

Enhanced gene detection assays for fumarate-adding enzymes allow uncovering anaerobic hydrocarbon degraders in terrestrial and marine systems

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Supplementary table S1: Overview of published FAE gene primer sets

This table gives an overview of published primers used in enrichments and environmental samples. Primer target positions are indicated on gene and protein level for the *bss* operon and *bssA* subunit of *Thauera aromatica* K127 (7) as a reference. Primers of Shinoda *et al.* (8) for *Magnetospirillum* strains are not included in this list. From the primer sets developed by Callaghan *et al.* (5), only the sets are given which were used for environmental samples and enrichments.

Supplementary references:

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	forward primer				reverse primer			
	sequence (5'-3') Protein (K127)	bss operon (12448 bp, K127)	bssA (6560-9145 bp, K127 bss operon)	sequence (5'-3') reverse complement Protein (K127)	bss operon (12448 bp, K127)	bssA (6560-9145 bp, K127 bss operon)	Amplicon (bp)	
Beller et al. (2002) ¹	AC GAC GGY GGC ATT TCT C D D G G I S P	8744 8762	2184 2202	G CAT GAT SGG YAC CGA CA TG TCG GTR CCS ATC GTA C L S V P I M R	8859 8876	2299 2286	132	
Washer & Edwards (2007) ¹⁰	BssA327f C GAA TTC ATC NTC GGC TAC C D E F I V G Y H	6886 6905	326 345	BssA2004r GTC GTC RTT GCC CCA YTT NGG CCN AAR TGG GGC AAY GAC GAC P K W G H D D	8543 8563	1983 1973	1677	
	MBssA1516f AG ACC CAG AAG ACC AGG TC K A Q K T R S	8055 8073	1495 1513	MBssA2446r ATG CTT TTC AGG CTC CCT CT AG AGG GAG CCT GAA AAG CAT Q R E P E K H	8988 9007	2428 2417	952	
	BssA1985f CN AAR TGG GGC AAY GAC GA P K W G N D D	8544 8562	1984 2002	BssA2524r AT GAT SGT GTT YTG SCC RTA GGT ACC TAY GGS CAR AAC ACS ATC AT T Y G Q N T I I	9062 9084	2524 2494	540	
	bssA1-416f CA GAA CAC AAA GTA TGC CC L K S K Y S P	6972 6989	412 429	bssA1-749r TGG AGT TCC AGA GGT CGA TT AA TCG ACC TCT GGA ACT CCA K I D N W K A	7284 7304	744 714	332	
	bssA2-413f TAC CTG CAG AGC AAG TAC GC Y L K S K Y S	6968 6987	408 427	bssA2-713r A CTT CAG CTT ATC GGC GTT C G AAC GCC GAT AAG CTG AAG T W H A P S G L E	7252 7271	711 681	303	
	7772f GAC ATG ACC GAC GCS ATY CT D M T D A I L	7772 7791	1212 1231	8546r TC GTC GTC RTT GCC CCA YTT AAR TGG GGC AAY GAC GAC GA K W G H D D D	8546 8565	1986 2005	793	
Botton et al. (2007) ¹¹	TC GAY GAY GGC TGC ATG GA L D D G C M E	8322 8340	1762 1780	TT CTG GTT YTT CTG CAC GTG CAG AAR AAC CAG AA V Q K N Q K	8819 8835	2259 2275	513	
