

Table S6. Transport systems of *G. sulfurreducens* and *G. metallireducens*.

Transporter substrate	<i>G. metallireducens</i> gene(s)	<i>G. sulfurreducens</i> gene(s)
Ammonium	Gmet_0695	GSU0940
Ammonium? ¹	Gmet_1738	GSU1221
Quaternary ammonium compounds (efflux protein SugE)	Gmet_2960 ²	GSU0707 GSU0708
Potassium (Kup)	Gmet_0038	GSU3346
	Gmet_0039	GSU2485
	none	GSU2350
Potassium (ATPase KdpABCDE)	Gmet_2433-Gmet_2437	GSU2480-GSU2484
Potassium (antiport with proton)	none	GSU1203
Potassium (antiport with proton; KefB)	none	GSU2759
Potassium (antiport with proton; RosB)	Gmet_1105	GSU1204
Potassium? (antiport with proton)	none	GSU0261
Potassium? (TrkA domain)	Gmet_0063	none
Sodium (antiport with proton; MrpABCDEFG complex)	none	GSU2344-GSU2338
Sodium? (antiport with proton)	Gmet_1089	GSU2303
Magnesium/cobalt (CorA-1) ³	Gmet_1189	GSU1399
Magnesium/cobalt/nickel (CorA-2) ⁴	Gmet_0134	GSU3322
Cobalt? (CbiMQO and porin)	Gmet_2441-Gmet_2438	GSU1279-GSU1282
Cobalt? (CbiMQO)	Gmet_0472-Gmet_0475	GSU3004 ⁵ ; GSU3002-GSU3001
Cobalt/zinc/cadmium? (efflux pump)	Gmet_3071	GSU0487
Cobalt/zinc/cadmium? (efflux pump)	Gmet_0858	GSU2613
Cobalt/zinc/cadmium? (efflux pump)	Gmet_0515	GSU2959
Zinc? (ZIP family)	none	GSU0206
Ferrous iron (FeoB-2)	none	GSU3268
Ferrous iron? (FeoB-1)	Gmet_2444	GSU1380
Manganese? Zinc? Iron? Nickel? (ABC- type)	Gmet_0491-Gmet_0493	GSU2986-GSU2984
Copper (P-type ATPase and membrane proteins)	Gmet_2774-Gmet_2772	GSU2454-GSU2452
Heavy metal? (efflux pump)	Gmet_3507-Gmet_3509	GSU0828-GSU0830
	none	GSU2137-GSU2135
	none	GSU3398-GSU3400
Heavy metal? (ABC-type and protein of unknown function)	Gmet_1556-Gmet_1552	GSU1338 ⁶ -GSU1341
Heavy metal? (ABC-type)	none	GSU0677-GSU0678
Heavy metal efflux? (P-type ATPase)	none	GSU2147
Metal ion (efflux pump and protein of unknown function)	Gmet_1549-Gmet_1546	GSU1330-GSU1333
Cations (E1-E2 family efflux ATPase)	Gmet_1614	GSU1678

MgtA)		
Cations (E1-E2 family efflux ATPase)	none	GSU2325
	Gmet_3497	GSU2351
Cations (CorB-type and membrane protein)	Gmet_1153-Gmet_1154	GSU0853-GSU0854
Ion (stomatin-like channel)	Gmet_0813-Gmet_0814	GSU2431-GSU2430
Ions (mechanosensitive channels)	none	GSU1557
	Gmet_1942	GSU1633
	none	GSU1723
	Gmet_2581	GSU2316
	Gmet_2522	GSU2794
Chloride (voltage-gated channel)	Gmet_3470	GSU2363
Phosphate (ABC-type PstSCAB-PhoU)	Gmet_2701-Gmet_2705	GSU1099-GSU1095
Phosphate? (NptA-related sodium/anion symporter)	Gmet_1829	GSU1742
Phosphate? (orthophosphate/polyphosphate-selective porin family)	Gmet_1042	none
Phosphate/sulfate? (PitA and regulator)	Gmet_3132-Gmet_3131	GSU0388-GSU0389
Sulfate (ABC-type CysPTWA)	Gmet_1906-Gmet_1903	GSU1346-GSU1349
Sulfate? (proton/anion symporter)	none	GSU2312
Molybdate (ABC-type ModABC)	Gmet_0512-Gmet_0514	GSU2962-GSU2960
Tungstate (ABC-type TupBA)	Gmet_1041-Gmet_1039	GSU2700-GSU2702
Arsenite (ABC-type, tyrosine phosphatase, ArsR regulator, efflux pump and membrane protein)	Gmet_0524-Gmet_0519	GSU2950-GSU2955
Nitrate (symport with proton; NarK-1)	Gmet_0333	none
Nitrate/nitrite (antiport; NarK-2)	Gmet_0334	none
Chromate	Gmet_2732-Gmet_2731	none
Dicarboxylic acids (<i>dcuB</i>)	none	GSU2751
Anion	Gmet_2857	none
L-lactate/glycolate?	none	GSU0226
	none	GSU1622
Formate? (FNT family)	none	GSU0234
Hexuronate?	none	GSU0249
Amino acid? (ABC-type and MarC-related membrane protein)	none	GSU0800-GSU0797
Amino acid? (ABC-type)	none	GSU2649-GSU2651
	none	GSU3406-GSU3404
Branched-chain amino acids? (ABC-type)	Gmet_1824-Gmet_1819	GSU1736 ⁷ -GSU1730
	none	GSU2005-GSU2009
	none	GSU3391-GSU3394
Homoserine/homoserine lactone/threonine? (efflux protein)	none	GSU1194
	Gmet_0798	none
	none	GSU1545

