

Region I

Accession	45	50	60	70	80	90	100	110	120	124										
1-L.plantarum|ADN99864	45	ITTWLS	PIYQSPMV	DNGYDISDY	QAIDSR	FGTMA	DFDEL	MEVTKRL	GLKVI	LDLVI	NHTSDQ	HVWF	QSAI	TKSPT	SPYRD	124				
2-L.casei_ATCC_334|ABJ70852	49	ITTWLS	PVYKSPMV	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSDQ	HRWF	QAAL	KNPAS	PYRD	128				
3-L.rhamosus_ATCC_8530|AER64849	49	VTAI	WLSPVYR	SPMV	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSDQ	HRWF	QAAL	KNPAS	PYRD	128			
4-E.italicus_DSM_15952|ZP_07895342	49	IDFV	WLNPIY	ASPN	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSDQ	HRWF	QAAL	KNPAS	PYRD	128			
5-L.sakei_subsp._sakei_23K|YP_395811	43	IELI	WLT	PMYV	SPGR	DNGYDISDY	QAIDPI	FGLAD	DFERL	LKEA	HQRGI	KI	MDM	VNHTSD	QHRWF	QESL	KGKDN	PYHD	122	
6-P.larvae|ZP_02329600	45	VEVI	WLT	PIYES	PKD	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	124	
7-T.halophilus_NBRC_12172|YP_004886688	47	VDV	WLS	PVYQ	SPND	DNGYDISDY	KAIMSE	FGTMD	DLDEL	MEKI	HKRGM	KLI	MDLV	NHTSD	HEHWF	IESR	SSKDN	LYRD	126	
8-B.fusum|BAB60692	59	VDV	WLS	PVYQ	SPND	DNGYDISDY	YSIDPT	FGTLE	DLDEL	IGEL	HTRGM	KLV	MDLV	NHTSD	HEHWF	IESR	SSKDN	LYRD	138	
9-H.hydrogeniformans|YP_003995944	45	VDV	WLN	PVYK	SPND	DNGYDISDY	RAIMDE	FGTME	DEL	ELI	ALLK	ERNI	KI	MDLV	NHTSD	HEHWF	IESR	SSKDN	LYRD	124
10-L.pentosus_IG1|CCC17113	45	VDV	WLN	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
11-L.plantarum|AD000180	45	VDV	WLN	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
12-L.pentosus_IG1|CCC16900	47	VDV	WLN	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
13-L.plantarum|ADN97379	47	VDV	WLN	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
14-L.rhamosus_ATCC_8530|AER65504	45	ADV	WLN	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
15-L.brevis_ATCC_367|ABJ65230	45	ADV	WLN	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
16-L.pentosus_IG1|CCC16895	45	ADV	WLN	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
17-L.plantarum|ADN97381	45	ADV	WLN	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
18-R.lactaris_ATCC_29176|ZP_03168755	53	VDV	WLN	PVYK	SPND	DNGYDISDY	REI	IEPT	LGTME	DFEN	LAE	AHEA	GLKI	LDLV	NHTSD	QHPWF	QESL	KGKDN	PYSD	132
19-D._formicigenerans|ZP_02235523	52	VDV	WLN	PVYK	SPND	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	131	
20-R.torques_ATCC_27756|ZP_01967024	50	VDV	WLN	PVYK	SPND	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	131	
21-B.coagulans|BAA11354|O16G	44	IDC	WIS	SPVYD	SPQD	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	131	
22-F.prausnitzii_L2-6|CBK98455	45	VNV	WLC	PI	MDSP	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
23-L.sakei_subsp._sakei_23K|CAI56099	45	VNAI	WLS	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
24-C.leptum_DSM_753|ZP_02079428	69	VDV	WLS	PVYQ	SPND	DNGYDISDY	RAIMKD	FGTME	DFERL	CEA	HKRGL	RIV	MDLV	NHTSD	HEHWF	IESR	SSKDN	LYRD	148	
25-S.mutans|AA26939|G16G	45	VMAI	WLS	PVYD	SPMD	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	131	
26-S.mitis_bv._2_str._F0392|EGR94186	46	ITA	WLS	PVYD	SPMD	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	131	
27-L.pseudomesenteroides|ZP_08659173	45	VDV	WLN	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
28-L.ruminis_ATCC_27782|AEN77768	45	IGA	WLS	PVYK	SPND	DNGYDISDY	RNIMKE	FGTMS	DMDEL	IDE	ANKR	GIRI	MDLV	NHTSD	HEHWF	IESR	SSKDN	LYRD	124	
29-L.delbrueckii|ADQ60220	51	IDA	WLS	PVYK	SPND	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	131	
30-L.casei_LC2W|AEA53469	44	IDA	WLS	PVYK	SPND	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	131	
31-C.sp._DL-VIII|ZP_09206015	45	IDV	WLS	PVYK	SPND	DNGYDISDY	EDIMDD	FGTME	DMDEL	IKE	GKNG	RIKI	MDLV	NHTSD	HEHWF	IESR	SSKDN	LYRD	124	
32-C.sp._DL-VIII|ZP_09207308	45	IDV	WLS	PVYK	SPND	DNGYDISDY	EDIMDD	FGTME	DMDEL	IKE	GKNG	RIKI	MDLV	NHTSD	HEHWF	IESR	SSKDN	LYRD	124	
33-L.jensenii_269-3|ZP_04645733	44	VDV	WLC	PIYK	SPGAD	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	131	
34-L.iners_DSM_13335|ZP_05744409	44	IDA	WLS	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
35-L.johnsonii_DPC_6026|AEB92563	44	IDA	WLS	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
36-L.johnsonii_ATCC_33200|ZP_04006730	81	IDA	WLS	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
37-L.gasseri_ATCC_33323|ABJ59631	44	IDA	WLS	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
38-L.amylolyticus_DSM_11664|ZP_06818684	44	IDA	WLS	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
39-L.acidophilus_NCFM|G16G|LBA0264	44	IDA	WLS	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
40-L.amylolyticus_GRL1118|AEA31245	44	IDA	WLS	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
41-L.crispatus_ST1|CBL49714	44	IDA	WLS	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
42-Lc.garvieae_ATCC_49156|YP_004779435	46	IGG	WLS	PVYK	SPND	DNGYDISDY	YESIMDE	FGTME	DMDEL	ISE	ADKR	GIRI	MDLV	NHTSD	HEHWF	IESR	SSKDN	LYRD	125	
43-E.saccharolyticus_30-1|ZP_09110526	44	IDA	WLS	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
44-E.italicus_DSM_15952|ZP_07895345	44	ITA	WLS	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
45-E.faecalis_T2|ZP_05424932	45	IDA	WLS	PVYK	SPND	DNGYDISDY	EEIMAE	FGTME	DMDEL	IEE	GKRN	RIKI	MDLV	NHTSD	HEHWF	IESR	SSKDN	LYRD	124	
46-E.faecium_TX0133a04|ZP_07845411	60	IDA	WLS	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
47-T.halophilus_NBRC_12172|YP_004886502	45	IGA	WLS	PVYK	SPND	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	131	
48-E.faecalis_TX0109|ZP_07568166	45	IGA	WLS	PVYK	SPND	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	131	
49-E.saburreum_DSM_3986|ZP_07905892	45	IDV	WLS	PVYK	SPND	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	131	
50-R.sp._5_1_39B_FAA|ZP_04856921	45	IDV	WLS	PVYK	SPND	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	131	
51-T.thermosaccharolyticum|YP_003852493	45	VDV	WLC	PIYK	SPNC	DNGYDISDY	KDIMDE	FGTME	DFERL	LKEA	HQRGI	KI	MDM	VNHTSD	QHRWF	QESL	KGKDN	PYHD	122	
52-C.owensensis_OL|YP_004001509	47	VDV	WLN	PVYK	SPND	DNGYDISDY	QAIDPR	FGTMA	DFDQL	MATAKDL	GIKVV	MDLVN	NHTSD	HRWF	QAAL	KNPAS	PYRD	128		
53-O.sp._TW25|ZP_08784662	45	IDV	WLS	PVYK	SPND	DNGYDISDY	QSIMDE	FGTME	DMDEL	IAE	IHKR	GMKLI	MDLV	NHTSD	HEHWF	IESR	SSKDN	LYRD	124	
54-B.sp._NRR_LB-14911|ZP_01172682	50	IDV	WLS	PVYK	SPND	DNGYDISDY	KNIMDE	FGTME	DMDEL	INEL	HLRDM	KLI	MDLV	NHTSD	HEHWF	IESR	SSKDN	LYRD	129	
55-B.sp._2_A_57_CT2|ZP_08004010	45	IDV	WLS	PVYK	SPND	DNGYDISDY	QKIMSE	FGTME	DFERL	LKEA	HQRGI	KI	MDM	VNHTSD	QHRWF	QESL	KGKDN	PYHD	122	
56-B.halodurans_C-125|NP_243769	45	VDV	WLS	PVYK	SPND	DNGYDISDY	RDIMSE	FGTME	DFERL	LKEA	HQRGI	KI	MDM	VNHTSD	QHRWF	QESL	KGKDN	PYHD	122	
57-G.thermoglucoasidasius|BAA01368|O16G	45	VDV	WLS	PVYK	SPND	DNGYDISDY	RDIMSE	FGTME	DFERL	LKEA	HQRGI	KI	MDM	VNHTSD	QHRWF	QESL	KGKDN	PYHD	122	
58-B.cereus_Rock3-44|ZP_04218751	51	IDV	WLS	PVYK	SPND	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	131	
59-B.cereus_ATCC_14579|AAP10934|O16G	45	IDV	WLS	PVYK	SPND	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	131	
60-Lis.grayi_DSM_20601|ZP_07053050	45	INTI	WLN	PIYK	SPQV	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	131	
61-B.coagulans_36D1|YP_004859480	45	ATAI	WLN	PIYK	SPQV	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	131	
62-C.sp._AT7|ZP_02185859	46	VTAI	WLN	PIYK	SPQV	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	131	
63-C.sp._17-4|YP_004375075	45	VNMI	WLN	PIYK	SPQV	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	131	
64-C.sp._AT7|ZP_02185858	45	VNMI	WLN	PIYK	SPQV	DNGYDISDY	YRIQPE	YGTMET	FEEL	LRQA	HRLGI	KI	MDI	VNHTSD	HAWFI	EASS	SKDS	PLRD	131	
65-L.farciminis_KCTC_3681|ZP_08576747																				

