3165	HNE_3164		sodium ion export
HNE_0723	HNE_0724	HNE_2253 HNE_2138? HNE_2106? HNE_2919	toluene tolerance

* contains both an ABC and a membrane domain as one polypeptide

** contains both a membrane domain and a binding protein domain as one polypeptide

[The H⁺- or Na⁺-translocating F-type, V-type and A-type ATPase \(F-ATPase\) Superfamily](#)

HNE_1922	
HNE_1921	
HNE_1920	protons
HNE_1919	
HNE_1918	

HNE_1895	
HNE_1894	
HNE_1893	protons
HNE_1892	
HNE_1891	

[The H⁺-translocating Pyrophosphatase \(H⁺-PPase\) Family](#)

HNE_1158	proton
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[The P-type ATPase \(P-ATPase\) Superfamily](#)

HNE_1713	cadmium ion
HNE_1700	copper ion
HNE_1690	mercuric ion
HNE_1483	silver/copper ion
HNE_1226	heavy metal ion

Ion Channels

[The Cation Channel-forming Heat Shock Protein-70 \(Hsp70\) Family](#)

HNE_0525	heat shock protein 70 homolog
HNE_3321	heat shock protein DnaK homolog

[The Major Intrinsic Protein \(MIP\) Family](#)

HNE_0461	water channel
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[The CorA Metal Ion Transporter \(MIT\) Family](#)

HNE_2787	magnesium/cobalt ion
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[The Large Conductance Mechanosensitive Ion Channel \(MscL\) Family](#)

HNE_0190	large-conductance mechanosensitive ion channel
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[The Small Conductance Mechanosensitive Ion Channel \(MscS\) Family](#)

HNE_1377	small-conductance mechanosensitive ion channel
HNE_0598	small-conductance mechanosensitive ion channel
HNE_0597	small-conductance mechanosensitive ion channel
HNE_0534	small-conductance mechanosensitive ion channel

[The Voltage-gated Ion Channel \(VIC\) Superfamily](#)

HNE_0436	potassium ion channel
HNE_3152	sodium ion channel

Phosphotransferase System (PTS)

[General PTS](#)

HNE_0619	Enzyme I	?
HNE_0439	HPr	?

[Sugar Specific PTS](#)

HNE_0438	Enzyme IIA	fructose/mannose
HNE_3289	Enzyme IIA	nitrogen regulatory

Secondary Transporter

[The p-Aminobenzoyl-glutamate Transporter \(AbgT\) Family](#)

HNE_2107	aminobenzoyl-glutamate
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[The Arsenical Resistance-3 \(ACR3\) Family](#)

HNE_0992	arsenite
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[The Auxin Efflux Carrier \(AEC\) Family](#)

HNE_2301	malonate
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[The Alanine or Glycine:Cation Symporter \(AGCS\) Family](#)

HNE_2334	sodium ion/alanine
HNE_0101	sodium ion/alanine

[The Ammonium Transporter \(Amt\) Family](#)

HNE_3542	ammonium
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[The Amino Acid-Polyamine-Organocation \(APC\) Family](#)

HNE_2674	amino acid
HNE_2593	amino acid
HNE_1338	amino acid

[The Betaine/Carnitine/Choline Transporter \(BCCT\) Family](#)

HNE_1490	choline
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[The Ca²⁺:Cation Antiporter \(CaCA\) Family](#)

HNE_1856	sodium ion/calcium ion
HNE_0473	sodium ion/calcium ion
HNE_3087	sodium ion/calcium ion

[The Cation Diffusion Facilitator \(CDF\) Family](#)

HNE_1727	cation efflux
HNE_0549	zinc ion efflux

[The Chromate Ion Transporter \(CHR\) Family](#)

HNE_0575	chromate ion
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[The Concentrative Nucleoside Transporter \(CNT\) Family](#)

HNE_2817 nucleosides

[The Monovalent Cation:Proton Antiporter-1 \(CPA1\) Family](#)

HNE_2462 sodium ion/proton

HNE_0214 sodium ion/proton

[The Monovalent Cation:Proton Antiporter-2 \(CPA2\) Family](#)

HNE_2775 potassium ion efflux

HNE_0044 potassium ion efflux

[The Monovalent Cation \(K+ or Na+\):Proton Antiporter-3 \(CPA3\) Family](#)

HNE_0738
HNE_0736
HNE_0735
HNE_0734
HNE_0733
HNE_0732?
HNE_0731
HNE_0730
HNE_0729 sodium ion/proton

[The Dicarboxylate/Amino Acid:Cation \(Na+ or H+\) Symporter \(DAACS\) Family](#)

HNE_0400 proton/sodium ion:glutamate

[The Divalent Anion:Na+ Symporter \(DASS\) Family](#)

HNE_2682 sodium ion/sulfate

HNE_2347 sodium ion/sulfate

HNE_0962 sodium ion/sulfate

[The Drug/Metabolite Transporter \(DMT\) Superfamily](#)

HNE_2609 SugE homolog

HNE_0908 multidrug/quaternary ammonium compound

HNE_0481 amino acid metabolite efflux

HNE_3537 chloamphenicol (RarD homolog)

HNE_3523 drug/metabolite?