Arginine? (efflux protein)	none	GSU2777
Guanine/hypoxanthine	Gmet_2715	GSU1019
Uracil	none	GSU0932
Aromatic hydrocarbons? (inner and outer membrane proteins and ATPase)	Gmet_1537-Gmet_1534	none
Polyisoprenoids (periplasmic protein YceI)	Gmet_3449	none
Lipid A (ABC-type, MsbA family)	Gmet_2349	GSU2260
3-deoxy-D-manno-octulosonate? (ABC-type YhbNG)	Gmet_1281-Gmet_1282	GSU1889-GSU1888
O-antigen (ABC-2 family)	Gmet_1406-Gmet_1407	GSU1504-GSU1505
O-antigen/teichoic acid? (membrane protein)	Gmet_2012	none
Oligopeptides? (ABC-type)	Gmet_0848-Gmet_0847, Gmet_1234-Gmet_1236	GSU2623-GSU2624, GSU1433-GSU1435
Lipoprotein (ABC-type LolDE)	Gmet_2359-Gmet_2358	GSU2270-GSU2269
	none	GSU2188-GSU2187
	Gmet_1518-Gmet_1517	none
Protease (ABC-type and efflux pump outer membrane and membrane fusion proteins)	none	GSU0278-GSU0276
Exopolysaccharide? (membrane protein)	none	GSU0629
	Gmet_2888	none
Exopolysaccharide? (outer membrane protein)	Gmet_2030	GSU1985
Biopolymer? (TolQRB-TonB-type)	Gmet_3537-Gmet_3540	GSU0028-GSU0025
Biopolymer? (TolQR-type)	Gmet_1459-Gmet_1460	none
Nucleic acids? (uptake proteins ComEA and ComEC)	Gmet_1878, Gmet_1915	GSU1797, GSU1657
Cell division-related (FtsEX, ABC-type)	Gmet_1855-Gmet_1854	GSU1775-GSU1774
Unknown	none	GSU2317
	Gmet_0568-Gmet_0570	GSU2903-GSU2901
Unknown (membrane protein)	none	GSU0265
	none	GSU0268
	none	GSU0752
	none	GSU0758
	Gmet_2550	GSU1016
	Gmet_2050	GSU1998
	none	GSU2677
	Gmet_0563	GSU2907
	none	GSU3407
	Gmet_1490	none
	Gmet_1663	none
Unknown (TerC-related)	Gmet_1155	GSU1570
	Gmet_1782	GSU1336

Unknown (YjgPQ-type)	Gmet_1249-Gmet_1248	GSU1922-GSU1923
Unknown (sodium/solute symporter)	Gmet_2061	none
Unknown (sodium/solute symporter)	Gmet_3031	GSU0518
Unknown ⁸ (sodium/solute symporters)	Gmet_0739, Gmet_3288	GSU1068, GSU1070, GSU2352
Unknown (membrane importer Tim44 subunit)	Gmet_1927	GSU1091
Unknown (exporter)	Gmet_2183	GSU1855
Unknown (exporter, RND superfamily)	Gmet_2244	none
Unknown (exporter, outer membrane lipoprotein LolB, and carrier/sorter protein LolA)	Gmet_1698, Gmet_3378, Gmet_1699	GSU0457.1-GSU0456
Unknown (drug resistance?)	Gmet_1682	GSU0264
Unknown (DUF6 domain membrane protein)	Gmet_2977	GSU0545
	none	GSU3388
	none	GSU3390
	Gmet_3456	none
Unknown (sodium-driven?)	none	GSU0844
Unknown (ACR3 family)	none	GSU1411
Unknown (TRAP-type)	none	GSU2055-GSU2057
Unknown (TRAP-type solute receptor)	none	GSU2692
Unknown (OstA-type)	Gmet_2474	GSU2367
Unknown (major facilitator superfamily)	none	GSU2491
	none	GSU3264
	Gmet_2251	none
	Gmet_3221	none
Unknown (DUF81 domain membrane protein)	Gmet_1097	none
Unknown (ABC-2 family membrane protein)	Gmet_2545	GSU0922
	Gmet_0014	GSU3455
Unknown (membrane protein and TonB-type)	Gmet_1157-Gmet_1158	GSU0857-GSU0858
Unknown (periplasmic protein)	Gmet_0781	none
	Gmet_0986	GSU2017
Unknown (ABC-type periplasmic protein)	none	GSU1397
	Gmet_1244	GSU1444
	none	GSU1528
	none	GSU2389
	none	GSU3401
	Gmet_2771	none
Unknown (ABC-type periplasmic protein DUF534)	Gmet_1746	GSU1230
Unknown (ligand-gated porin and ABC-type periplasmic protein DUF534)	Gmet_2735-Gmet_2736	GSU0883-GSU0882
Unknown (ABC-type ATP-binding)	Gmet_0013	GSU0011