Callaghan et al. (2008) ⁴	bssA 1230F GAC ATG ACC GAY GCC ATY CT D M T D A I L	7772 7791	1212 1231	bssA 2000R TC GTC GTC RTT GCC CCA YTT AAR TGG GGC AAY GAC GAC GA K W G H D D D	8546 8565	1986 2005	793	
Beller et al. (2008) ²	SRBf GTS CCC ATG ATG CGC AGC V P I M R S	8865 8882	2305 2322	SRBr C GAC ATT GAA CTG CAC GTG RTC G C GAY CAC GTG CAG TTC AAT GTC G I D H V Q F N V V	8939 8961	2379 2401	96	
Callaghan et al. (2010) ⁵	Primer Set 1 TTT GAG TGC ATC CGC CAY GGI CT F E C I R H G L	7879 7902	1319 1342	Primer Set 1 TC GTC RTT GCC CCA TTT IGG IGC GCY CCY AAA TGG GGC AAY GAC GA A P K W G H D D D	8540 8562	1980 2002	683	
	Primer Set 5 TTY GAG TGY ATN CGC CAS GGC F E C I R H G	7879 7902	1319 1342	Primer Set 5 TC RTC ATT NCC CCA YTT NGG CCN AAR TGG GGN AAT GAY GA P K W G H D D	8543 8562	1983 2002	683	
	Primer Set 9 CC NAC CAC NAA GCA YGG G L A G R R	8037 8053	1477 1493	Primer Set 9 TC GTC RTT GCC CCA TTT IGG IGC GCY CCY AAA TGG GGC AAY GAC GA A P K W G H D D D	8540 8562	1980 8518	525	
Staats et al. (2011) ⁶	bssA3f TC GAY GAY GGS TGC ATG GA L D D G C M E	8322 8340	1762 1780	bssAr TT CTG GTT YTT CTG CAC GTG CAG AAR AAC CAG AA V Q K N Q K	8819 8835	2259 2275	513	
Koulikirik et al. (2011) ⁶	bssA_715f WGG ATC GMC AAG ATC GAY RA W I D K I D N	7274 7293	714 733	bssA_1107r GNC IWA ARG TYT CMG ARC AR RT GYT CKG ARA CYT TSA GNC R L K V S E H	7647 7666	1087 1106	392	
	assA_1578f K GAY TTT GAG SAS CTT TTC S A T F D Q L W E	8194 8213	1634 1653	assA_1967r GA CGA CGA YTA YGT GGA CGA TCG TCC ACR TAR TCG TCG TC D D D D A D V	8558 8577	1998 2017	383	
von Netzer et al. (this study)	77768f (FAE-B) C AAY GAT TTA ACC RAC GCC AT C N D M T D A I	7768 7788	1208 1228	8543r (FAE-B) TC GTC RTT GCC CCA YTT NGG CCN AAR TGG GGC AAY GAC GA P K W G H D D	8543 8562	1983 2002	794	
	7363f (FAE-N) TC GCC GAG AAT TTC GAY TTG V A E H F - -	7363 -	803 -	8543r (FAE-N) TC GTC RTT GCC CCA YTT NGG CCN AAR TGG GGC AAY GAC GA P K W G H D D	8543 8562	1983 2002	1199	
	7374f (FAE-N) TTC GAY TTG AGC GAC AGC GT F - - - - -	7374 -	814 -	8543r (FAE-N) TC GTC RTT GCC CCA YTT NGG CCN AAR TGG GGC AAY GAC GA P K W G H D D	8543 8562	1983 2002	1188	
	7757r-1 FAE-Kf (FAE-KM) TCG GAC GCG TGC AAC GAT CTG A S D A C N D M T	7757 7778	1197 1218	8543r (FAE-KM) TC GTC RTT GCC CCA YTT NGG CCN AAR TGG GGC AAY GAC GA P K W G H D D	8543 8562	1983 2002	805	
	7757r-2 FAE-Kf (FAE-KM) TCG GAC GCG TGC AAC GCC CTG A S D A C N D M T	7757 7778	1197 1218	8543r (FAE-KM) TC GTC RTT GCC CCA YTT NGG CCN AAR TGG GGC AAY GAC GA P K W G H D D	8543 8562	1983 2002	805	
	7766f FAE-Mf (FAE-KM) TGT AAC GGC ATG ACC ATT GCG CT C N D M T D A I	7766 7788	1206 7810	8543r (FAE-KM) TC GTC RTT GCC CCA YTT NGG CCN AAR TGG GGC AAY GAC GA P K W G H D D	8543 8562	1983 2002	796	