HNE_3482 drug/metabolite?

HNE_3359 drug/metabolite?

HNE_3178 drug/metabolite?

HNE_3088 drug/metabolite?

[The Formate-Nitrite Transporter \(FNT\) Family](#)

HNE_2236 formate/nitrite

[The Glycoside-Pentoside-Hexuronide \(GPH\):Cation Symporter Family](#)

HNE_2645 proton/sodium ion:sugar

HNE_2445 proton/sodium ion:sugar

HNE_2129 proton/sodium ion:sugar

HNE_1474 proton/sodium ion:sugar

HNE_0615 proton/sodium ion:sugar

The Major Facilitator Superfamily (MFS)

HNE_2432	?	
HNE_2422	?	
HNE_2405	multidrug efflux	
HNE_2390	?	
HNE_2283	drug efflux	
HNE_2223	sugar/metabolite?	
HNE_2215	sugar/metabolite?	
HNE_1644	?	
HNE_1559	nitrate/nitrite	
HNE_1370	efflux	
HNE_1254	efflux	
HNE_1253	oxalate/formate?	
HNE_0949	?	
HNE_0948	?	
HNE_0931	?	
HNE_0726	drug efflux	
HNE_0492	tetracycline efflux	
HNE_0337	AmpG homolog	
HNE_0309	?	
HNE_0295	AmpG homolog	
HNE_3348	multidrug efflux	
HNE_3257	multidrug efflux	
HNE_3256	multidrug efflux	
HNE_3113	bicyclomycin	
HNE_3053	?	
HNE_3037	3-phenylpropionic acid	
HNE_3021	?	

The Multidrug/Oligosaccharidyl-lipid/Polysaccharide (MOP) Flippase Superfamily

HNE_2771	MATE	multidrug efflux (DinF homolog)
HNE_2304	MATE	multidrug efflux
HNE_1594	PST	polysaccharide
HNE_1188	PST	polysaccharide
HNE_0711	MATE	multidrug efflux
HNE_0519	MVF	virulence factor MviN homolog

The NhaC Na⁺:H⁺ Antiporter (NhaC) Family

HNE_1971	sodium ion/proton
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The Metal Ion (Mn²⁺-iron) Transporter (Nramp) Family

HNE_2126	manganese ion
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[The Neurotransmitter:Sodium Symporter \(NSS\) Family](#)

HNE_2932 sodium ion/?

[The Cytochrome Oxidase Biogenesis \(Oxa1\) Family](#)

HNE_0414 60 KD inner membrane protein OxaA homolog

[The Inorganic Phosphate Transporter \(PiT\) Family](#)

HNE_3040 phosphate

[The Phosphate:Na⁺ Symporter \(PNaS\) Family](#)

HNE_1902 sodium ion/phosphate

[The Proton-dependent Oligopeptide Transporter \(POT\) Family](#)

HNE_1376 dipeptide/tripeptide:proton

[The Resistance to Homoserine/Threonine \(RhfB\) Family](#)

HNE_0986 amino acid efflux

[The Resistance-Nodulation-Cell Division \(RND\) Superfamily](#)

HNE_2430 cation efflux

HNE_2378 protein-export (SecDF)

HNE_2373 heavy metal ion efflux

HNE_2190 cation/multidrug efflux

HNE_2111 multidrug efflux

HNE_1926 protein export (SecDF)

HNE_1925

HNE_1851 cation/multidrug efflux

HNE_1714 heavy metal ion efflux

HNE_1693 heavy metal ion efflux

HNE_0815 multidrug efflux

HNE_0211 multidrug efflux

HNE_3061 cation/multidrug efflux

[The Na⁺-dependent Bicarbonate Transporter \(SBT\) Family](#)

HNE_1527 sodium ion/bicarbonate

[The Solute:Sodium Symporter \(SSS\) Family](#)

HNE_2177 sodium ion:glucose/myo-inositol

HNE_1645 sodium ion/proline

HNE_1401 sodium ion/solute

HNE_1081 sodium ion/proline

[The Sulfate Permease \(SuIP\) Family](#)

HNE_0998 sulfate

HNE_0610 sulfate

[The Twin Arginine Targeting \(Tat\) Family](#)

HNE_1934
HNE_1933 protein export
HNE_1932

[The Tripartite ATP-independent Periplasmic Transporter \(TRAP-T\) Family](#)

HNE_0892		
HNE_0891	C4-dicarboxylate	
HNE_0890		
HNE_0305	?	

[The K⁺ Transporter \(Trk\) Family](#)

HNE_2733	potassium ion uptake	
HNE_2007	potassium ion uptake	
HNE_1323	potassium ion uptake	

Unclassified

[The MerTP Mercuric Ion \(Hg²⁺\) Permease \(MerTP\) Family](#)

HNE_1690	mercuric ion (MerP)	
HNE_1689	mercuric ion (MerT)	

[The Mg²⁺ Transporter-E \(MgtE\) Family](#)

HNE_1270 magnesium ion

[The Nicotinamide Mononucleotide \(NMN\) Uptake Permease \(PnuC\) Family](#)

HNE_1176	nicotinamide mononucleotide	
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