			130	140	150	160	170	180	190	200																																																								
1-L. plantarum |ADN99864	125	FYI	IRRG	.AHGNP	PNNWRSNF	GK	GSSW	TLLPGSQD	EYH	HVFS	KQ	QPDNLN	EN	PAL	RKRI	YQMIN	WVLA	KGV	AGFR	IDA	203																																													
2-L. casei_ATCC_334 |ABJ70852	129	FYI	IRRG	.HDGQP	PNNWRSNF	GK	GSSW	TAVPGE	PNT	YH	HVFS	QPDNLN	EN	PKL	RQAI	YSMIN	WVLA	KGV	AGFR	IDA	207																																													
3-L. rhamnosus_ATCC_8530 |AER64849	129	YYI	FRKG	.HDGQP	PNNWRSNF	GK	GSAW	TAVPGE	ADM	YH	HVFS	QPDNLN	EN	PKL	RQAI	YSMIN	WVLA	KGV	AGFR	IDA	207																																													
4-E. italicus_DSM_15952 |ZP_07895342	129	YYI	WADG	...TQK	PNE	WESTF	.GSI	WQEVPSL	.KKQ	YLV	FAKE	QPDNLN	EN	KQ	MRQD	LYKMR	WVLD	L	GIDG	FRIDA	203																																													
5-L. sakei_subsp._sakei_23K |YP_395811	123	YYL	WRDP	.VDGHE	PNNWRSNF	GK	GSAW	EYVPAL	.N	QY	LHL	YKRM	PDLN	WR	N	Q	REEI	YQMM	Q	WADL	GIDG	LRDL	199																																											
6-P. larvae |ZP_02329600	125	YYI	WKNP	.ADGGV	PNNWRSNF	GK	GSAW	AFDERT	.G	QY	LHL	FDES	QADLN	W	EN	PEL	RERI	YDMM	R	WLDK	GV	DGFR	LDVI	201																																										
7-T. halophilus_NBRC_12172 |YP_004886688	127	YYI	WHPG	KKDGSR	PNNWESTF	.NG	PAW	EWD	DKT	.K	EY	MH	F	S	K	Q	P	D	L	N	W	EN	PEV	R	Q	S	L	Y	D	T	V	N	W	L	D	K	G	I	D	G	F	R	I	D	A	I	204																			
8-B. fuscum |BAB60692	139	YYI	WRDP	.HHGAE	PNNWGSFF	.SG	SAW	E	W	D	E	Q	T	.G	QY	L	H	L	F	S	K	K	Q	P	D	L	N	W	EN	PEV	R	A	A	I	Y	R	M	N	W	L	D	R	G	I	D	G	F	R	M	D	V	I	215													
9-H. hydrogeniformans |YP_003995944	125	YYI	WKDG	.KNDGP	PNNWGSFF	.GG	S	T	W	E	Y	D	Q	K	T	.D	QY	L	H	L	F	S	K	K	Q	P	D	L	N	W	EN	K	E	L	R	S	E	L	Y	D	M	N	W	L	E	K	G	I	D	G	F	R	L	D	V	I	201									
10-L. pentosus_IG1 |CCC17113	125	YYI	WADP	.VDGHV	PNDLTS	SGF	IG	S	A	W	Q	W	A	E	S	.E	QY	L	H	L	F	S	E	K	Q	I	D	L	N	W	Q	N	P	K	L	R	Q	A	I	Y	Q	M	N	F	W	I	D	Q	G	I	S	G	F	R	M	D	V	I	202							
11-L. plantarum |AD000180	125	YYI	WADA	.VDGHA	PNDLTS	SGF	SG	S	A	W	E	L	D	E	L	T	.G	QY	L	H	L	F	S	K	K	Q	I	D	L	N	W	Q	N	P	D	L	R	R	A	I	Y	R	M	N	F	W	I	D	K	G	I	E	G	F	R	M	D	V	I	202						
12-L. pentosus_IG1 |CCC16900	127	FYI	FRSG	.KGA	DQ	PNNW	S	A	F	.G	S	A	W	T	Y	D	E	Q	T	.Q	QY	L	H	T	F	S	T	K	Q	P	D	L	N	W	EN	P	A	L	R	T	A	I	Y	Q	M	T	W	L	E	K	G	V	D	G	F	R	M	D	V	I	203					
13-L. plantarum |ADN97379	127	FYI	FRSG	.NGKKA	PNNW	D	A	F	.G	S	A	W	Q	Y	D	E	Q	T	.Q	QY	L	H	T	F	S	T	K	Q	P	D	L	N	W	EN	P	T	L	R	E	S	V	T	M	M	T	W	L	N	K	G	V	D	G	F	R	M	D	V	I	203						
14-L. rhamnosus_ATCC_8530 |AER65504	125	YYI	WRDP	.VDGHA	PNNWR	A	D	F	.G	S	A	W	T	Y	V	E	V	.G	QY	L	H	L	F	A	V	K	Q	P	D	L	N	W	EN	P	A	V	R	K	A	V	T	M	M	Q	W	C	D	Q	G	I	D	G	F	R	M	D	V	I	201							
15-L. brevis_ATCC_367 |ABJ65230	125	YYI	WRDP	.VDGHE	PNNWGSFF	.GG	S	A	W	T	F	E	P	K	R	.G	QY	L	H	L	F	A	P	G	Q	P	D	L	N	W	EN	P	Q	V	R	E	A	V	W	N	L	M	R	F	W	L	D	K	G	V	D	G	F	R	M	D	V	I	201							
16-L. pentosus_IG1 |CCC16895	125	YYI	WRDP	.VDGHA	PNNWGSFF	.GG	S	V	W	E	Y	V	E	S	R	.Q	QY	L	H	S	F	A	V	E	Q	P	D	L	N	W	EN	P	K	L	R	Q	A	V	Y	D	M	N	F	W	V	D	K	G	V	D	G	F	R	L	D	V	I	201								
17-L. plantarum |ADN97381	125	YYI	WRDP	.VDGHE	PNNWGSFF	.GG	S	A	W	K	Y	V	A	S	R	.D	QY	L	H	S	F	A	V	E	Q	P	D	L	N	W	EN	P	Q	L	R	Q	A	V	Y	D	M	N	F	W	N	K	G	V	D	G	F	R	L	D	V	I	201									
18-R. lactaris_ATCC_29176 |ZP_03168755	133	YYI	WKDEVIN	NWGS	S	F	.G	S	A	W	E	Y	A	E	R	.A	QY	L	H	C	F	A	K	E	Q	P	D	L	N	W	EN	P	K	V	R	Q	E	V	Y	D	I	L	R	F	W	L	D	K	G	I	D	G	F	R	M	D	V	I	205						
19-D._formicigenerans |ZP_02235523	132	YYI	WRDPV	PNNW	G	S	S	F	.G	S	A	W	E	Y	V	E	A	V	.D	QY	L	H	L	F	S	K	K	Q	P	D	L	N	W	EN	P	K	V	R	E	D	Y	D	I	L	R	F	W	L	D	K	G	I	D	G	F	R	M	D	V	I	204				
20-R. torques_ATCC_27756 |ZP_01967024	130	YYI	WKDTI	PNNW	G	S	S	F	.G	P	A	W	E	Y	V	E	E	T	.A	QY	L	H	L	F	A	K	E	Q	P	D	L	N	W	EN	P	K	V	R	K	E	V	Q	E	I	L	R	F	W	L	E	K	G	I	D	G	F	R	M	D	V	I	202			
21-B. coagulans |BAA11354 |O16G	124	FYI	WKDP	KPKD	GTP	PNNW	G	S	M	F	.G	S	A	W	E	Y	D	E	T	.G	QY	L	H	Y	F	S	K	K	Q	P	D	L	N	W	EN	E	K	V	R	K	E	I	Y	D	M	M	K	F	W	M	D	K	G	V	D	G	F	R	M	D	V	I	201			
22-F. prausnitzii_L2-6 |CBK98455	125	YYI	WKPG	.KDGHE	PNNW	G	A	S	F	.G	S	A	W	K	Y	D	P	Q	T	.D	Y	L	H	L	F	S	P	K	Q	P	D	L	N	W	EN	P	K	V	R	D	E	V	F	N	M	T	W	F	D	K	G	I	D	G	F	R	M	D	V	I	201					
23-L. sakei_subsp._sakei_23K |CAI56099	125	FYI	WRDP	ATD	G	S	V	P	N	L	S	N	F	.G	S	A	W	A	F	D	A	V	T	.N	QY	L	H	L	F	S	P	K	Q	P	D	L	N	W	EN	P	K	V	R	E	A	V	Y	K	M	M	F	W	L	D	K	G	I	D	G	F	R	M	D	V	I	202
24-C. leptum_DSM_753 |ZP_02079428	149	YYI	WKKG	.KDSKP	PNNW	G	S	W	F	.Y	G	S	A	W	E	Y	D	Q	Q	T	.D	S	H	L	H	F	S	K	K	Q	P	D	L	N	W	EN	P	K	V	R	R	E	I	Y	D	M	T	W	L	E	K	G	V	D	G	F	R	M	D	V	I	225				
25-S. mutans |AA26939 |G16G	125	YYI	WCDQP	N	L	S	I	F	.G	S	A	W	Q	Y	D	D	K	S	.D	QY	L	H	F	F	S	K	K	Q	P	D	L	N	W	EN	A	N	L	R	Q	K	I	Y	D	M	N	F	W	I	D	K	G	I	G	F	R	M	D	V	I	196					
26-S. mitis_bv._2_str._F0392 |EGR94186	126	YYI	WRDEP	N	L	S	I	F	.G	S	A	W	Y	D	E	K	S	.G	QY	L	H	F	F	S	K	K	Q	P	D	L	N	W	EN	E	K	L	R	Q	K	I	Y	E	M	N	F	W	I	D	K	G	I	G	F	R	M	D	V	I	197						
27-L. pseudomesenteroides |ZP_08659173	125	FYI	WRDA	.NHNA	PNNL	H	S	A	F	.G	S	A	W	T	L	D	P	L	T	.N	QY	L	H	L	F	S	P	K	Q	P	D	L	N	W	EN	P	D	V	R	E	A	I	Y	A	M	N	F	W	L	D	K	G	I	D	G	F	R	M	D	V	I	201				
28-L. ruminis_ATCC_27782 |AEN77768	125	YYI	WRDP	.IDGSE	PNNL	S	L	K	S	C	F	.G	S	A	W	Q	Y	D	E	Q	S	.G	QY	L	H	F	S	P	K	Q	P	D	L	N	W	EN	P	E	V	R	E	E	V	D	M	N	F	W	I	D	K	G	I	G	F	R	M	D	V	I	201					
29-L. delbrueckii |ADQ60220	131	YYI	WADKA	N	E	L	K	S	A	F	.G	S	A	W	E	Y	D	G	Q	V	.G	QY	L	H	L	F	A	K	E	Q	P	D	L	N	W	EN	P	A	L	R	Q	K	V	Y	D	L	M	N	F	W	I	D	K	G	I	G	F	R	M	D	V	I	202		
30-L. casei_LC2W |AEA53469	124	YYI	WRDGS	AIGGP	PNNM	K	S	T	F	.G	S	A	W	Q	R	D	E	A	T	.G	QY	L	H	L	F	G	D	K	Q	P	D	L	N	W	EN	A	N	P	Q	V	R	Q	A	I	Y	K	M	N	F	W	I	S	K	G	I	G	F	R	M	D	V	I	201			
31-C. sp._DL-VIII |ZP_09206015	125	FYI	WRDP	.VKGEE	PNNL	H	S	A	F	.G	S	A	W	K	Y	D	E	V	S	.D	QY	L	H	L	F	S	P	K	Q	P	D	L	N	W	EN	A	E	M	R	N	K	I	Y	D	M	N	F	W	L	D	K	G	I	D	G	F	R	M	D	V	I	201				
32-C. sp._DL-VIII |ZP_09207308	125	YYI	WRDS	.VNGEE	PNNL	R	S	T	F	.G	S	A	W	Q	Y	D	E	I	T	.G	QY	L	H	L	F	S	K	K	Q	P	D	L	N	W	EN	E	E	M	R	N	K	V	Y	D	M	N	F	W	I	D	K	G	I	G	F	R	M	D	V	I	201					
33-L. jensenii_269-3 |ZP_04645733																																																																		

