SUPPLEMENTARY INFO

2-Deoxyribose-5-phosphate Aldolase, a Remarkably Tolerant Aldolase Towards Nucleophile Substrate

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1 Material

Acetone, dihydroxyacetone, propanone, butanone, cyclopentanone, propanal, hydroxypropanal and ethanal were purchased from Sigma-Aldrich. D,L-glyceraldehyde-3-phosphate diethyl acetal barium salt was from Sigma-Aldrich. All the enzymes required namely α-glycerophosphate dehydrogenase from rabbit muscle, triosephosphate isomerase from rabbit muscle, pyruvate kinase from rabbit muscle, lactic dehydrogenase from rabbit muscle, glycerokinase from *Cellulomonas sp*. and phosphatase acid from potato were purchased from Sigma-Aldrich. L-G3P reductase was produced as previously reported, without the lyophilisation step.[1] L-G3P was prepared as already published and purified by barium salt precipitation.[2]

2 Methods

2.1 DERA collection implementation

A sequence driven approach[3] have been applied using DERA related to a publication, as references (Table S1 below). Notably, 4 enzymes ORFAN of genes in the publication of Valino group[4] were included after a search of the corresponding DERAs sequences into strain genomes using MicroScope/MaGe platform (http://www.genoscope.cns.fr/agc/microscope/mage/). From 4654 proteins retrieved from UniprotKB, the clustering at 80% of identity allowed to select 411 enzymes representative of the biodiversity of this family. Primers were chosen for the corresponding genes. Genes were cloned in a pET22b(+) (Novagen) modified for ligation independent cloning as already described[3]. All primers and strains of the genes for which activity could be significantly measured by LCMS (see 2.2), are listed in Table S1. All the strains along with their identifiers were purchased from DSMZ collection. When DNA samples corresponding to the gene encoding the selected enzyme was not available, PCR was performed on the DNA of another strain from the same species as noted in Table S1. The genes corresponding to the selected DERA were recloned with a six histidine tag in N terminal position. Each expression plasmid was transformed into *E. coli* BL21-CodonPlus (DE3)-RIPL. Cell culture, induction of protein production, and cell lysis were conducted as previously published in 96-well microplates[3]. Protein over-expression was evaluated by SDS-PAGE analysis using the NuPAGE system (Invitrogen). Protein concentration was determined by the Bradford method, with bovine serum albumin as the standard (Bio-Rad).

Entry	Organism	References
Q8ZJV8	*Salmonella typhimurium*	Hoffee et al., 1974; Jargiello et al., 1976
Q73A11	*Bacillus cereus*	Sgarrella eta l., 1992
P0A6L0	*Escherichia coli*	Gijsen et al., 1994
Q9Y948	*Aeropyrum pernix*	Sakuraba et al., 2003
Q73A11	*Bacillus cereus*	Han et al., 2004
Q9AIP7	*Streptococcus mutans*	Han et al., 2004
Q5SJ28	*Thermus thermophilus*	Lokanath et al., 2004
Q877I0	*Thermococcus kodakarensis*	Rashid et al., 2004
Q8ZXK7	*Pyrobaculum aerophilum*	Sakuraba et al., 2007
Q9X1P5	*Thermotoga maritima*	Sakuraba et al., 2007
C0LSK9	*Yersinia sp. EA015*	Kim YM et al., 2009
C7E719	*Paenibacillus sp. EA001*	Kim YM et al., 2010
A2BLE9	*Hyperthermus butylicus*	Pei et al., 2010
B5IEU6	*Aciduliprofundum boonei*	Xiaopu Yin et al., 2011
B6YUB3	*Thermococcus onnurineus*	Xiaopu Yin et al., 2011
C3JIL6	*Rhodococcus erythropolis*	Kullartz & Pietruszka, 2012
Q88Z64	*Lactobacillus plantarum*	ORFAN extrapolated from Valino et al., 2012
Q6D992	*Pectobacterium atrosepticum*	ORFAN extrapolated from Valino et al., 2012
F8K193	*Streptomyces cattleya*	ORFAN extrapolated from Valino et al., 2012
B1W2U4	*Streptomyces griseus subsp. griseus*	ORFAN extrapolated from Valino et al., 2012
O66540	*Aquifex aeolicus*	Tan et al. PDB submission (PDB : 1MZH)

Table S1. DERA used as a reference set, related to a publication, for the genome sequence driven approach.

