Supplemental Material

Methods

Filter disk assays. Filter disk assays were performed using a modified version of a previously described protocol (1). Overnight cultures of each strain were pelleted, washed once, resuspended in fresh tryptone medium, and adjusted to an OD_{600} of 0.05. 50 µL of this suspension was spread onto tryptone medium plates with noble agar, 20 mM lactate, and 40 mM fumarate. 20 µL of 1 M $CdCl_2$, 1 M $CoCl_2$, 1 M $CuCl_2$, 6 M $FeCl_2$, 4 M $MnCl_2$, 1 M $NiCl_2$, or 1 M $ZnCl_2$ was placed onto a 6-mm filter disk in the center of the plate. Zones of growth inhibition were measured after plates were incubated anaerobically at 30°C for two days.

Fumarate and ferric citrate growth curve. Overnight cultures of each strain were pelleted, washed once, and resuspended in fresh SBM. Cultures of anaerobic SBM supplemented with 20 mM lactate, 40 mM fumarate, and 1 mM ferric citrate were incubated with shaking at 30°C. Growth was measured by periodically plating serial 1:10 dilutions of each culture to LB plates and performing colony counts after one day of incubation.

Table S1. Inhibition of wild-type and *ΔfeoE* by divalent metals in filter disk assays.

	Wild-type		**Δ*feoE***	
Metal	**Ave. zone size (mm)**	**S.D. (mm)**	**Ave. zone size (mm)**	**S.D. (mm)**
$FeCl_2$	26.3	0.6	35.0	2.0
$CdCl_2$	41.0	1.0	41.0	1.0
$CoCl_2$	36.7	2.1	36.7	1.5
$CuCl_2$	31.0	1.0	31.7	0.6
$MnCl_2$	14.3	1.5	14.3	2.1
$NiCl_2$	27.3	0.6	26.3	0.6
$ZnCl_2$	21.7	3.1	21.0	0.0

Table S2. *Shewanella* and *E. coli* strains used for FieF and FeoE alignment

Species name	Strain	Protein Accession No.
Escherichia coli	042	CBG37114.1
Escherichia coli	101-1	EDX38712.1
Escherichia coli	55989	CAV01107.1
Escherichia coli	ABU 83972	ADN48832.1
Escherichia coli	APEC O1	ABJ03381.1
Escherichia coli	BL21(DE3)	ACT45593.1
Escherichia coli	BW2952	ACR65792.1
Escherichia coli	CFT073	AAN83294.1
Escherichia coli	DH1(ME8569)	BAJ45640.1
Escherichia coli	ED1a	CAR10725.2
Escherichia coli	FVEC1302	EFI17836.1
Escherichia coli	H299	EGI48340.1
Escherichia coli	H591	EGI43690.1
Escherichia coli	H736	EGI08350.1
Escherichia coli	HS	ABV08323.1
Escherichia coli	IAI1	CAR00891.1
Escherichia coli	IAI39	YP_002409011.1
Escherichia coli	IHE3034	ADE89170.1
Escherichia coli	K12(DH10B)	ACB04927.1
Escherichia coli	K12(MG1655)	NP_418350.1
Escherichia coli	K12(W3110)	BAE77395.1

Escherichia coli	LF82	CAP78372.1
Escherichia coli	M605	EGI13549.1
Escherichia coli	M718	EGI18796.1
Escherichia coli	NA114	AEG38898.1
Escherichia coli	NC101	EFM53266.1
Escherichia coli	NRG 857C	YP_006122251.1
Escherichia coli	O103:H2(12009)	BAI33309.1
Escherichia coli	O111:H(11128)	BAI38485.1
Escherichia coli	O127:H6(E2348/69)	CAS11767.1
Escherichia coli	O139:H28(E24377A)	KIO42250.1
Escherichia coli	O157:H7(EDL933)	AIG71382.1
Escherichia coli	O157:H7(Sakai)	NP_312867.1
Escherichia coli	O157:H7(TW14359)	ACT74675.1
Escherichia coli	O26:H11(11368)	BAI27835.1
Escherichia coli	O55:H7(CB9615)	ADD59161.1
Escherichia coli	P12b	AFG42844.1
Escherichia coli	REL606	ACT41437.1
Escherichia coli	S88	CAR05545.1
Escherichia coli	SMS-3-5	ACB16239.1
Escherichia coli	TA143	EGI29243.1
Escherichia coli	TA206	EGI24455.1
Escherichia coli	TA271	EGI33945.1
Escherichia coli	TA280	EGI38874.1

Escherichia coli	UMN026	CAR15569.1
Escherichia coli	UM146	ADN73293.1
Escherichia coli	UTI89	ABE09910.1
Shewanella sp.	38A_GOM-205M	WP_028780032.1
Shewanella sp.	ANA-3	WP_011715494.1
Shewanella sp.	ECSMB14102	WP_039034709.1
Shewanella sp.	MR-4	WP_011621062.1
Shewanella sp.	MR-7	WP_011627504.1
Shewanella sp.	POL2	WP_037425101.1
Shewanella sp.	W3-18-1	ABM23071.1
Shewanella sp.	ZOR0012	WP_047538636.1
Shewanella amazonensis	SB2B	ABM01633.1
Shewanella baltica	OS185	ABS06427.1
Shewanella baltica	OS223	ACK44795.1
Shewanella benthica	KT99	EDP98627.1
Shewanella colwelliana	ATCC 39565	WP_028762938.1
Shewanella denitrificans	OS217	ABE56734.1
Shewanella fidelis	ATCC BAA-318	WP_028769358.1
Shewanella frigidimarina	NCIMB 400	ABI70177.1
Shewanella halifaxensis	HAW-EB4	ABZ74916.1
Shewanella loihica	PV-4	ABO25434.1
Shewanella marina	JCM 15074	WP_025821863.1
Shewanella oneidensis	MR-1	WP_011074103.1