Region II $\beta_4 \rightarrow \alpha_4$ loop Region III

Accession	204	210	220	230	240	250	260	279
1-L.plantarum|ADN99864	TFIKKQDFASISP	DGVDGLGKVKRKAENRPGLEKFLAELNTATFKPA	..	NAVTVGEASGVSYDQLGQ	IGKKG	Y	FSM	279
2-L.casei_ATCC_334|ABJ70852	TFIKKQDFASITP	DGSDGLGKVKRKTENRPGLDQFLKELNVATFKPA	..	NAVTVGEASGVVAYDQLGQ	IGKKG	Y	FMS	283
3-L.rhamnosus_ATCC_8530|AER64849	TFIKKQDFAAITP	DGNDGLGKVKRKAENRPGLARFLKELNAATFKPA	..	NAVTVGEASGVVAYDELGD	IGKNG	Y	FMS	283
4-E.italicus_DSM_15952|ZP_07895342	SHIKKSSW	DTKPDADWAFSPFTNVAGIDVYLETGQ	IFKEY	..	DIVTVGEASGVTAEQAPE	VGENG	Y	FNM
5-L.sakei_subsp._sakei_23K|YP_395811	NMISKDKDFPNDTF	ETPSDDGRNFYTNCPHYHEYLHEMYERVFSGPN	..	NFVTVGELSSTPVSEAIRY	INPERE	ELSM	274	274
6-P.larvae|ZP_02329600	NLISKDQRYPNDDL	EKATDDGRKYTDGPRHEYLKEMNERVFSRY	PNL	..	LTVGEMSSTSIHCIRY	INPEEK	ELSM	277
7-T.halophilus_NBRC_12172|YP_004886688	THIKKKGFPDLPN	PLKKDVVPSFDAHMNQPDKHLTELAEEFTNNY	..	DIVTVGEANGVEVEDAEQ	VGEENG	Y	FDM	281
8-B.fusum|BAB60692	SFISKHPDLPDGA	GKGGIWDGIPFFGSGPRVHEYLQEMHREVFHRDA	DL	..	TVGEMVDVTEPELARLY	DQRRK	ELDM	294
9-H.hydrogeniformans|YP_003995944	NLISKNDQDFPDGKE	NGLCGHEHFA	NGPRVHEFLQEMA	AEKTYNNY	..	DAMTVGEPFVVDKDEAIK	VKEERQ	EFSM
10-L.pentosus_IG1|CCC17113	DMIAKEPL	NKVLVNGPRVHEYLHEMNRQTWADR	..	DFTVGEAWSASPEDARQ	YSDEQR	ELSM	264	264
11-L.plantarum|AD000180	DMIAKEPR	AKILVNGPHHEYLHEMNRQTWRNR	..	DFTVGEAWSASPEDARQ	YSDEQR	ELSM	264	264
12-L.pentosus_IG1|CCC16900	NQISKLPGLPDGPL	KPHSQYGDARVTNGPHHEFLQEMNRRVLSRF	..	DIMTVGETHGVTTPADAR	KYAGNDR	ELDM	278	278
13-L.plantarum|ADN97379	NQISKLPGLPDGPL	KPHSQYGDARVTNGPRVHEFLQEMNQEVLVSQF	..	DIMTVGETHGVTTPADAL	KYAGADR	ELDM	278	278
14-L.rhamnosus_ATCC_8530|AER65504	NLISKPEVFADDPH	LLEQPNGLSLGLIANGPHVHEYLKEMNRKAVLSKH	..	DIMTVGEAPGVTTPALAL	QYGFDR	HELM	278	278
15-L.brevis_ATCC_367|ABJ65230	NLISKPAFLPDAPQ	APGAAYGDSQPIVSDGPKNDYLRMNEDEVLSHY	..	DVMTVGEMPGSTPKDAIT	YGLNAN	ELNM	278	278
16-L.pentosus_IG1|CCC16895	NLISKPASFADGQP	EAGEPYAAIGDIVANGPHLHDYLRMNEDEVLSHY	..	QLMTVGETPGATVADAK	QLASLQ	QELNM	278	278
17-L.plantarum|ADN97381	NLISKPDSFADGQP	EAGEPYAAIGGIIANGPHLHEYLQEMNQVVFAGH	..	QLMTVGETPGATVADAK	QLASGQ	QELNM	278	278
18-R.lactaris_ATCC_29176|ZP_03168755	SLISKDQSFDPDPV	IQNKAYGSYYAGCANGPRVHEFLQEMNREVLSKY	..	DIMTVGEAPHTNADEAAL	YTESR	KELNM	282	282
19-D._formicigenerans|ZP_02235523	TLISKDPTFPDGP	IQNKAYGSYYAGCANGPRVHEYLQEMNREVLSKY	..	DIMTVGEAPHTNADEAAL	YTESR	KELNM	281	281
20-R.torques_ATCC_27756|ZP_01967024	TLISKDPAYPDGPV	IQNKAYGSYYAGCANGPRVHEYLQEMNREVLSKY	..	DIMTVGEAPHTNADEAAL	YTESR	KELNM	279	279
21-B.coagulans|BAA11354|O16G	GSISKFLDFPDYEL	PEGQKYGI	GKYHANGPRVHEFLQEMNREVLSKY	..	DCMTVGEAIGSDVEIAR	KYTPDR	HELM	277
22-F.prausnitzii_L2-6|CBK98455	SMISKDQRFDPDGEK	HGLYGNNGPYVNGPRVHEFLQEMNRRVLSKY	..	DIMTVGETPGATVENA	APVAGL	DGKELNM	276	276
23-L.sakei_subsp._sakei_23K|CAI56099	DLIGKEPD	RKIKENGPVHEYLQEMNARVLSQY	..	DVMTVGETWGATPEI	QMYNPNR	HELSM	264	264
24-C.leptum_DSM_753|ZP_02079428	SLISKNRFPDQVGTGAYGEYDLPYCE	NGPRVHEYLQEMNREVLSRY	..	DIMTVGETPNAIVEEA	ARYTNAAG	TELM	303	303
25-S.mutans|AA26939|G16G	DMIGKIPA	QHIVSNGPKLHAYLKEMNAASFGGH	..	DLLTVGETWGATPEI	AKYSNPVN	HELSM	258	258
26-S.mitis_bv._2_str._F0392|EGR94186	DMIGKIPD	EKVVNNGPMHPYLKEMNQATFGDK	..	DLLTVGETWGATPEI	AKYSDPKG	QELSM	259	259
27-L.pseudomesenteroides|ZP_08659173	DLIGKIPD	DKITANGPKLHAYLKEMNQATFGANH	..	DLMTVGETWGATPEI	AKYTRPDR	HELSM	263	263
28-L.ruminis_ATCC_27782|AEN77768	EMIGKQPD	KMISSNGPKLHEYLKEMNQKTFGNH	..	DLLTVGETWGATPEI	AKYSDPERN	ELSM	263	263
29-L.delbrueckii|ADQ60220	ELIGKQPE	EDITANGPKLHAYLKEMHRETFGGR	..	DFTVGETWGATLDNAP	YSDPDR	KELSM	264	264
30-L.casei_LC2W|AEA53469	DLIGKEPD	RGIRENGPKLHPYLQEMNRATFGDT	..	DLLTVGETWGATPEI	AQYADPKR	HELSM	263	263
31-C.sp._DL-VIII|ZP_09206015	ELIGKIPD	KKIKENGPVHEYLKEMNKTFGDK	..	NLLTVGEAWCSNPEI	AKYSDPDG	SELSM	263	263
32-C.sp._DL-VIII|ZP_09207308	ELIGKIPD	EKIKENGPVHEYLKEMNKTFGDK	..	NLLTVGEAWCSNPEI	AKYSDPDG	SELSM	263	263
33-L.jensenii_269-3|ZP_04645733	ECIGKEPD	QEITANGPKLHEYLQEMNRETFGKK	..	DFTVGETWTSASLADAK	KYIDPKR	HELSM	257	257
34-L.iners_DSM_13335|ZP_05744409	ELIGKDPD	KMIRENGKMLHPYLQEMNQKTFGQS	..	DLLTVGETWNAATPKI	AEDYSD	PARHELSM	262	262
35-L.johnsonii_DPC_6026|AEB92563	ELIGKDPD	KKIRENGPMLHPYLKEMNENTFAGK	..	ELMTVGETWNSNTPKI	AEYSD	PARHELSM	262	262
36-L.johnsonii_ATCC_33200|ZP_04006730	ELIGKDPD	KKIRENGPMLHPYLKEMNENTFAGK	..	ELMTVGETWNSNTPKI	AEYSD	PARHELSM	299	299
37-L.gasseri_ATCC_33323|ABJ59631	ELIGKDPD	QKIRENGPMLHPYLKEMNEHTFANK	..	DMMTVGETWNAATPKI	AEYSD	PARHELSM	262	262
38-L.amylovorus_DSM_11664|ZP_06818684	ELIGKEPD	KKIRENGPMLHPYLQEMNKTFGDK	..	NLLTVGETWNAATPKI	AEYSD	PARHELSM	262	262
39-L.acidophilus_NCFM|G16G|LBA0264	ELIGKDPD	KNIRENGPMLHPYLQEMNKATFGKR	..	DVMTVGETWNAATPKI	AEYSD	PARHELSM	262	262
40-L.amylovorus_GRL1118|AEA31245	ELIGKDPD	KMIRENGPMLHPYLQEMNKATFGKR	..	DVMTVGETWNAATPKI	AEYSD	PARHELSM	262	262
41-L.crispatus_ST1|CBL49714	ELIGKDPD	KMIRENGPMLHPYLQEMNKATFGDH	..	DVMTVGETWNAATPKI	AEYSD	PARHELSM	262	262
42-Lc.garvieae_ATCC_49156|YP_004779435	DLIGKQPN	QGITNGPKLHAYLKEMNQATFGNK	..	NLLTVGETWGATPEI	AKYSDPKN	KELSM	265	265
43-E.saccharolyticus_30_1|ZP_09110526	DLVIGKQPF	KKITNGPKLHEYLQEMNRATFGNK	..	DLMTVGETWGATPEI	AKYSDPKN	HELSM	263	263
44-E.italicus_DSM_15952|ZP_07895345	DLVIGKQPF	KKITNGPKLHEYLQEMNRATFGNK	..	DLMTVGETWGATPEI	AKYSDPKN	HELSM	262	262
45-E.faecalis_T2|ZP_05424932	DLVIGKQPF	KKITNGPKLHEYLQEMNRATFGNK	..	DLMTVGETWGATPEI	AKYSDPKN	HELSM	263	263
46-E.faecium_TX0133a04|ZP_07845411	DMIGKEPD	KEITANGPKLHEYLQEMNQATFGDK	..	NLLTVGETWGATPEI	AKYSDPKN	HELSM	278	278
47-T.halophilus_NBRC_12172|YP_004886502	DLVIGKQPF	KKITNGPKLHEYLQEMNRATFGNK	..	DLMTVGETWGATPEI	AKYSDPKN	HELSM	264	264
48-E.faecalis_TX0109|ZP_07568166	DLVIGKQPF	KKITNGPKLHEYLQEMNRATFGNK	..	DLMTVGETWGATPEI	AKYSDPKN	HELSM	264	264
49-E.saburreum_DSM_3986|ZP_07905892	SLISKPEGFPDAKV	VG.LYGD.MNICANGPKVHDYLRMNEKQVLSKF	..	DIMTVGETAGVTLDEAK	RYANSEGS	ELNM	275	275
50-R.sp._5_1_39B_FAA|ZP_04856921	SLISKPEGFPDAKV	VG.LYGD.MNICANGPKVHDYLRMNEKQVLSKF	..	DIMTVGETAGVTLDEAK	RYANSEGS	ELNM	277	277
51-T.thermosaccharolyticum|YP_003852493	NMISKDQRFDPDQIV	PEGGLYDMSPYVMNGPRVHEYLKELNEKVLVSKY	..	DIMTVGETPCVTPPEI	AIDYVGED	RNLM	278	278
52-C.owensensis_OL|YP_004001509	NLISKVGLPDDRE	GEKKGVLGVMFYANGPRVHEYLKEMNREVLSKY	..	DIMTVGETPFVTPPEI	AKYTRPDR	HELSM	280	280
53-O._sp._TW25|ZP_08784662	NLISKDPELDPDAPN	PEGRPYVGGQYVNGPRVHEYLQEMNQEVLVSQY	..	DILTVMGEMPGASVEDAK	LYDPER	HEVNM	278	278
54-B.sp._NRR_LB-14911|ZP_01172682	NFISKEDGLPDDEV	KPGKKYASGSKYYRNGPRVHEYLQEMNEKVLVSHY	..	DVMTVGEMPGVKPEMARD	YTGEDR	HELSM	283	283
55-B.sp._2_A_57_CT2|ZP_08004010	NFISKVEGLPDDEP	KPGKKYASGSKYYRNGPRVHEYLQEMNEKALAKF	..	NVMTVGEMPGVTPPEI	ARQYTG	ESRHELSM	278	278
56-B.halodurans_C-125|NP_243769	NFISKVEGLPDDEP	KPGKKYASGSKYYRNGPRVHEYLQEMNEKALAKF	..	NVMTVGEMPGVTPPEI	ARQYTG	ESRHELSM	278	278
57-G.thermoglucoasidiasus|BAA01368|O16G	NMISKVPELDPDGE	QSGKKYASGSRYYMNGPRVHEFLQEMNREVLSKY	..	DIMTVGETPGVTPKEG	ILYDPSR	HELSM	278	278
58-B.cereus_Rock3-44|ZP_04218751	NFISKTEGLPSVET	KEEGYVSGHQYFMNGPNHLYHEMNRKQVLSKY	..	DIMTVGEMPGVTTTEEAR	LYTADR	QELQM	283	283
59-B.cereus_ATCC_14579|AAP10934|O16G	NFISKTEGLPSVET	KEEGYVSGHQYFMNGPNHLYHEMNRKQVLSKY	..	DIMTVGEMPGVTTTEEAR	LYTADR	QELQM	277	277
60-Lis.grayi_DSM_20601|ZP_07053050	IHLAKADF	SKQMSGEETYPYIAEPPYANLPAVKVYLSHEWIGRLKAFH	PEL	..	FFLGEAASADATLAEE	YCDPEADLCDA	277	277
61-B.coagulans_36D1|YP_004859480	IHLAKDTRFLPVKT	KSEAFVLAEMFYANLPRVHDYTRFNRRTIKAKH	PEL	..	FLFGEAASADATLAEE	YCDPEADLCDA	279	279
62-C.sp._AT7|ZP_02185859	IHLAKDTRFLPVKT	KSEAFVLAEMFYANLPRVHDYTRFNRRTIKAKH	PEL	..	FLFGEAASADATLAEE	YCDPEADLCDA	281	281
63-C.sp._17-4|YP_004375075	IHLAKDTRFLPVKT	KSEAFVLAEMFYANLPRVHDYTRFNRRTIKAKH	PEL	..	FLFGEAASADATLAEE	YCDPEADLCDA	280	280
64-C.sp._AT7|ZP_02185858	IHLAKDTRFLPVKT	KSEAFVLAEMFYANLPRVHDYTRFNRRTIKAKH	PEL	..	FLFGEAASADATLAEE	YCDPEADLCDA	283	283
65-L.farciminis_KCTC_3681|ZP_08576747	IHLAKANFEQDSDL	SSTKFPIDDKFYAKLPAVKDYSGFVKEIKAFK	PD	..	VFLFGEAASAKARDAE	YTRPDEHVC	277	277
66-L.pentosus_MP-10|CCB83116	IHLAKADFRQMYPSQSGDSTPIISDMFYAHL	PKVHQYLHDFVAAIKANH	PE	..	TYVGEAASADPHLMVDY	TPGTDECDQ	282	282
67-L.plantarum|YP_003061749	IHLAKADFRQMYPSQSGDSTPIISDMFYAHL	PKVHQYLHDFVAAIKAKH	PD	..	TYVGEAASADPHLMVDY	TPGTDECDQ	282	282
68-L.ruminis_SPM0211|ZP_08562977	IHLAKADFEQNMPS	HGKKGPIVAEPPFFANMPLQTYLHDFVVKTLREYK	PD	..	FLFGEAASADIDLAVDY	TTPKESCDT	279	279
69-L.animalis_KCTC_3501|ZP_08548669	IHLAKADFEQNMPS	HGKKGPIVAEPPFFANMPLQTYLHDFVVKTLREYK	PD	..	FLFGEAASADIDLAVDY	TTPKESCDT	278	278
70-L.pentosus_IG1|CCC16918	IHLAKADFEQNMPS	HGKKGPIVAEPPFFANMPLQTYLHDFVVKTLREYK	PD	..	FLFGEAASADIDLAVDY	TTPKESCDT	278	278
71-L.casei_ATCC_334|YP_0806220	IHLAKADFEQNMPS	HGKKGPIVAEPPFFANMPLQTYLHDFVVKTLREYK	PD	..	FLFGEAASADIDLAVDY	TTPKESCDT	279	279
72-L.delbrueckii|ZP_07091943	IHLAKADFEQNMPS	HGKKGPIVAEPPFFANMPLQTYLHDFVVKTLREYK	PD	..	FLFGEAASADIDLAVDY	TTPKESCDT	280	280
73-L.jensenii_27-2-CHN|ZP_05557003	IHLAKADFEQNMPS	HGKKGPIVAEPPFFANMPLQTYLHDFVVKTLREYK	PD	..	FLFGEAASADIDLAVDY	TTPKESCDT	276	276
74-L.iners_LEAF_2053A-b|ZP_07735311	IHLAKADFEQNMPS	HGKKGPIVAEPPFFANMPLQTYLHDFVVKTLREYK	PD	..	FLFGEAASADIDLAVDY	TTPKESCDT	280	280
75-L.gasseri_JV-V03|ZP_07058635	IHLAKADFEQNMPS	HGKKGPIVAEPPFFANMPLQTYLHDFVVKTLREYK	PD	..	FLFGEAASADIDLAVDY	TTPKESCDT	279	279
76-L.johnsonii_FI9785|YP_003292438	IHLAKADFEQNMPS	HGKKGPIVAEPPFFANMPLQTYLHDFVVKTLREYK	PD	..	FLFGEAASADIDLAVDY	TTPKESCDT	279	279
77-L.amylovorus_DSM_11664|ZP_06818628	IHLAKADFEQNMPS	HGKKGPIVAEPPFFANMPLQTYLHDFVVKTLREYK	PD	..	FLFGEAASADIDLAVDY	TTPKESCDT	279	279
78-L.helveticus_H10|ADX71102	IHLAKADFEQNMPS	HGKKGPIVAEPPFFANMPLQTYLHDFVVKTLREYK	PD	..	FLFGEAASADIDLAVDY	TTPKESCDT	284	284
79-L.acidophilus_NCFM|LBA1872	IHLAKADFEQNMPS	HGKKGPIVAEPPFFANMPLQTYLHDFVVKTLREYK	PD	..	FLFGEAASADIDLAVDY	TTPKESCDT	277	277
80-L.amylovorus_GRL1118 AEA32747	IHLAKADFEQNMPS	HGKKGPIVAEPPFFANMPLQTYLHDFVVKTLREYK	PD	..	FLFGEAASADIDLAVDY	TTPKESCDT	279	279
consensus	* !	** ! ** ** *			***** !	* * **	** *	