protein)	Gmet_2630	GSU0169
	Gmet_1743	GSU1227
	Gmet_1926	GSU1644
	Gmet_2524	GSU2093
	Gmet_2479	none
Unknown (ABC-type)	Gmet_3423	GSU0093
	Gmet_3416	GSU0101
	none	GSU0211-GSU0212
	Gmet_2543-Gmet_2541	GSU0924-GSU0926
	Gmet_1401-Gmet_1403	GSU1499-GSU1501
	none	GSU2413-GSU2414
	Gmet_0996-Gmet_0998	none
Gmet_1899-Gmet_1901	none	
Unknown (DUF140 ABC-type)	Gmet_2543-Gmet_2541	GSU0924-GSU0926
	Gmet_1271-Gmet_1272	GSU1900-GSU1899
Unknown (DUF140 ABC-type and efflux pump outer membrane protein)	Gmet_0788-Gmet_0784	GSU0817-GSU0813
Unknown (efflux pump YbhG and ABC-type YbhFSR)	Gmet_0659-Gmet_0655	GSU2823-GSU2826
Unknown (ABC-type and membrane protein)	none	GSU1260-GSU1262
Unknown (ABC-type and efflux pump membrane fusion protein)	Gmet_3038-Gmet_3036	GSU0496-GSU0496.2
	Gmet_2408-Gmet_2405	GSU1161-GSU1164
	none	GSU2687-GSU2685
Unknown (ABC-type and efflux pump outer membrane and membrane fusion proteins)	none	GSU0950-GSU0947
	Gmet_3465-Gmet_3460	none
Unknown (outer membrane receptor)	Gmet_1245	GSU1445
Unknown (ligand-gated porin)	Gmet_1669	none
Unknown (TonB-dependent ligand-gated receptor)	none	GSU2982-GSU2981
Unknown (efflux pump outer membrane protein)	Gmet_1190	none
Unknown (efflux pump EmrAB and outer membrane protein)	Gmet_1376-Gmet_1374	GSU1482-GSU1480
Unknown (efflux pump)	Gmet_3129-Gmet_3127	GSU0391-GSU0392, GSU0394
	Gmet_1650-Gmet_1652	GSU1609-GSU1611
	Gmet_2519-Gmet_2517	GSU2665-GSU2664 ⁹
	Gmet_0809-Gmet_0811	GSU2697-GSU2695
	none	GSU2781-GSU2782
Gmet_1666-Gmet_1664	none	
Unknown (sodium-driven efflux pump)	Gmet_2508	GSU2653
	Gmet_0358	GSU3129
Unknown (porin)	Gmet_0802	GSU0767

	Gmet_0532	GSU2939
	none	GSU3271
	Gmet_0783	none
	Gmet_1101	none
	Gmet_1194-Gmet_1193	none
	Gmet_1200	none
	Gmet_1649	none
	Gmet_1995	none
	Gmet_1998	none
	Gmet_2192	none
	Gmet_2624	none
	Gmet_2831	none
Unknown (porin OmpJ and paralog)	Gmet_3254	GSU3304, GSU3403

¹The alignment with known ammonium transporters is unsatisfactory.

²Duplicate transporter genes GSU0707 and GSU0708 correspond to a single gene, Gmet_2960, inactivated by an internal stop codon.

³*Thermotoga*-type CorA protein.

⁴Enteric-type CorA protein.

⁵The two domains of CbiM represented by Gmet_0472 and Gmet_0473 are fused in GSU3004.

⁶Heavy metal-binding domain protein GSU1338 is duplicated as Gmet_1556 and Gmet_1555.

⁷*G. sulfurreducens* and other *Geobacteraceae* have duplicate periplasmic amino acid-binding protein genes (GSU1734-GSU1735); *G. metallireducens* has only Gmet_1823, a GSU1734 ortholog.

⁸These symporters are very closely related to each other, and co-transcribed with members of an uncharacterized protein family.

⁹The inner membrane protein and outer membrane protein represented by Gmet_2518 and Gmet_2517 are fused in GSU2664, suggesting that they must be proteolytically separated to accommodate the membrane fusion protein GSU2665 (Gmet_2519).