Shewanella pealeana	ATCC 700345	ABV89241.1
Shewanella piezotolerans	WP3	ACJ27086.1
Shewanella putrefaciens	200	ADV52715.1
Shewanella putrefaciens	CN-32	ABP74101.1
Shewanella sediminis	HAW-EB3	ABV34894.1
Shewanella waksmanii	ATCC BAA-643	WP_028773609.1
Shewanella woodyi	ATCC 51908	ACA84584.1
Shewanella violacea	DSS12	BAJ00217.1
Shewanella xiamenensis	BC01	KEK26877.1

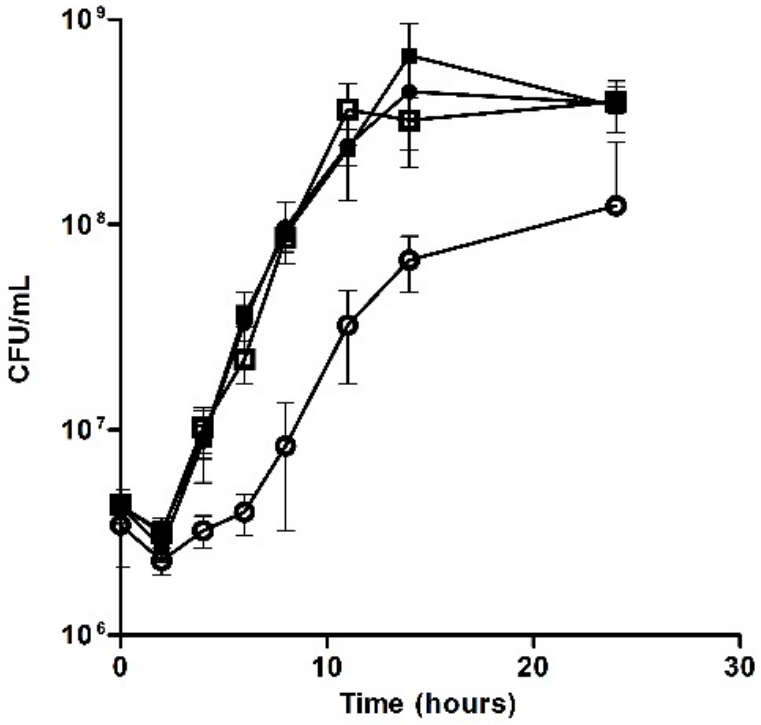

FIG. S1. Anaerobic growth of wild-type MR-1 and Δ*feoE* strains on fumarate and ferric citrate. The rate of growth in SBM with 20 mM lactate, 40 mM fumarate, and 1 mM ferric citrate over time was measured for (○) Δ*feoE* with empty pBBR1MCS-2, (□) MR-1 with empty pBBR1MCS-2, (●) Δ*feoE* with pBBR1MCS-2::*feoE*, and (■) MR-1 with pBBR1MCS-2::*feoE*. Growth was determined by counting colony-forming units per mL of culture medium (CFU/mL).

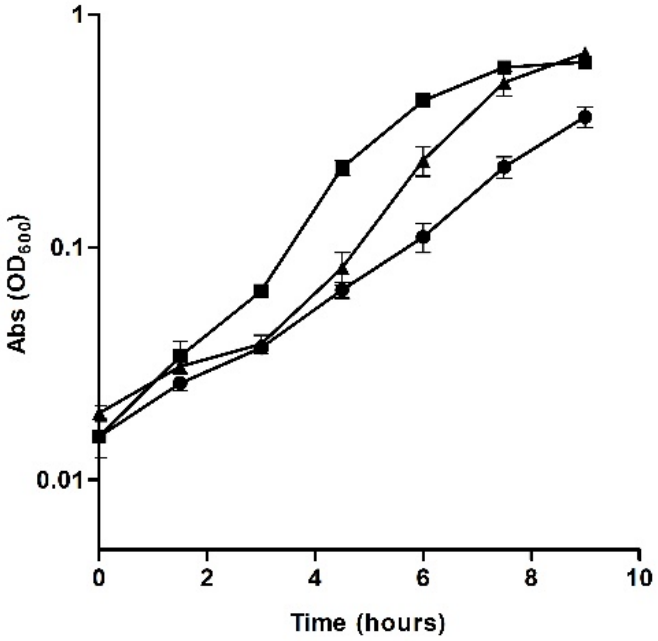

FIG. S2. Growth of *E. coli* Δ*fieF* complemented with *fieF* or *feoE* in the presence of excess Fe^{2+}. Growth in anaerobic LB with 20 mM lactate, 40 mM fumarate, and 7 mM $FeCl_2$ was measured for *E. coli* Δ*fieF* with (●) empty pBBR1MCS-2, (■) pBBR1MCS-2::*feoE*, or (▲) pBBR1MCS-2::*fieF*.

References

1. Rugh CL, Wilde HD, Stack NM, Thompson DM, Summers AO, Meagher RB. 1996. Mercuric ion reduction and resistance in transgenic *Arabidopsis thaliana* plants expressng a modified bacterial *merA* gene. Proc Natl Acad Sci USA. **93**:3182–3187.