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Acid Base

		340	350	360	370	380	390	400	410										
1-L.plantarum ADN99864	353	KALAL	LYFNLR	GCPFIY	QGQEL	GVINARRDS	ITMEND	SSHNDY	DRA..I	EEGY	SASEAL	AFVNARS	RDNAR	LPPYWD	428				
2-L.casei_ATCC_334|ABJ70852	357	KALALL	YFGLRG	CPFIYQ	QGEEL	GMVNAVVRTN	IDQFND	SAHDNY	YRRA..L	AEGY	SEADAL	ACVNRRS	RDNAR	TPYPWD	432				
3-L.rhamnosus_ATCC_8530|AER64849	357	KALALL	YFCLRG	CPFIYQ	QGEEL	GMVNAVRRSS	IDQFND	SAHDNY	YRRA..L	AEGY	SEADAL	ACVNRRS	RDNAR	TPYPWN	432				
4-E.italicus_DSM_15952|ZP_07895342	342	TALAT	MYLLQ	GTPFIY	QGEEL	GMTNMTFTD	LDQLDD	VAKQQI	EELRKLEDS	GE	RNLEI	LELMSSIS	RDN	SRTPMQWS	420				
5-L.sakei_subsp._sakei_23K|YP_395811	347	KLLAL	VEFGLQ	GTPYIY	QGEEL	IAMKNANFTS	IDQYQD	ESINAY	YHQM..L	ADCI	SEDLAI	KILQKKS	R	NCRI	IPMQWD	422			
6-P.larvae|ZP_02329600	350	KMLAT	TLHLMQ	GTPYIY	QGEEL	GMTNPFYFSN	IDQYRD	ESINAY	YRLL..I	KQGV	KETEVA	MAALQKKS	RDN	SRTPMQWD	425				
7-T.halophilus_NBRC_12172|YP_004886688	347	KALAT	MYFFMQ	GTPFIY	QGEEL	GMTNVHFDS	IDEYDD	QSVNKA	KATM..I	KEGS	KQEAME	EYIWESS	RDN	SRTPMQWN	422				
8-B.fuscum|BAB60692	366	TAFAT	ILHLMR	GTPYIY	QGEEL	GMTNMPFST	IDEFRD	ESLNAY	YRQA..L	LERD	GA	DAATV	LAGIT	VGG	RDNAR	TPVQWD	442		
9-H.hydrogeniformans|YP_003995944	346	KMLG	TLHLTR	GTPFIY	QGEEL	GMTNVSFEN	LDQYDD	ETRGYL	NLDL..K	KKGEM	TNEML	KMANYRS	RDNAR	TPMHWN	422				
10-L.pentosus_IG1|CCC17113	337	KMLAIT	LHGLK	GTPFIY	QGEEL	GMTNCPVNS	IDQYDD	EARTIY	RQL..R	QRGD	DADTAM	QKIN	VFN	RDNAR	TPMQWN	412			
11-L.plantarum|AD000180	337	KMLA	IALHGLK	GTPFIY	QGEEL	GMTDCPVAT	IDQYND	VEARTI	YRQL..R	AQGD	DAGTAM	QKIN	IFN	RDNAR	TPMQWT	412			
12-L.pentosus_IG1|CCC16900	353	KMLAT	CLHLQ	GTPYIY	QGEEL	GMTDAHFTD	LDYRD	ETLNAY	YRDL..V	TRHLL	THADMM	ARLAASS	RDN	SRTPMQWN	430				
13-L.plantarum|ADN97379	353	KMLAT	CLHLQ	GTPYIY	QGEEL	GMTDAHFTD	LDYRD	ETLNAY	YRDL..V	TRHLL	THADMM	ARLAASS	RDN	SRTPMQWD	430				
14-L.rhamnosus_ATCC_8530|AER65504	352	KMLA	ATLHFLQ	GTPYIY	QGEEL	GMTNVAFPS	IDEYRD	ETLNAY	YHEL..V	EQHAL	APDML	KRIHRS	RDNAR	TPMQWS	429				
15-L.brevis_ATCC_367|ABJ65230	354	KMLA	ITLHMMQ	GTPYIY	QGEEL	GMTNVHYTQ	LDQYED	ESLNAY	YHEL..V	DDQH	IVDQPT	MLKYL	SHIS	RDNAR	TPMHWD	431			
16-L.pentosus_IG1|CCC16895	354	KMLA	TALHFLQ	GTPYIY	QGEEL	GMTNAHFDD	LDYQD	ESLNAY	YHHF..V	DDQV	VVSA	DKMSY	LAHTS	RDNAR	TPMQWD	431			
17-L.plantarum|ADN97381	354	KMLA	ITLHFLQ	GTPYIY	QGEEL	GMTNAHFDD	LDYQD	ESLNAY	YHHF..V	DDQV	VVSA	DKMSY	LAHTS	RDNAR	TPMQWD	431			
18-R.lactaris_ATCC_29176|ZP_03168755	356	KMLG	TCLHMMQ	GTPYIY	QGEEL	GMTNADFTR	IEEYKD	VEALDI	FKDF..T	TERK	CF	SKEDT	LHL	LHKS	RDNAR	TPMQWD	432		
19-D._formicigenerans|ZP_02235523	355	KMLG	TCLHMMQ	GTPYIY	QGEEL	GMTNADFTR	IEEYKD	VEALDI	FKDF..T	TERK	CF	SKEDT	LHL	LHKS	RDNAR	TPMQWD	431		
20-R.torques_ATCC_27756|ZP_01967024	353	KMLG	TILHMMQ	GTPYIY	QGEEL	GMTNAHFES	IDEYKD	VEALDI	FRDF..T	TERK	CF	SEKDT	LEL	LGLKS	RDNAR	TPMQWD	429		
21-B.coagulans|BAA11354|O16G	352	KAFAT	ILHGLK	GTPFIY	QGEEL	GMVNADLE	LEEYDD	IRNAY	YQEL..V	MENQ	IMSKE	DEFL	TAV	RKKG	RDNAR	TPMQWD	428		
22-F.prausnitzii_L2-6|CBK98455	345	KMLA	ICLLSLQ	GTPYIY	QGEEL	GMTNAYFKD	LSQYRD	ESLNAY	YFEL..T	GALIS	AD	EMMEC	LALRS	RDNAR	TPVQWD	421			
23-L.sakei_subsp._sakei_23K|CAI56099	337	KMLA	IYLLHMLK	GTPYIY	QGEEL	GMTNYPITSYH	IEDI	ESRRVY	YQRR..Q	QGY	AISD	ILNG	INAKG	RDNAR	TPMQWN	412			
24-C.leptum_DSM_753|ZP_02079428	377	KMLA	TCLHMLQ	GTPYIY	QGEEL	GMTNPNFSS	LEDYPD	EDARQA	YELL..V	KAQR	KMSE	EEFL	RQV	NLGR	DN	CR	TPMQWS	454	
25-S.mutans|AAA26939|G16G	333	KALA	ILLHLMR	GTPYIY	QGEEL	GMTNYPFKD	NELDD	ESLNAY	AKEA..F	TNGK	SMET	IMDS	IRMIG	RDNAR	TPMQWD	408			
26-S.mitis_bv._2_str._F0392|EGR94186	334	KAFAT	ILLHLMR	GTPYIY	QGEEL	GMTNYPFKD	NELDD	ESLNAY	AREA..L	GKCV	PMEE	IMDS	IRVIC	RDNAR	TPMQWD	409			
27-L.pseudomesenteroides|ZP_08659173	337	KMLA	ILLHMMK	GTPYIY	QGEEL	GMTNTPVKD	ISLDRD	ESLNAY	YHDS..L	KGYL	SSDA	ILDQ	INHKG	RDNAR	TPIPWR	413			
28-L.ruminis_ATCC_27782|AEN77768	336	KMLA	IVLHLLK	GTPYIY	QGEEL	GMTNCKVED	ISEVDD	ESRNMY	YFEE..I	EKGT	PKEEL	INR	INRKG	RDNAR	TPMQWD	411			
29-L.delbrueckii|ADQ60220	337	KMLA	LLHGLR	GTPYIY	QGEEL	GMTNCPVSA	IDEVED	EARMY	YQER..L	AEW	KKED	LKA	INARG	RDNAR	TPMQWD	412			
30-L.casei_LC2W|AEA53469	336	KMFA	ILLHLLR	GTPYIY	QGEEL	GMTNAPVAS	IVVQD	ESVNMY	YREQ..M	ALCQ	SEKT	ILTA	INAKG	RDNAR	TPMQWR	411			
31-C.sp._DL-VIII|ZP_09206015	336	KMFA	IVLHMMK	GTPYIY	QGEEL	GMTNIRFEN	IDEYRD	ETINMY	NER..K	KGY	RHED	IMNS	IYAKG	RDNAR	TPMQWD	411			
32-C.sp._DL-VIII|ZP_09207308	336	KMLA	TLLHGMK	GTPYIY	QGEEL	GMTNIRFED	SDYKD	ETINMY	NER..L	AEW	KKED	LKA	INARG	RDNAR	TPMQWD	411			
33-L.jensenii_269-3|ZP_04645733	326	KMFA	IVLHLLK	GTPYIY	QGEEL	GMTNCPVES	IDEVND	ESRNMY	YFAG..L	EKGT	PKEEL	INR	INRKG	RDNAR	TPMQWD	401			
34-L.iners_DSM_13335|ZP_05744409	336	KMFA	IVLHLMH	GTPYIY	QGEEL	GMTNSPVKN	INEVED	ESINMY	NER..L	DACY	DKDEL	LHA	INVKG	RDNAR	TPMQWS	411			
35-L.johnsonii_DPC_6026|AEB92563	336	KMFA	IVLHLMH	GTPYIY	QGEEL	GMTNCPVKS	IDEVED	ESINMY	YRER..I	DKGY	SKDEL	LKA	INTKG	RDNAR	TPMQWS	411			
36-L.johnsonii_ATCC_33200|ZP_04006730	373	KMFA	IVLHLMH	GTPYIY	QGEEL	GMTNCPVKS	IDEVED	ESINMY	YRER..I	DKGY	SKDEL	LKA	INTKG	RDNAR	TPMQWS	448			
37-L.gasseri_ATCC_33323|ABJ59631	336	KMFA	IVLHLMH	GTPYIY	QGEEL	GMTNCPVKS	IDEVED	ESINMY	YHER..L	EQGY	KRAD	LINS	INVKG	RDNAR	TPMQWS	411			
38-L.amylolyticus_DSM_11664|ZP_06818684	336	KMFA	IVLHLMH	GTPYIY	QGEEL	GMTNCPVKS	IDEVED	ESINMY	NER..L	AEW	KKED	LKA	INARG	RDNAR	TPMQWN	411			
39-L.acidophilus_NCFM|G16G|LBA0264	336	KMFA	IVLHMMH	GTPYIY	QGEEL	GMTNCPVKN	IDEVED	ESINMY	NER..L	AEW	KKED	LKA	INARG	RDNAR	TPMQWN	411			
40-L.amylolyticus_GRL1118|AEA31245	336	KMFA	IVLHMMH	GTPYIY	QGEEL	GMTNCPVKS	IDEVED	ESINMY	NER..L	AEW	KKED	LKA	INARG	RDNAR	TPMQWN	411			
41-L.crispatus_ST1|CBL49714	336	KMFA	IVLHMMH	GTPYIY	QGEEL	GMTNCPVKN	IDEVED	ESINMY	NER..L	AEW	KKED	LKA	INARG	RDNAR	TPMQWN	411			
42-Lc.garvieae_ATCC_49156|YP_004779435	338	KMLA	ILLHMMK	GTPYIY	QGEEL	GMTNSPVTD	IEQIDD	ESRNMY	YFER..L	EEGY	SKED	ILHS	INVKG	RDNAR	TPMQWS	413			
43-E.saccharolyticus_30-1|ZP_09110526	336	KMFA	IVLHLLK	GTPYIY	QGEEL	GMTNYPVET	IEVDD	ESINMY	NVR..L	SQGY	AKED	ILDS	INAKG	RDNAR	TPMQWN	411			
44-E.italicus_DSM_15952|ZP_07895345	335	KMFA	IVLHMMK	GTPYIY	QGEEL	GMTNCPVKS	IDEVED	ESINMY	NER..L	AEW	KKED	LKA	INARG	RDNAR	TPMQWD	410			
45-E.faecalis_T2|ZP_05424932	338	KMFA	IVLHMMK	GTPYIY	QGEEL	GMTNYPISD	ISEAED	ETINMY	NER..L	SI	GF	SKET	LMES	INAKG	RDNAR	TPMQWD	413		
46-E.faecium_TX0133a04|ZP_07845411	351	KMFA	IVLHMMK	GTPYIY	QGEEL	GMTNCPIDD	IAEAKD	ETINMY	NER..I	SSGF	TKEE	ILS	INAKG	RDNAR	TPMQWN	426			
47-T.halophilus_NBRC_12172|YP_004886502	337	KMLA	ILLHMMK	GTPYIY	QGEEL	GMTNTPISD	ISEAED	ESINMY	YHER..L	AKGY	DKKD	ILAS	INAKG	RDNAR	TPMAWD	412			
48-E.faecalis_TX0109|ZP_07568166	337	KLFA	IVLHMMK	GTPYIY	QGEEL	GMTNTPITD	IREARD	ETINMY	HEY..L	EKGY	YKEE	ILK	INTKG	RDNAR	TPMQWT	412			
49-E.saburreum_DSM_3986|ZP_07905892	348	KCTA	TCLHMMQ	GTPYIY	QGEEL	GMTNVPFNS	VDYFRD	ESVNAY	YREL..I	ES	GLYTK	EDM	FPK	IAHKS	RDNAR	TPMPWD	424		
50-R.sp._5_1_39B_FAA|ZP_04856921	351	KMLAT	CLHMMQ	GTPYIY	QGEEL	GMTNCPFNT	DNFRD	ESINAY	YHEL..T	EQ	KMTE	EDM	MAA	IGYK	RDNAR	TPMQWD	427		
51-T.thermosaccharolyticum|YP_003852493	349	KMLA	TCLHMMQ	GTPYIY	QGEEL	GMTNVPFQD	IDEYRD	ETAVNG	YNEE..V	IKGR	SHEQ	YMY	IYDFS	RDNAR	TPMQWD	425			
52-C.owensensis_OL|YP_004001509	351	KMLA	TLLHLMQ	GTPYIY	QGEEL	GMTNCKFES	IDEFRD	ETLNFY	YREEM..K	KGM	SDD	ELT	INAKG	RDNAR	TPMQWN	426			
53-O._sp._TW25|ZP_08784662	350	KMLA	TFLHLLQ	GTPYIY	QGEEL	GMTNVPFES	IDQYKD	ETLNMY	YREK..V	IE	GNES	HEK	VMES	IYTKG	RDNAR	TPMQWD	426		
54-B.sp._NRR_LB-14911|ZP_01172682	355	KMLA	TLLHMMK	GTPYIY	QGEEL	GMTNVEFPD	IGDYRD	ETLNFY	YFRES..T	EAGV	PAGK	AMES	IYAKG	RDNAR	TPMQWN	430			
55-B.sp._2_A_57_CT2|ZP_08004010	350	KMLA	TLLHMMK	GTPYIY	QGEEL	GMTNVPFSS	IEEYRD	ETLNFY	YKEA..L	NDGW	TED	KALES	IYAKG	RDNAR	TPMQWD	425			
56-B.halodurans_C-125|NP_243769	350	KMLA	TLLHMMK	GTPYIY	QGEEL	GMTNVPFSS	IEEYRD	ETLNFY	YKEA..L	NDGW	TED	KALES	IYAKG	RDNAR	TPMQWD	425			
57-G.thermoglucosidaseus|BAA01368|O16G	350	KMLA	TFLHMMQ	GTPYIY	QGEEL	GMTNVPFSS	IEEYRD	ETLNMY	YKER..V	EYGE	DPQEV	MEKI	IYKGR	RDNAR	TPMQWD	426			
58-B.cereus_Rock3-44|ZP_04218751	355	KMLA	TVLHMMK	GTPYIY	QGEEL	GMTNVHFDS	IDEYRD	ETLNMY	YREK..V	IELGE	DEE	KVM	QSI	IYKGR	RDNAR	TPMQWN	431		
59-B.cereus_ATCC_14579|AAP10934|O16G	349	KMLA	TVLHMMK	GTPYIY	QGEEL	GMTNVHFES	IDEYRD	ETLNMY	YREK..V	IDHGE	DI	EKVM	QSI	IYKGR	RDNAR	TPMQWN	425		
60-Lis.grayi_DSM_20601|ZP_07053050	351	MMLA	GLMYLQR	GLPLLY	QGEEL	GMVQLVLMLE	ITAFQE	EAARD	FLREG..Q	EKGY	DEQ	LL	EAS	LTSS	KDAS	R	GAMQWE	426	
61-B.coagulans_36D1|YP_004859480	356	KMLA	TLLMYLQ	GLPII	QGEEL	GMVNLKLP	QVDFSD	QRAVDL	LISNL..R	QKGF	TDKQ	ILRL	LNQ	DEMT	AR	G	PMQWN	431	
62-C.sp._AT7|ZP_02185859	358	KMLA	TLLMYLQ	GLPII	QGEEL	GMVNLKLP	QVDFSD	QRAVDL	LISNL..R	QKGF	TDKQ	ILRL	LNQ	DEMT	AR	G	PMQWN	431	
63-C.sp._17-4|YP_004375075	357	KMLA	TLLMYLQ	GLPII	QGEEL	GMVNLKLP	QVDFSD	QRAVDL	LISNL..R	QKGF	TDKQ	ILRL	LNQ	DEMT	AR	G	PMQWN	432	
64-C.sp._AT7|ZP_02185858	360	KMLA	TLLMYLQ	GLPII	QGEEL	GMVNLKLP	QVDFSD	QRAVDL	LISNL..R	QKGF	TDKQ	ILRL	LNQ	DEMT	AR	G	PMQWN	435	
65-L.farciminis_KCTC_3681|ZP_08576747	353	KL	LAMLL	FLQRG	IPVIY	QGEEL	GMHGLKYQ	VADFSD	QRAVDL	LISNL..R	QKGF	TDKQ	ILRL	LNQ	DEMT	AR	G	PMQWD	428
66-L.pentosus_MP-10|CCB83116	358	KALATA	LALYLQR	GTPYIY	QGEEL	GLTNIRYQK	LADFED	QTVPTF	VKSA..Q	AAGK	TMPE	IM	TMLN	KTH	MAC	R	G	PMQWD	433
67-L.plantarum|YP_003061749	358	KALATA	LALYLQR	GTPYIY	QGEEL	GLTNIRYQK	LADFED	QTVPTF	VKSA..Q	AAGK	TMPE	IM	TMLN	KTH	MAC	R	G	PMQWD	433
68-L.ruminis_SPM0211|ZP_08562977	357	KMLA	TLLMYLQ	GLPII	QGEEL	GMVNLKLP	QVDFSD	QRAVDL	LISNL..R	QKGF	TDKQ	ILRL	LNQ	DEMT	AR	G	PMQWN	432	
69-L.animalis_KCTC_3501|ZP_08548669	355	KMLA	TLLMYLQ	GLPII	QGEEL	GMVNLKLP	QVDFSD	QRAVDL	LISNL..R	QKGF	TDKQ	ILRL	LNQ	DEMT	AR	G	PMQWN	430	
70-L.pentosus_IG1|CCC16918	354	KCLAT	MLYLQR	GIPVIY	QGEEL	GMVNLKLP	QVDFSD	QRAVDL	LISNL..R	QKGF	TDKQ	ILRL	LNQ	DEMT	AR	G	PMQWN	429	
71-L.casei_ATCC_334|YP_0806220	352	RSLA	VLMYLQR	GIPVIY	QGEEL	GMVNLKLP	QVDFSD	QRAVDL	LISNL..R	QKGF	TDKQ	ILRL	LNQ	DEMT	AR	G	PMQWN	427	
72-L.delbrueckii|ZP_07091943	351	RSLA	MAMYLQR	GIPVIY	QGEEL	GMVNLKLP	QVDFSD	QRAVDL	LISNL..R	QKGF	TDKQ	ILRL	LNQ	DEMT	AR	G	PMQWN	426	
73-L.jensenii_27-2-CHN|ZP_05557003	349	RSLA	MMLYLQR	GIPVIY	QGEEL	GMVNLKLP	QVDFSD	QRAVDL	LISNL..R	QKGF	TDKQ	ILRL	LNQ	DEMT	AR	G	PMQWN	424	
74-L.iners_LEAF_2053A-b|ZP_07735311	353	RGLA	MMLYLQR	GIPVIY	QGEEL	GMVNLKLP	QVDFSD	QRAVDL	LISNL..R	QKGF	TDKQ	ILRL	LNQ	DEMT	AR	G	PMQWN	428	
75-L.gasseri_JV-V03|ZP_07058635	352	RSLA	MMLYLQR	GIPVIY	QGEEL	GMVNLKLP	QVDFSD	QRAVDL	LISNL..R	QKGF	TDKQ	ILRL	LNQ	DEMT	AR	G	PMQWN	427	
76-L.johnsonii_FI9785|YP_003292438	352	RSLA	MMLYLQR	GIPVIY	QGEEL														

	420	430	440	450	460	470	480				
1-L.plantarum|ADN99864	429	DSV	NGGFNQGAKPWIT	PKQSHDRVNWQAEQLD	SNVWHFYQSLIKLRQISN	LSQDLIVGDFRPI	ITCDCDQVIA	YQR	504		
2-L.casei_ATCC_334|ABJ70852	433	DSQ	NGGFNAGHEPWLP	LAKQAAGVNWQAEHDD	PNSVWTFYQTLCLRNASP	LRADLIEGDFAP	DAHNDNVIA	YAR	508		
3-L.rhamnosus_ATCC_8530|AER64849	433	DEA	NGGFSDH.QPWL	VAAQAPGVNWQDEQAD	PDVWHFYQKLCQLRNDSP	LRSDLIDGDFAP	TVADHVAIA	YAR	507		
4-E.italicus_DSM_15952|ZP_07895342	421	TEE	NAGFSTA.EPWL	VNPNYEEINVAQAQ	KQPNSILSYKQLIQLRKNRA	V...FVTG	HYHDYLLDDPKV	VYVER	492		
5-L.sakei_subsp._sakei_23K|YP_395811	423	MTA	NHGFTTG.MPWL	QPVVADY...SVATKAQAPD	SFAFYQQLVALRKTEP	V...LIEG	QYQLAPEDEAV	YTYQR	493		
6-P.larvae|ZP_02329600	426	DTE	QGGFTNG.EPWIK	LAPSESSVNVKNE	NDPDSIFHHYRNLIQLRKEYD	I...IAYG	DYNLLADHPEL	FAYVR	497		
7-T.halophilus_NBRC_12172|YP_004886688	423	STE	QAGFTTG.TPWLK	VNDNYADINVAESYED	PNSVYNFYKMKMID	IRRRSE	T...LIYGT	YELIEEKHPSV	YAYLR	494	
8-B.fuscum|BAB60692	443	ASV	HAGFTTG.EPWIP	VNPNHGWLNAATQRQD	PEVYGYWYKRLIQLRHEEP	V...IVDGR	FNLILADDPQI	FAYTR	514		
9-H.hydrogeniformans|YP_003995944	423	DSK	YAGFSNV.EPWLQ	MNDNYPEINVAR	DKSDSVFKYYQKLISLRKEYP	V...FVYG	KYKILLEDDQN	IYTYIR	494		
10-L.pentosus_IG1|CCC17113	413	DDP	YAGFSTT.QPWL	S...VNPNYREINVASAQARRQ	SLWVYKQLIALRHQEP	V...LQNG	KFEALPAMPASV	MYTR	484		
11-L.plantarum|AD000180	413	AKQ	HAGFTTG.KPWLA	VNPNYPRINVAQAQ	DHQSIFWYTYQRLIRLRKQSA	V...LQQG	EFTLESAVPSPI	VAYTR	484		
12-L.pentosus_IG1|CCC16900	431	ATE	NAGFSDA.QPWIK	VTPNYQQINAEAA	ADPHSVWYTYQQLIKLRHHYP	I...VTLG	TFKLLADDTQV	FMYER	502		
13-L.plantarum|ADN97379	431	TEV	NAGFSDA.APWL	T...VNPNYRQINAAAA	ADPDVWYTYQHLIQLRHQYP	L...VTLG	SFELWADDPQV	FLYAR	502		
14-L.rhamnosus_ATCC_8530|AER65504	430	TAP	QAGFTAG.TPWLA	VNPNYPDINATAAL	ADSDVFFFYQKLIQLRKQYPD	L...IVYGA	YTLDSDDPDV	MYQR	502		
15-L.brevis_ATCC_367|ABJ65230	432	DTT	NAGFTTG.QPWFA	VNPNYPTINAAADQ	DQDSDVFNYYRRLIALRHSSD	L...IVLGS	YEELEPKDDQV	FAYKR	503		
16-L.pentosus_IG1|CCC16895	432	DSA	NAGFSTA.TPWLA	VNPNYPRINVAQAQ	LRTPGVSFGYTYQRLIKLRHQPL	V...ITTG	TYRLLPEDRSV	YAYMR	503		
17-L.plantarum|ADN97381	432	DSQ	NAGFSTA.TPWLA	VNPNYPRINVAQAQ	LRTPGVSLSYTYQRLIKLRHHLP	V...ITTG	TYHLSPDDAAV	YAYVR	503		
18-R.lactaris_ATCC_29176|ZP_03168755	433	ASE	NAGFSEA.QPWIR	VNPNYKVINVENA	ADSDVFFFYQKLIALRHLP	I...ITDGV	YELDAENEKI	YAYLR	504		
19-D._formicigenerans|ZP_02235523	432	DIR	HAGFTEG.IPWID	VNPNYTEINAEKAL	EDSDVFNYYRRLIALRHHSV	V...ITDGV	YELDAENEKI	YAYLR	503		
20-R.torques_ATCC_27756|ZP_01967024	430	NTV	NAGFTEG.TPWIG	VNKNCKEINVEQCL	ADQDSIFYYYQKLIQLRHMP	I...ITDGV	YELDAENEKI	YAYLR	501		
21-B.coagulans|BAA11354|O16G	429	GSF	NAGFTTG.TPWIK	VNSRYSEINVAQAQ	QEPDSIFYYYQSLIKLRHSYD	V...FTDGR	YELMPDHPHY	VYTR	500		
22-F.prausnitzii_L2-6|CBK98455	422	DSP	NAGFTTG.TPWIE	VNPNYTINAAAEK	DPDVLNYYKQMITLRKSHL	G...LIYGS	FQLAEENPQV	FAYRR	493		
23-L.sakei_subsp._sakei_23K|CAI56099	413	GKN	QSGFTDG.TPWLP	VNPNYEINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...IVYGR	FEVPTGNQV	ISYKR	484		
24-C.leptum_DSM_753|ZP_02079428	455	GQK	NGGFTAG.EPWIK	VNPNYQRINVAQAQ	GRPDSVFSYTYQRLIRLRKTYE	I...ITEG	TYELDSGNSV	WYAYQR	526		
25-S.mutans|AAA26939|G16G	409	ASQ	NAGFSTADKTWLP	VNPNYKVINVAQAQ	KVNSIFYTYQQLIQLRKEND	W...LVDAD	FELPTADKVF	AYLR	480		
26-S.mitis_bv._2_str._F0392|EGR94186	410	ESK	NAGFSTG.KPWLA	VNPNYEINVEAAL	ADPDVFFFYQKLIQLRKNS	W...LIRAD	FELDTADKVF	AYIR	480		
27-L.pseudomesenteroides|ZP_08659173	414	NSL	NGGFTDV.IPWID	VNSNYPDINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...IVYGR	FELPTGNQV	ISYKR	484		
28-L.ruminis_ATCC_27782|AEN77768	412	GTE	NAGFTKG.TPWHL	VNPNYHTINAKAC	EDENSIFYTYKKLIDYRKKND	I...VVYGD	YEMVDDVPDD	VYVLR	483		
29-L.delbrueckii|ADQ60220	413	ASA	SAGFTSG.RPWLA	VNPNCQVINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...LTDGS	FELDTADAV	YVHR	483		
30-L.casei_LC2W|AEA53469	412	DAP	NAGFTTS.QPWLR	VNPNYHTINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...IVNGR	FEALENLAPAV	YAYR	483		
31-C.sp._DL-VIII|ZP_09206015	412	DNE	NAGFTTG.EPWIK	VNPNYKEINAKSAL	EDENSIFYTYQKLIQLRKNSP	V...VVYGR	FELLEGSEI	FAYTR	483		
32-C.sp._DL-VIII|ZP_09207308	412	DSK	NAGFTTG.EPWIK	VNPNYKEINAKSAL	EDENSIFYTYQKLIQLRKNSP	V...VVYGR	FELLEGSEI	FAYTR	483		
33-L.jensenii_269-3|ZP_04645733	402	DTA	NAGFTTG.KPWHL	VNPNYREINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...LVDG	DFKAVATSDN	FAYER	472		
34-L.iners_DSM_13335|ZP_05744409	412	DAL	NAGFTTG.KPWHL	VNSNYTDINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...VVDG	DFQLTEETAQ	ILAYR	483		
35-L.johnsonii_DPC_6026|AEB92563	412	NGE	NAGFTTG.TPWIK	VNPNYKTINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...VVDG	DFELVENTSDN	ILAFWR	483		
36-L.johnsonii_ATCC_33200|ZP_04006730	449	NGE	NAGFTTG.TPWIK	VNPNYKTINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...VVDG	DFELVENTSDN	ILAFWR	520		
37-L.gasseri_ATCC_33323|ABJ59631	412	NEE	NAGFTSG.NPWIK	VNPNYKVINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...VVDG	DFELVENTSDN	ILAFWR	483		
38-L.amylolyticus_DSM_11664|ZP_06818684	412	DQP	NAGFTKG.KPWLA	VNPNYKVINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...VVDG	DFELVENTSDN	ILAFWR	483		
39-L.acidophilus_NCFM|G16G|LBA0264	412	DEK	NAGFSEV.DPWLS	VNPNYKVINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...VVDG	DFELVENTSDN	ILAFWR	483		
40-L.amylolyticus_GRL1118|AEA31245	412	DDK	NAGFSDV.RPWLA	VNSNYVDINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...VVDG	DFELVENTSDN	ILAFWR	483		
41-L.crispatus_ST1|CBL49714	412	DEK	NAGFTKS.KPWLT	VNPNYKEINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...VVDG	DFELVENTSDN	ILAFWR	483		
42-Lc.garvieae_ATCC_49156|YP_004779435	414	NAK	AAGFTG.HPWLA	VNPNYEINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...IIVGE	FELKDTTEE	VYAYIR	485		
43-E.saccharolyticus_30-1|ZP_09110526	412	DSK	NAGFTSN.KPWHL	VNPNYPEINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...VVGTY	NLVDTEDE	NFAYCR	483		
44-E.italicus_DSM_15952|ZP_07895345	411	NSA	HAGFTTG.TPWHL	VNPNYEINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...VVGTY	NLVDTEDE	NFAYCR	482		
45-E.faecalis_T2|ZP_05424932	414	NSE	NAGFTTG.TPWHL	VNPNYREINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...VVGTY	NLVDTEDE	NFAYCR	485		
46-E.faecium_TX0133a04|ZP_07845411	427	ARE	HAGFTTG.IPWLR	VNPNYKEINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...IVWGD	YELVEKTP	EHVAYS	498		
47-T.halophilus_NBRC_12172|YP_004886502	413	SST	NAGFTSG.KPWLA	VNDNYKVINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...MIWGS	FQLDVTDE	VFSYR	483		
48-E.faecalis_TX0109|ZP_07568166	413	AEK	NAGFTTG.IPWID	VNPNYKVINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...IVWGD	FELVENTSDN	ILAFWR	483		
49-E.saburreum_DSM_3986|ZP_07905892	425	TSE	NAGFTTG.TPWLA	VNPNYKVINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...IVYGR	FELVENTSDN	ILAFWR	496		
50-R.sp._5_1_39B_FAA|ZP_04856921	428	DSA	YAGFSTA.NPWIM	VNPNYTKINAKDQ	INREDSVFKYYQKLIQLRHNSA	L...IVYGT	YDLDDDKD	IYAYIR	499		
51-T.thermosaccharolyticum|YP_003852493	426	DDP	NGGFTTG.KPWIK	VNPNYTKINAKDQ	INREDSVFKYYQKLIQLRHNSA	L...IIVGD	FELVENTSDN	ILAFWR	497		
52-C.owensensis_OL|YP_004001509	427	DSE	NAGFTTG.KPWIK	VNPNYTKINAKDQ	INREDSVFKYYQKLIQLRHNSA	L...IIVGD	FELVENTSDN	ILAFWR	498		
53-O._sp._TW25|ZP_08784662	427	ASE	HAGFTTG.TPWLE	VNPNYKEINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...MVYGE	YELVENTSDN	ILAFWR	498		
54-B.sp._NRR_LB-14911|ZP_01172682	431	SSE	NAGFTTG.TPWIG	VNPNYKEINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...IVYGR	FELVENTSDN	ILAFWR	502		
55-B.sp._2_A_57_CT2|ZP_08004010	426	SSE	HGGFSDG.TPWIK	VNPNYKVINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...IVYGR	FELVENTSDN	ILAFWR	497		
56-B.halodurans_C-125|NP_243769	426	ETK	HGGFTDG.TPWLE	VNPNYKEINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...LVHGS	YDLDDDKD	IYAYIR	497		
57-G.thermoglucosidarius|BAA01368|O16G	427	DSE	NAGFTAG.TPWIP	VNPNYKEINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...IVYGT	YDLDDDKD	IYAYIR	498		
58-B.cereus_Rock3-44|ZP_04218751	432	ANE	HAGFTAG.EPWIG	VNPNYKEINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...IVYGT	YDLDDDKD	IYAYIR	503		
59-B.cereus_ATCC_14579|AAP10934|O16G	426	DQN	HAGFTKG.EPWIT	VNPNYKEINVAQAQ	EDSDVFNYYRRLIALRHNSA	I...VVYGS	YDLDDDKD	IYAYIR	497		
60-Lis.grayi_DSM_20601|ZP_07053050	427	NTD	YAGFSET.APWGS	VNVEEK.YNVADQ	QSDPNSILSYKQLIQLRKNSA	E...FLAG	NWEMIDT	GELPLFR	493		
61-B.coagulans_36D1|YP_004859480	432	NDR	YCGFSTY.APWIG	VNVEEK.YNVADQ	QSDPNSILSYKQLIQLRKNSA	E...FTAG	SWEMLE	ADDPDI	YAYIR	503	
62-C.sp._AT7|ZP_02185859	434	RSE	FAGFSTV.KPWSG	VNVEEK.YNVADQ	QSDPNSILSYKQLIQLRKNSA	E...FNKGS	FKLHDTKDT	LYVYER	502		
63-C.sp._17-4|YP_004375075	433	NSK	YAGFSTH.RPWSG	VNVEEK.YNVADQ	QSDPNSILSYKQLIQLRKNSA	E...FTIEG	DFKLHDTKDT	LYVYER	501		
64-C.sp._AT7|ZP_02185858	436	DSN	YAGFSSH.VPWSG	VNVEEK.YNVADQ	QSDPNSILSYKQLIQLRKNSA	E...FSEGG	FQLHDTKDT	LYVYER	504		
65-L.farciminis_KCTC_3681|ZP_08576747	429	STQ	YRGSFKE.KPWNL	VNDQETADPDS	IMNFFYKQLIQLRKNSA	D...FTS	GDYRLL	ITDSN	IYAYR	496	
66-L.pentosus_MP-10|CCB83116	434	SST	YHGFSDH.LPWKH	...GQTDQMNAADE	IDDSDIYNYYRQLIQLRKNSA	...FTD	GQFIML	GSNDQ	LFTYLI	501	
67-L.plantarum|YP_003061749	434	NTV	YHGFSDH.LPWKH	...GQTDQMNAADE	IDDSDIYNYYRQLIQLRKNSA	...FTN	GQFIML	GSNDQ	LFTYLI	501	
68-L.ruminis_SPM0211|ZP_08562977	433	ESE	YHGFSDH.LPWKH	...GQTDQMNAADE	IDDSDIYNYYRQLIQLRKNSA	...FVEGN	FVLA	DTTDD	LYVYKR	500	
69-L.animalis_KCTC_3501|ZP_08548669	431	TIA	YAGFSKV.KPWKW	...SKDENVASIAEQ	MDPDSVLFYKQLIQLRKNSA	...FIQGR	FIL	NTSSE	IYAYR	499	
70-L.pentosus_IG1|CCC16918	430	QQQN	NAGFSEH.TPWLS	...GKTHLVDVATEED	ADSLNFFYRSLIKLRKNSA	E...FTS	GTEIK	NTPQG	IYAYR	498	
71-L.casei_ATCC_334|YP_086220	428	ATT	NSGFTSG.TPWLP	...VGRSSRTHVVEQ	QHPDSSLAFYKQLIQLRKNSA	S...FQT	GSFRL	STGPD	SYVYLR	496	
72-L.delbrueckii|ZP_07091943	427	DSQ	YDGFSTA.EPWL	...GRSRDHFVASE	ADPSSMLNFFYRQLIQLRKNSA	P...FTK	GSYLL	DTKAD	LVYQR	495	
73-L.jensenii_27-2-CHN|ZP_05557003	425	KTE	NYGFSKR.KPWLT	...GKKQDEHFAEAE	ADADSFNFFYRQLIQLRKNSA	P...FMEG	SYLH	PTSNK	SFYQR	493	
74-L.iners_LEAF_2053A-b|ZP_07735311	429	DSQ	YDGFSTA.EPWL	...GVPANADNVAGEEN	DNSVLFNFFYRQLIQLRKNSA	D...FTN	GTYL	DTNKY	TYVYER	497	
75-L.gasseri_JV-V03|ZP_07058635	428	NAK	NGFSDG.KPWIK	...GKKVDHANA	AADEIADSSMFFNFFYRQLIQLRKNSA	A...FED	GGYLL	PTSDN	SYVYER	496	
76-L.johnsonii_FI9785|YP_003292438	428	NER	NGFSDG.KPWIK	...GKKVDHANA	AADEIADSSMFFNFFYRQLIQLRKNSA	A...FED	GGYLL	PTSDN	SYVYER	496	
77-L.amylolyticus_DSM_11664|ZP_06818628	428	NDK	FNGFSDG.KPWIK	...GKVDHANA	AADEIADSSMFFNFFYRQLIQLRKNSA	A...FED	GGYLL	PTSDN	SYVYER	496	
78-L.helveticus_H10|ADX71102	433	DTK	NYGFTG.TPWIN	...GKIENHVS	VASEITSDSMLFFYKQLIQLRKNSA	N...FQK	GDYML	PTDKN	SYVYQR	501	
79-L.acidophilus_NCFM|LBA1872	426	DTK	NYGFTG.TPWIN	...GKIENHVS	VASEITSDSMLFFYKQLIQLRKNSA	N...FQK	GDYML	PTDKN	SYVYQR	494	
80-L.amylolyticus_GRL1118|AEA32747	427	DTK	NYGFTG.TPWIN	...GKIENHVS	VASEITSDSMLFFYKQLIQLRKNSA	N...FQK	GDYML	PTDKN	SYVYQR	495	
consensus		*	***!!*	!!*	** **	***	* *	!!** *	** **	* ** ! * **	** ! *

	490	500	510	520	530				
1-L.plantarum|ADN99864	505	G....RRVQVYVNL	SAKRLFLT	PNG.....RPR	LNYY..AHYRLN	.....TLEPYQAT	FEVNSNE.	555
2-L.casei_ATCC_334|ABJ70852	509	G....QHVQIFVNL	SSKPAAVD	LPAG.....HVV	LNYY..SDVGT	.....SLQPYQAT	IEVVK...	555
3-L.rhamnosus_ATCC_8530|AER64849	508	G....KHLRIYVNL	SATPATID	LPDG.....QVW	LNYY..PDAAP	.....TLKPYQAT	IEVNV...	554
4-E.italicus_DSM_15952|ZP_07895342	493	FLGT..ERMLVVVNL	KDAAEID	LPAAISGQSW	TLVIDNH..SVEGANSEHELQ	LTQHKTMA	LAPYEARVYHMNRVK	567	
5-L.sakei_subsp._sakei_23K|YP_395811	494	QLGD..KKVRVIANF	TDQTTQRANA	AAVK.....AVMMS	SNY..PDQQLT	TDQI.....TLR	PYEAVMLEIE...	549	
6-P.larvae|ZP_02329600	498	SFGK..ERLLVSNF	SSRTTSFT	PPEGLDAGKETT	LLISNY..PDTNEY	LSEF.....VLR	PYESAAYYCRD...	560	
7-T.halophilus_NBRC_12172|YP_004886688	495	HGEQ..EDFLIMVNM	FDGREKMD	FSKYN...LK	ELVLANY..EVNDR	LNSI.....L	LRPYEARNYKISK...	553	
8-B.fuscum|BAB60692	515	TSDS..TELFIAANCS	ADPAALPG	DVTEEWDDA	DVLLIANH..PGVREL	...GR.....T	LLPWEVILRRGLA...	575	
9-H.hydrogeniformans|YP_003995944	495	EGKE..NNLLIMLNF	SEQLAEVD	LEDELEIQNA	ELLINNY..NNEPEF	RSKS.....Q	LNPYEARVYLFQ...	555	
10-L.pentosus_IG1|CCC17113	485	TWKQ..TQWLVCNYS	QAQVSVK	LPQSK...S	TLVISNY..PDGPGQ	LGQT.....V	LRPYEARVVALN...	541	
11-L.plantarum|AD000180	485	NWQQ..QVWLICANF	ADTLITVD	LPKRA...S	ELIISNY..QDYPEQ	LGRV.....V	LRPYEARVVALS...	541	
12-L.pentosus_IG1|CCC16900	503	HWQG..QVWLICANF	TSETISRPL	HQYL.TADA	KCLLSNY..DDCQTD	.....TLR	PYEARVYQLA...	558
13-L.plantarum|ADN97379	503	QWEG..RTWLVCCNF	AETLSRPL	DQYL.TPTA	KCLISNY..GEQQPN	.....K	LRPYEARVYQLA...	558
14-L.rhamnosus_ATCC_8530|AER65504	503	QAAN..QELLVISNF	TDLTRN	IAKKL.SPSA	KLLISNY..DDDAEN	.....TLR	PYETKAYLIER...	560
15-L.brevis_ATCC_367|ABJ65230	504	HYQE..QTLVLSNF	TQVTRDYG	QAEAS...E	ERLIGNY..ADDQGT	.....TLR	PYETKAYVYFK...	557
16-L.pentosus_IG1|CCC16895	504	QAGD..QHLLVICNF	TATQTRHFAEL	PATA...K	LLLSNY..DEDHQD	.....V	LRAVEAKVYQF...	557
17-L.plantarum|ADN97381	504	HMGS..QHLLVICNF	TATQTRHFAEL	PADA...H	LLISNY..DEDHQD	.....V	LRAVEAKVYQF...	557
18-R.lactaris_ATCC_29176|ZP_03168755	505	KGEK..ESLIVLCNF	TETVEYEV	DESVKAERS	ELVISNY..KDAPEK	FASKI.....T	KPYGAYVYTK...	566	
19-D._formicigenerans|ZP_02235523	504	KGEN..ESLIVCANF	TDEIDYQV	DEKVKAKES	SLLISNY..GDAPDT	FNNHL.....T	KPYDALVVAIGNEEK	548	
20-R.torques_ATCC_27756|ZP_01967024	502	KGEK..ETLVVGNF	TDKTINYH	IEEKVQAKKS	RLLISNY..NAAET	FERDL.....S	LEPYGACVYLLAEK	565	
21-B.coagulans|BAA11354|O16G	501	ENES..EKLVAAANF	SENTVSFD	QPPDDN...W	KLLIGNY..EDT...GT	ST.....L	FRPYEARVYYLEK...	555	
22-F.prausnitzii_L2-6|CBK98455	494	TLAETGENYL	IACNFS	DKDAAF	TIPADF..AGA	RRLISNY..PDTAP	...TGAV.....T	LRPYEARVYVYTK...	552
23-L.sakei_subsp._sakei_23K|CAI56099	485	MLGE..QVWLIVCANF	TDEIDYQV	DEKVKAKES	SLLISNY..GDAPDT	FNNHL.....T	KPYDALVVAIGNEEK	548	
24-C.leptum_DSM_753|ZP_02079428	527	VWNR..ERLLVLANF	SQAEACPL	AKNPEVTR..Q	LLISNY..DDVKSE	.....TLR	PYEARVAFYERERAD	586
25-S.mutans|AAA26939|G16G	481	KVRE..ERYLVVNV	SDQEEVLE	IDVDK...Q	ETLISNT..NESAA	LANH...K	LQPVDAFCIKIN...	536	
26-S.mitis_bv._2_str._F0392|EGR94186	481	KDGE..RRFLVVANF	SNEKQNF	VEGRV...K	SLLIENY..TAKEA	VEKQ...T	LAPWDAFCVEMTD...	537	
27-L.pseudomesenteroides|ZP_08659173	485	HYHD..LTWLVVSNF	TQVTRDYG	QAEAS...E	ATLVANY..DEPKN	LHNK...I	LQPYEARVYVYTKL	543	
28-L.ruminis_ATCC_27782|AEN77768	484	KYRG..QMLLVCANF	TNEFRINL	DKFG...RQ	TSFISNY..DEGVID	LSSK...V	LKPYEARVAFIEVK...	541	
29-L.delbrueckii|ADQ60220	484	ENTE..DKWLVVCF	NLTGEEQVFL	PKDV...K	EVLISNY..PVPED	LSAA...V	LPAYAFCVCRVKK...	540	
30-L.casei_LC2W|AEA53469	484	VLGH..TRWLVVNV	SEKRRPLD	NDQL...E	KTVISNY..DAPLQS	LTDQ...T	LQPYEARVAFVYRHV...	541	
31-C.sp._DL-VIII|ZP_09206015	484	TLEN..EMLLVICNF	TGKTKFA	FEDEIEFNSK	ELLISNY..NADVNN	PNIDNI.....T	LRPYEARVYKLLI...	546	
32-C.sp._DL-VIII|ZP_09207308	484	TLEN..EMLLVICNF	TGKTKFA	FEDEIEFNSK	ELLISNY..DVDNNS	INNI.....D	LRPYEARVYKLLI...	547	
33-L.jensenii_269-3|ZP_04645733	473	VLGD..EKWLVVCF	NLTKEEAT	FTESEYKI...Q	NALISNY..PAR	TT.LQDI...T	LKPYEARVAFACVTC...	529	
34-L.iners_DSM_13335|ZP_05744409	484	ILGD..QKWLVVANF	LDEKPF	NCHEYQ...Q	KVLVSNY..TTP	SN.LQNI...I	LKPYEARVAFVYVIA...	539	
35-L.johnsonii_DPC_6026|AEB92563	484	KLED..ENWLVVANS	LGEDQNLN	LIDIPF...K	EVLISNY..EKR	DS.LKDM...V	LKPYEARVAFVYVIA...	538	
36-L.johnsonii_ATCC_33200|ZP_04006730	521	KLED..EKWLVVANS	LGEDQNLN	LIDISF...K	KVLISNY..EKR	DS.LKDM...V	LKPYEARVAFVYVIA...	575	
37-L.gasseri_ATCC_33323|ABJ59631	484	KLGS..EKWLVVANS	LGDQRFN	LNDNF...K	EVLISNY..EKQ	DS.LKNI...I	LKPYEARVAFVYVIA...	538	
38-L.amylolyticus_DSM_11664|ZP_06818684	484	KLNG..QKWLVVANF	LGNEES	SFAKDV...K	ENIENY..DKH	QQ.LQDL...T	LKPYEARVAFVYVIA...	539	
39-L.acidophilus_NCFM|G16G|LBA0264	484	ILND..KKWLVVANS	LNEEQNF	VSNQI...E	ETLISNY..PERNN	VQNI...T	LKPYEARVAFVYVIA...	539	
40-L.amylolyticus_GRL1118|AEA31245	484	VLGD..EKWLVVANS	LGEQKFN	SADQI...D	QVLVANY..DER	ND.LNDI...T	LKPYEARVAFVYVIA...	540	
41-L.crispatus_ST1|CBL49714	484	ILGT..EKWLVVANS	LGEQQFT	STDRI...K	ENLISNY..AVR	ND.LHDI...T	LKPYEARVAFVYVIA...	539	
42-Lc.garvieae_ATCC_49156|YP_004779435	486	SYKG..EDWLVVANS	LHENQF	SSYDV...K	EGIMHNY..PEAIDN	VKER...V	LKPYEARVAFVYVIA...	542	
43-E.saccharolyticus_30_1|ZP_09110526	484	VLDE..QKWLITNF	QKTTTFD	LKEEP...K	SVLISNY..TKKEYT	KGML...Y	LDPYEARVAFVYVIA...	540	
44-E.italicus_DSM_15952|ZP_07895345	483	EFSG..EKWLVVANS	LESNQFT	LIEEII...G	EVLHNY..HTSLPK	SGEV...Y	LDPYEARVAFVYVIA...	542	
45-E.faecalis_T2|ZP_05424932	486	TLND..EVWLVVANS	LRNQQT	MPGAG...K	EVISNY..HLAELP	QGEI...M	LQPYEARVAFVYVIA...	542	
46-E.faecium_TX0133a04|ZP_07845411	499	IYED..QQWLVVANS	SEKQFT	VPREA...L	RVLVSNY..PLKQLP	DGKV...D	LRPYEARVAFVYVIA...	555	
47-T.halophilus_NBRC_12172|YP_004886502	484	KYKG..QRWLVVANS	SEVQPF	SSEDEM...K	KVLIQNT..VDEFTT	LENI...N	LQPYEARVAFVYVIA...	540	
48-E.faecalis_TX0109|ZP_07568166	484	TYGE..ERWLVVANS	SEVQPF	SADVHV...E	QVLIENM..PTDVT	LADY...S	LAPYEARVAFVYVIA...	541	
49-E.saburreum_DSM_3986|ZP_07905892	497	TLGN..QKLVVCF	NFSKTEQ	KDFSGYENA...K	VLLISNY..DGNISE	KA...T	LKPYEARVAFVYVIA...	556	
50-R.sp._5_1_39B_FAA|ZP_04856921	500	TLGD..EKLVVCF	NFSENRE	VELPEE..FTNG	KVLISNY..IDAKVN	HKI...T	LRPYEARVAFVYVIA...	556	
51-T.thermosaccharolyticum|YP_003852493	498	KLND..EMLLVICNF	TSNNAE	FLPDNIN	VNKNLISNY..DVANDD	NIENF...E	LRPYEARVAFVYVIA...	560	
52-C.owensensis_OL|YP_004001509	499	SYGN..EMLLVVANS	SEVEF	CAPKEIFLNK	PELLISNY..EVEDDI	QKI...E	LRPYEARVAFVYVIA...	558	
53-O._sp._TW25|ZP_08784662	499	KYED..QTLVITNF	TGQEIAYG	TQSEDLKRG..N	LLIGNY..QDAPVT	FVTSV...T	LRPYEARVAFVYVIA...	558	
54-B.sp._NRR_LB-14911|ZP_01172682	503	TLGS..QVLLVLCNF	YGNTRK	LALPEELKEIKY	SWITGNY..GSEGRED	IVPQ...Q	LKPYEARVAFVYVIA...	565	
55-B.sp._2_A_57_CT2|ZP_08004010	498	TLGN..QILLVLCNF	YGNPEVE	FPAYIEKFK	EALISNY..KDIQIN	...RTI...T	LRPYEARVAFVYVIA...	558	
56-B.halodurans_C-125|NP_243769	498	TYNG..QTLVVCNF	YGRITDF	ECPAEIVLSEP	TLLISNY..DEEENG	SYTSF...R	LRPYEARVAFVYVIA...	561	
57-G.thermoglucosidasius|BAA01368|O16G	499	TLGN..EQLIVITNF	SEKTPVFR	LPDHIIYKTK	ELLISNY..DVDEAE	EELKEI...T	LRPYEARVAFVYVIA...	562	
58-B.cereus_Rock3-44|ZP_04218751	504	TWRD..EKLLVIANF	TSDSVFEL	PEEIMYGD	ELLIHNY..NVQDEV	IESI...A	LQPYEARVAFVYVIA...	565	
59-B.cereus_ATCC_14579|AAP10934|O16G	498	TYGD..EKLLVIANF	TADESVFEM	PKDISYSES	ELFIHNY..DVEIGS	...IDNI...T	LRPYEARVAFVYVIA...	558	
60-Lis.grayi_DSM_20601|ZP_07053050	494	KTKR..QDAIVLANF	SAETIEYS	ASLAEA...S	ILLANT..ADFQIK	RDHI...I	VPPGMIYFKTKGVEK	554	
61-B.coagulans_36D1|YP_004859480	504	KHEG..SCAMIVCNF	TSKLLQFT	FCPELTHRW...A	CLLNNS..GYHSA	KAVPSKL...V	LSPFECFVLLQE...	564	
62-C.sp._AT7|ZP_02185859	503	NFEG..QRAIVCCNF	LSDAEEHV	QEDGVSTVGW..Q	ILLQNE..GNIIDK	...DAV...T	FAPYGTVMFYQDDPA	565	
63-C.sp._17-4|YP_004375075	502	SWGS..SKAIVCCNF	SENKQTT	TDKLTQSY...T	VALTNE..GNTLQE	...GQL...T	KLSPYGAIVLIDL...	561	
64-C.sp._AT7|ZP_02185858	505	SWDS..TTVLVCCNF	MSDETQVVS	LVLGIKQPY...T	IRLSNE..GNTLQE	...DKL...T	TLSPYGAIVLIDL...	562	
65-L.farciminis_KCTC_3681|ZP_08576747	497	KTAD..KQGLVITNF	SDQKTEFT	LPKTV...W	RKVLITNES..SEVEDG	VV...T	KLGPYGAIVLIDL...	552	
66-L.pentosus_MP-10|CCB83116	502	DDGT..EQAAITCNF	LSSEMYYT	LPFAGDA...T	LQAQGG..ASCTER	QV...T	TLPAWSSIVVSPRTTVS	561	
67-L.plantarum|YP_003061749	502	DDGQ..KQAAIVCNF	LSAQATYLL	PF...V	GGK.VLLVQGG..ATYRGR	...V...T	TLPAWSSIVVVKSA...	557	
68-L.ruminis_SPM0211|ZP_08562977	501	TLGD..SEAVVICNF	LADAVTKYR	VRGNLSDK...H	IVLQNGSL	SLNEENVL...T	LPFGSIVFMTE...	559	
69-L.animalis_KCTC_3501|ZP_08548669	500	VIDEH..KQVLVITNF	SDQKTEFT	LPKTV...K	VLLSNG..AKVSAD	QV...T	KLAPYGAIVLIDL...	553	
70-L.pentosus_IG1|CCC16918	499	RLGK..SAVVVTCNF	LIDQSI	EIPMI...K	NKTSTRF..AEGKIR	MLEDTV...T	SYGPAWFTIKDILED..	555	
71-L.casei_ATCC_334|YP_806220	497	QTDK..AIAVVAVAL	SDKTVNLR	LIPAGDYQA...V	LIVGDA..TLSEET	...L...T	TLSADSAWFIQEKERA	556	
72-L.delbrueckii|ZP_07091943	496	DLGD..DRALVVVSL	SAKKEHLT	LPPEEL...T	PVLTAGSIN	LQKGL...T	TLMPFAGVVLQKKK...	551	
73-L.jensenii_27-2-CHN|ZP_05557003	494	DLGD..ESALVVVNL	TNKLKVM	TKYQ...K	VLLSNGQYSL	LNDEL...T	QLAPFAGVLLRRD...	547	
74-L.iners_LEAF_2053A-b|ZP_07735311	498	DLED..EVGIVAVSL	SSKKEMIE	LP...I	GNV..DIKLT	GTCELVNNQL...T	TLAPGSGVLLIKK...	553	
75-L.gasseri_JV-V03|ZP_07058635	497	NLGD..QKALVAVSL	SKDAIELD	VDPFKQE...K	LVAGNY..QLKDGK	...L...T	KLAPYAGVLLTKD...	552	
76-L.johnsonii_FI9785|YP_003292438	497	NLKD..KKALVAVSL	QEPPIE	EVGKEFSSE...R	LSAGEY..DLTAGK	...L...T	RLEPYAGVLLLEN...	551	
77-L.amylolyticus_DSM_11664|ZP_06818628	497	DLGD..ESAVVAVSL	SPKTTVEI	PAEYETE...V	LSAGEY..QLNKQK	...L...T	TLMPYAGVLLMRKKEN	555	
78-L.helveticus_H10|ADX71102	502	DLND..ESAVVAVSL	SEKITIEI	PAQYTEE...K	LKAGEY..QLTNRK	...L...T	TLMPYAGVLLKKNEN	558	
79-L.acidophilus_NCFM|LBA1872	495	DLGN..ESAVVAVSL	SNKKSID	LPEEYIKE...L	LKAGEY..QLTNGK	...L...T	TLMPYAGVLLKKNEN	551	
80-L.amylolyticus_GRL1118|AEA32747	496	DLND..ESAVVAVSL	SDKTKIK	LIPAGYTE...V	LKAGEY..KLTG	...L...T	TLMPYAGVLLKKNEN	552	

*** * * * * ** **

1-L.plantarum|ADN99864	555	.....	555
2-L.casei_ATCC_334|ABJ70852	555	.....	555
3-L.rhamnosus_ATCC_8530|AER64849	554	.....	554
4-E.italicus_DSM_15952|ZP_07895342	568	ETFNEKIR....	575
5-L.sakei_subsp._sakei_23K|YP_395811	549	.....	549
6-P.larvae|ZP_02329600	560	.....	560
7-T.halophilus_NBRC_12172|YP_004886688	553	.....	553
8-B.fuscum|BAB60692	575	.....	575
9-H.hydrogeniformans|YP_003995944	555	.....	555
10-L.pentosus_IG1|CCC17113	541	.....	541
11-L.plantarum|AD000180	541	.....	541
12-L.pentosus_IG1|CCC16900	558	.....	558
13-L.plantarum|ADN97379	558	.....	558
14-L.rhamnosus_ATCC_8530|AER65504	560	.....	560
15-L.brevis_ATCC_367|ABJ65230	557	.....	557
16-L.pentosus_IG1|CCC16895	557	.....	557
17-L.plantarum|ADN97381	557	.....	557
18-R.lactaris_ATCC_29176|ZP_03168755	566	.....	566
19-D._formicigenerans|ZP_02235523	565	.....	565
20-R.torques_ATCC_27756|ZP_01967024	565	.....	565
21-B.coagulans|BAA11354|O16G	555	.....	555
22-F.prausnitzii_L2-6|CBK98455	552	.....	552
23-L.sakei_subsp._sakei_23K|CAI56099	548	.....	548
24-C.leptum_DSM_753|ZP_02079428	587	ENI.....	589
25-S.mutans|AAA26939|G16G	536	.....	536
26-S.mitis_bv._2_str._F0392|EGR94186	537	.....	537
27-L.pseudomesenteroides|ZP_08659173	543	.....	543
28-L.ruminis_ATCC_27782|AEN77768	541	.....	541
29-L.delbrueckii|ADQ60220	540	.....	540
30-L.casei_LC2W|AEA53469	541	.....	541
31-C.sp._DL-VIII|ZP_09206015	546	.....	546
32-C.sp._DL-VIII|ZP_09207308	547	.....	547
33-L.jensenii_269-3|ZP_04645733	529	.....	529
34-L.iners_DSM_13335|ZP_05744409	539	.....	539
35-L.johnsonii_DPC_6026|AEB92563	538	.....	538
36-L.johnsonii_ATCC_33200|ZP_04006730	575	.....	575
37-L.gasseri_ATCC_33323|ABJ59631	538	.....	538
38-L.amylolyticus_DSM_11664|ZP_06818684	539	.....	539
39-L.acidophilus_NCFM|G16G|LBA0264	539	.....	539
40-L.amylovorus_GRL1118|AEA31245	540	.....	540
41-L.crispatum_ST1|CBL49714	539	.....	539
42-Lc.garvieae_ATCC_49156|YP_004779435	542	.....	542
43-E.saccharolyticus_30_1|ZP_09110526	540	.....	540
44-E.italicus_DSM_15952|ZP_07895345	542	.....	542
45-E.faecalis_T2|ZP_05424932	542	.....	542
46-E.faecium_TX0133a04|ZP_07845411	555	.....	555
47-T.halophilus_NBRC_12172|YP_004886502	540	.....	540
48-E.faecalis_TX0109|ZP_07568166	541	.....	541
49-E.saburreum_DSM_3986|ZP_07905892	557	M.....	557
50-R.sp._5_1_39B_FAA|ZP_04856921	556	.....	556
51-T.thermosaccharolyticum|YP_003852493	560	.....	560
52-C.owensensis_OL|YP_004001509	558	.....	558
53-O._sp._TW25|ZP_08784662	558	.....	558
54-B.sp._NRRL_B-14911|ZP_01172682	565	.....	565
55-B.sp._2_A_57_CT2|ZP_08004010	558	.....	558
56-B.halodurans_C-125|NP_243769	561	.....	561
57-G.thermoglucoasidiasius|BAA01368|O16G	562	.....	562
58-B.cereus_Rock3-44|ZP_04218751	565	.....	565
59-B.cereus_ATCC_14579|AAP10934|O16G	558	.....	558
60-Lis.grayi_DSM_20601|ZP_07053050	554	.....	554
61-B.coagulans_36D1|YP_004859480	564	.....	564
62-C.sp._AT7|ZP_02185859	566	DTIPIEDEHLEN	577
63-C.sp._17-4|YP_004375075	561	.....	561
64-C.sp._AT7|ZP_02185858	562	.....	562
65-L.farciminis_KCTC_3681|ZP_08576747	552	.....	552
66-L.pentosus_MP-10|CCB83116	562	A.....	562
67-L.plantarum|YP_003061749	557	.....	557
68-L.ruminis_SPM0211|ZP_08562977	559	.....	559
69-L.animalis_KCTC_3501|ZP_08548669	553	.....	553
70-L.pentosus_IG1|CCC16918	555	.....	555
71-L.casei_ATCC_334|YP_806220	557	KP.....	558
72-L.delbrueckii|ZP_07091943	551	.....	551
73-L.jensenii_27-2-CHN|ZP_05557003	547	.....	547
74-L.iners_LEAF_2053A-b|ZP_07735311	553	.....	553
75-L.gasseri_JV-V03|ZP_07058635	552	.....	552
76-L.johnsonii_FI9785|YP_003292438	551	.....	551
77-L.amylolyticus_DSM_11664|ZP_06818628	555	.....	555
78-L.helveticus_H10|ADX71102	558	.....	558
79-L.acidophilus_NCFM|LBA1872	551	.....	551
80-L.amylovorus_GRL1118|AEA32747	552	.....	552
consensus			

FIG S1 Multiple sequence alignment of characterised GH13_31 enzymes and sequences from BLASTP with LBA0264 and LBA1872. The green boxes indicate conserved regions I, II, III and IV of α -amylase family enzymes (GH clan H) encompassing the catalytic groups and some -1 subsite residues of the active site cleft (4). The blue box indicates region V, which defines the specificity motifs of the 1,6- α -glucosidases and neopullulanases (5). The catalytic residues are marked with arrows. The sequence numbering on top corresponds to LaGH13_31 (LBA0264). Similar residues are highlighted in pink, conserved residues are highlighted in blue ($\geq 50\%$ conserved) or purple ($\geq 75\%$ conserved).

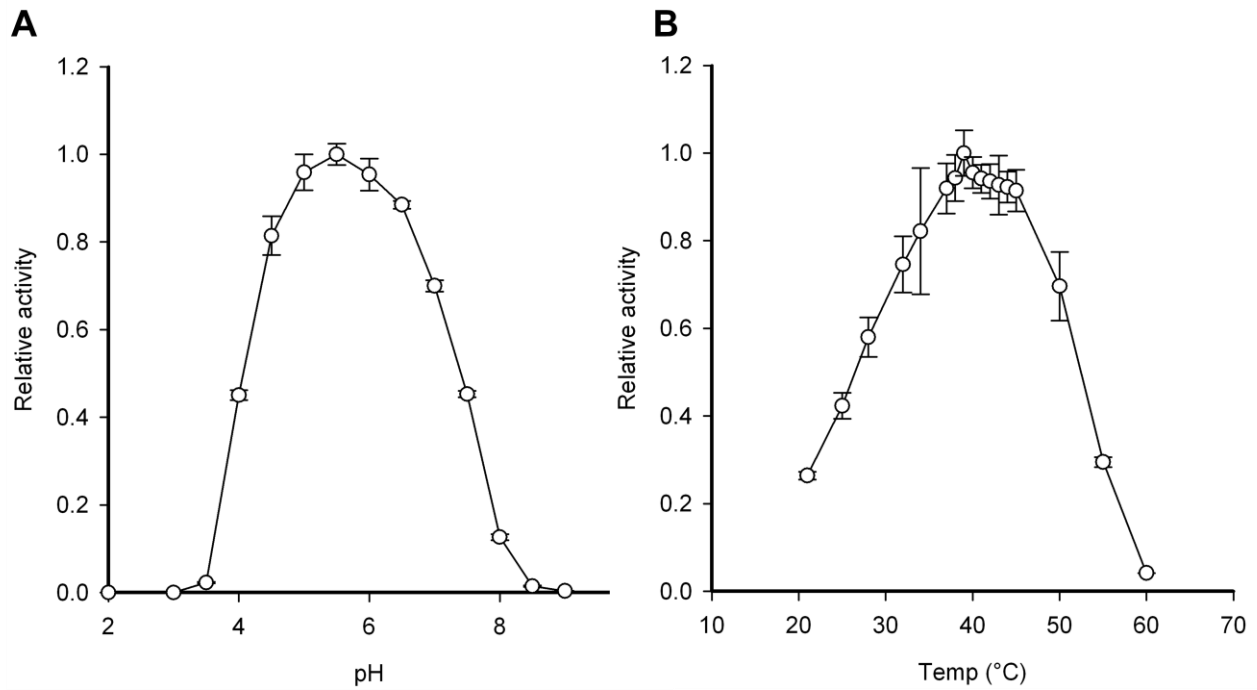


FIG S2 Activity optima of *LaGH13_31*. **(A)** pH activity optimum of *LaGH13_31* at 37°C, where a relative activity of 1 corresponds to a specific activity of 351 U/mg enzyme **(B)** Temperature activity optimum of *LaGH13_31* at pH 6.0, where 1 corresponds to 393.5 U/mg enzyme. The data is depicted as means of triplicates \pm standard deviation using 2 mM *p*-nitrophenyl α -D-glucopyranoside (*p*NPG) as a substrate.

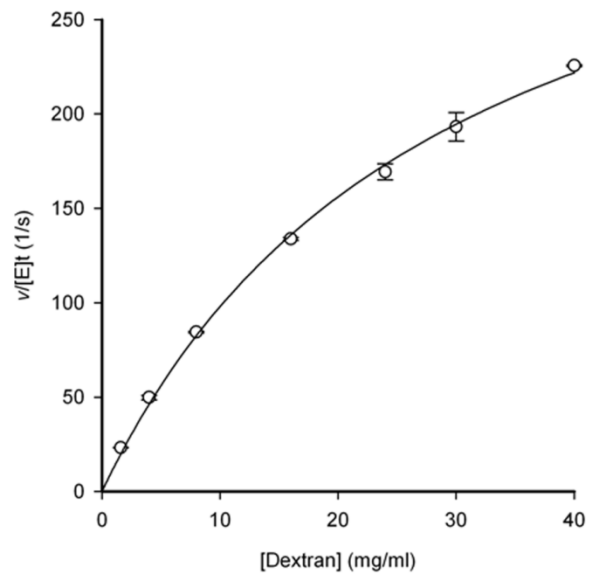


FIG S3 Michaelis-Menten plot of the Kinetics of dextran hydrolysis by *LaGH13_31*. The circles represent means of triplicates of the initial rates and the error bars represent the standard deviation of the data. The solid line is the Michaelis-Menten fit to the initial rate data.

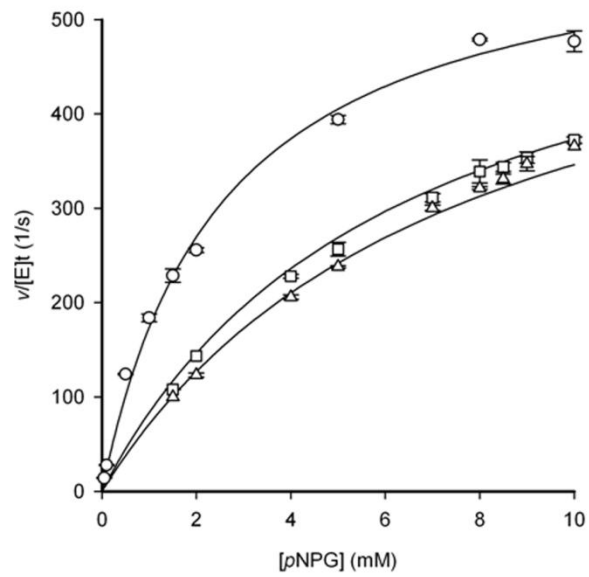


FIG S4 Glucose inhibition of *LaGH13_31*. *pNPG* without glucose addition (\circ), 6 mM glucose (\square), and 8 mM glucose (Δ). The data is depicted as means of triplicates and the solid lines represent global fits of the Michaelis-Menten model with a competitive inhibition term to the initial rate data.

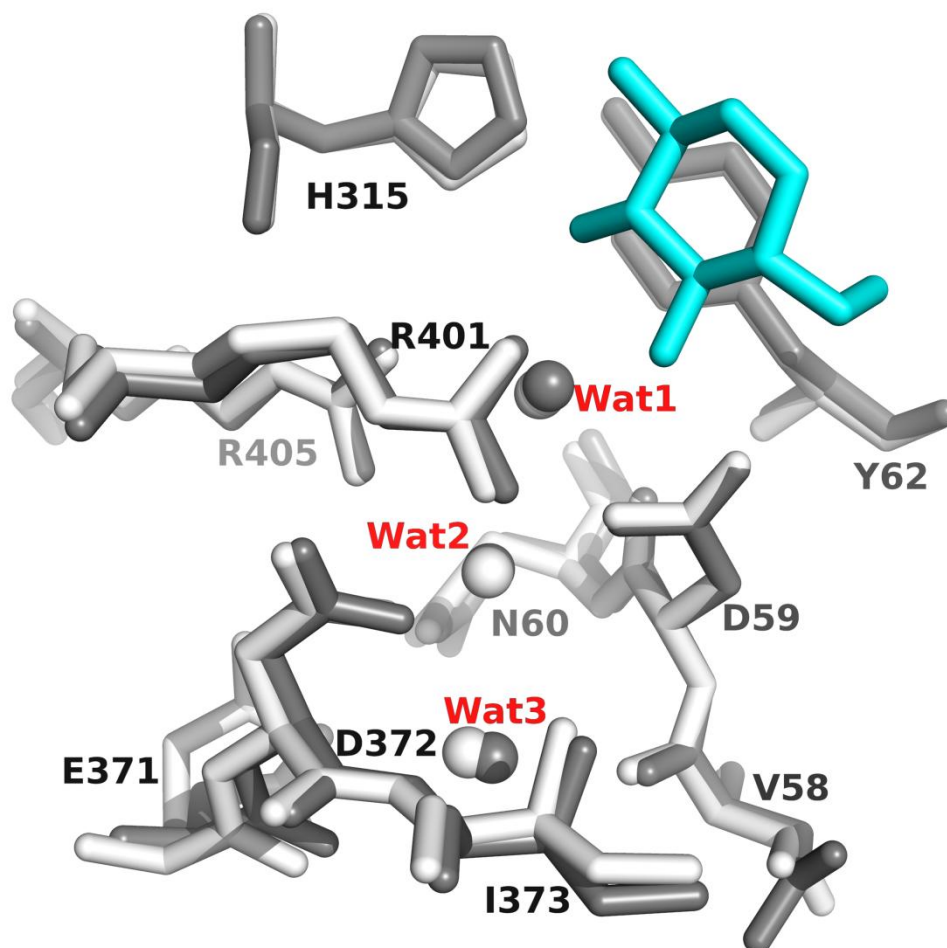


FIG S5 The figure depicts the conserved water path identified in *SmGH13_31* by Hondoh et al 2008, and proposed to be functionally important as an active site water drain facilitating the exit of water molecules upon substrate binding to the active site. *LaGH13_31* residues and bound water molecules are in white and *SmGH13_31* in grey. *LaGH13_31* residues are labeled and the three waters making the path to the surface of the enzyme are labeled in red. The glucose moiety of IG3 in the *SmGH13_31* -1 subsite is shown in cyan. This observation confirms the conservation of the water path of this class of enzymes.

TABLE S1 Primers used for semi-quantitative RT-PCR.

Target genes (locus tag number)	Primer sequence (5'→3') (+) sense and (-) antisense
0264	(+) GAAGAGTTGATTCATGCAATCAATG (-) CATTCAAATGCGATAATAAGCAAG
1866	(+) TGCTGAAAGCTTAGACTTGTTGTAG (-) CAAGAACATTAAGGTTTCGTGTTGTAC
1867	(+) TCTGTCAGCCAAAGTCATCG (-) CAAAGACAGCGTGTTGCATTAG
1872	(+) CCATGGATGTTGATCTGAAGTATG (-) ATGTCACATTGGTACGATCATGC
2071	(+) TAAGGTTCTTCGCGTTGCTT (-) CATGGGTAGCGAACAGGATT

TABLE S2 Amino acid sequence comparison of LBA1872 to functionally characterised GH13 enzymes. The similarity of amino acid sequence was investigated using the BLASTP program (UniProtKB/Swiss-Prot database). The proteins are enlisted according to descending identity and grouped according to specificity indicated in bold text in the first column.

	UniProtKB /Swiss-Prot accession no.	Identity (%)	Similarity (%)	Gaps	Score	References
Oligo 1,6-α-glucosidase						
<i>Bacillus cereus</i>	P21332 ^a	34.1	55.1	4.1	956	(10, 11, 13)
<i>Bacillus thermoglucosidasius</i> (<i>Geobacillus thermoglucosidasius</i>)	P29094 ^a	35.9	54.5	5.1	950	(12)
<i>Bacillus coagulans</i>	Q45101 ^b	35.6	55.2	3.2	936	(9)
<i>Saccharomyces cerevisiae</i> (<i>Isomaltase</i>)	P53051 ^b	29.7	46.6	14.9	649	(14)
Trehalose-6-phosphate hydrolase						
<i>Bacillus subtilis</i>	P39795 ^c	34.1	52.7	9.6	870	(2)
<i>Escherichia coli</i> (strain K12)	P28904 ^c	33.3	50.3	10.7	819	(6)
Glucan 1,6-α-glucosidase						
<i>Streptococcus mutans</i>	Q99040 ^a	35.1	52.4	10.3	844	(3, 7, 8)
<i>Candida albicans</i> (Yeast)	Q02751 ^b	30.4	49.3	15.0	675	(1)

^aGH13 subfamily 31; ^bGH13 no subfamily assigned; ^cGH13 subfamily 29

TABLE S3 Source organisms and accession numbers of sequences included in the multiple sequence alignment and phylogenetic tree (Fig. 2 and Fig. S1). The sequences are numbered according to Fig. 2 and Fig. S1; The different clusters in Fig. 2 are highlighted: Unknown specificity 2 in light green, Unknown specificity 1 including LBA1872 from *L. acidophilus* NCFM in light blue, the ancestral putative oligo 1,6- α -glucosidase in white, Glucan 1,6- α -glucosidases in dark grey, and oligo 1,6- α -glucosidases in light grey.

#	Group	Accession ID (links)	Organism name
1		ADN99864	<i>Lactobacillus plantarum</i> subsp. <i>plantarum</i> ST-III
2		ABJ70852	<i>Lactobacillus casei</i> ATCC 334
3	Unknown specificity 2	AER64849	<i>Lactobacillus rhamnosus</i> ATCC 8530
4		ZP_07895342	<i>Enterococcus italicus</i> DSM 15952
7		YP_004886688	<i>Tetragenococcus halophilus</i> NBRC 12172
60		ZP_07053050	<i>Listeria grayi</i> DSM 20601
65		ZP_08576747	<i>Lactobacillus farciminis</i> KCTC 3681
68		ZP_08562977	<i>Lactobacillus ruminis</i> SPM0211
69		ZP_08548669	<i>Lactobacillus animalis</i> KCTC 3501
66		CCB83116	<i>Lactobacillus pentosus</i> MP-10
67		YP_003061749	<i>Lactobacillus plantarum</i> JDM1
70		CCC16918	<i>Lactobacillus pentosus</i> IG1
71		YP_806220	<i>Lactobacillus casei</i> ATCC 334
74		ZP_07735311	<i>Lactobacillus iners</i> LEAF 2053A-b
75		ZP_07058635	<i>Lactobacillus gasserii</i> JV-V03
76	Unknown specificity 1	YP_003292438	<i>Lactobacillus johnsonii</i> F19785
77		ZP_06818628	<i>Lactobacillus amylolyticus</i> DSM 11664
78		ADX71102	<i>Lactobacillus helveticus</i> H10
79		AAV43672	<i>Lactobacillus acidophilus</i> NCFM
80		AEA32747	<i>Lactobacillus amylovorus</i> GRL1118
73		ZP_05557003	<i>Lactobacillus jensenii</i> 27-2-CHN
72		ZP_07091943	<i>Lactobacillus delbrueckii</i> subsp. <i>bulgaricus</i> PB2003/044-T3-4
62		ZP_02185859	<i>Carnobacterium</i> sp. AT7
63		YP_004375075	<i>Carnobacterium</i> sp. 17-4
64		ZP_02185858	<i>Carnobacterium</i> sp. AT7
61		YP_004859480	<i>Bacillus coagulans</i> 36D1
9		YP_003995944	<i>Halanaerobium hydrogeniformans</i>
10		CCC17113	<i>Lactobacillus pentosus</i> IG1
11		ADO00180	<i>Lactobacillus plantarum</i> subsp. <i>plantarum</i> ST-III
23		CAI56099	<i>Lactobacillus sakei</i> subsp. <i>sakei</i> 23K
29		ADQ60220	<i>Lactobacillus delbrueckii</i> subsp. <i>bulgaricus</i> ND02
33		ZP_04645733	<i>Lactobacillus jensenii</i> 269-3
34		ZP_05744409	<i>Lactobacillus iners</i> DSM 13335
35		AEB92563	<i>Lactobacillus johnsonii</i> DPC 6026
36		ZP_04006730	<i>Lactobacillus johnsonii</i> ATCC 33200
37		ABJ59631	<i>Lactobacillus gasserii</i> ATCC 33323
38		ZP_06818684	<i>Lactobacillus amylolyticus</i> DSM 11664
39		AAV42157	<i>Lactobacillus acidophilus</i> NCFM
40		AEA31245	<i>Lactobacillus amylovorus</i> GRL1118
41		CBL49714	<i>Lactobacillus crispatus</i> ST1
30	Glucan 1,6- α -glucosidases	AEA53469	<i>Lactobacillus casei</i> LC2W
25		AAA26939	<i>Streptococcus mutans</i> UA159
26		EGR94186	<i>Streptococcus mitis</i> bv. 2 str. F0392
27		ZP_08659173	<i>Leuconostoc pseudomesenteroides</i> KCTC 3652
42		YP_004779435	<i>Lactococcus garvieae</i> ATCC 49156
47		YP_004886502	<i>Tetragenococcus halophilus</i> NBRC 12172
48		ZP_07568166	<i>Enterococcus faecalis</i> TX0109
43		ZP_09110526	<i>Enterococcus saccharolyticus</i> 30 1
44		ZP_07895345	<i>Enterococcus italicus</i> DSM 15952
45		ZP_05424932	<i>Enterococcus faecalis</i> T2
46		ZP_07845411	<i>Enterococcus faecium</i> TX0133a04
28		AEN77768	<i>Lactobacillus ruminis</i> ATCC 27782
31		ZP_09206015	<i>Clostridium</i> sp. DL-VIII
32		ZP_09207308	<i>Clostridium</i> sp. DL-VIII
8		BAB60692	<i>Brevibacterium fuscum</i> var. <i>dextranlyticum</i>
5		YP_395811	<i>Lactobacillus sakei</i> subsp. <i>sakei</i> 23K
6		ZP_02329600	<i>Paenibacillus larvae</i> subsp. <i>larvae</i> BRL-230010
12		CCC16900	<i>Lactobacillus pentosus</i> IG1
13		ADN97379	<i>Lactobacillus plantarum</i> subsp. <i>plantarum</i> ST-III
14		AER65504	<i>Lactobacillus rhamnosus</i> ATCC 8530
15		ABJ65230	<i>Lactobacillus brevis</i> ATCC 367
16		CCC16895	<i>Lactobacillus pentosus</i> IG1
17		ADN97381	<i>Lactobacillus plantarum</i> subsp. <i>plantarum</i> ST-III
18		ZP_03168755	<i>Ruminococcus lactaris</i> ATCC 29176
19		ZP_02235523	<i>Dorea formicigenerans</i> ATCC 27755
20		ZP_01967024	<i>Ruminococcus torques</i> ATCC 27756
22		CBK98455	<i>Faecalibacterium prausnitzii</i> L2-6
24	Oligo 1,6- α -glucosidases	ZP_02079428	<i>Clostridium leptum</i> DSM 753
49		ZP_07905892	<i>Eubacterium saburreum</i> DSM 3986
50		ZP_04856921	<i>Ruminococcus</i> sp. 5 1 39B FAA
51		YP_003852493	<i>Thermoanaerobacterium thermosaccharolyticum</i> DSM 571
52		YP_004001509	<i>Caldicellulosiruptor owensensis</i> OL
53		ZP_08784662	<i>Ornithinibacillus</i> sp. TW25
54		ZP_01172682	<i>Bacillus</i> sp. NRRL B-14911
55		ZP_08004010	<i>Bacillus</i> sp. 2 A 57 CT2
56		NP_243769	<i>Bacillus halodurans</i> C-125
57		BAA01368	<i>Geobacillus thermoglucosidasius</i>
58		ZP_04218751	<i>Bacillus cereus</i> Rock3-44
59		AAP10934	<i>Bacillus cereus</i> ATCC 14579
21		BAA11354	<i>Bacillus coagulans</i>

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