2.2 DERA collection screening

The presence of aldol products were checked with a Thermo Scientific™ Dionex™ UltiMate™ 3000 Thermostatted Column Compartment Rapid Separation (TCC-3000RS) LC system (Thermo Fisher Scientific Courtaboeuf, France) coupled to QTRAP 5500 hybrid mass spectrometer (ABSciex, Toronto, Canada) equipped with an electrospray ionization (ESI) source.

2.2.1 *Chromatography conditions*

LC separation was performed using a reverse-phase chromatographic method using an ACQUITY UPLC BEN C18 column (1.7 µm, 2.1 x 150 mm) from Waters (Milford, USA) at 50°C. The flow rate was 300 µL/min and the sample injection volume was 10 µL. The mobile phase A was 10 mM ammonium carbonate in water, and the mobile phase B was acetonitrile. linear gradient from 0 to 100% over a period of 7 min.

2.2.2 *Mass spectrometry conditions*

The QTRAP mass spectrometer was operating in the negative ionization mode. Analyses were performed using multiple reaction monitoring (MRM) mode with the following in-source parameters: ion source (IS) 4.5 kV, temperature (TEM) 500°C, curtain gas (CUR) 20 a.u., gas 1 (GS1) 45 a.u., gas 2 (GS2) 60 a.u., CAD – medium. For each compound of interest, the corresponding method included three or four transitions, and the most intense was used for concentration calculations.

During the method development, MRM conditions for the detection of compounds **12**, **14** and **16** were optimized using pure products as standards.

The data processing was performed using Analyst software (ABSciex). Lysates overexpressing DERA with significant activity (more than five time compared to the *E. coli* lysate control) are listed in SI File 2.

2.3 DERA purification

All the proteins were purified by the IMAC technique, as already described[5]

2.4 DERA activity

This assay was run at room temperature monitoring NADH absorbance at 340 nm on a 1 mL final volume solution containing: Glygly buffer (50 mM, pH 8.0), 2-deoxy-D-ribose-5-phosphate (32 mM), NADH (0.2 mM), 30 U of GPDH/TPI and 10 µL of aldolase (1 mg mL^{-1} solution). One mmol of NADH oxidized was equivalent to the retroaldolisation of 1 mmol of 2-deoxy-D-ribose-5-phosphate. The results are summarized in the following table:

DERA	Specific activity (U mg^{-1})
P0A6L0 ($DERA_{Esch}$)	34
B8HFF3 ($DERA_{Arthro}$)	33
P44430 ($DERA_{Haemo}$)	13
E2NRK0	0.8
G4L7G6	0.2
B7CCR8	0.1
E1QYT1	0.1
A7VWB3	0.1

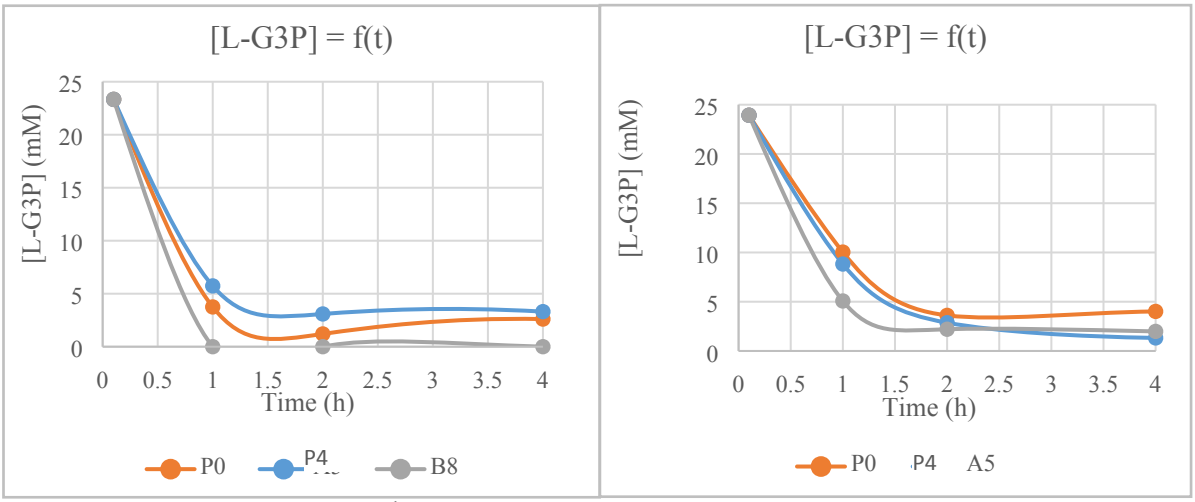
Table S2. Specific activity of selected purified enzymes

2.5 L-G3P content

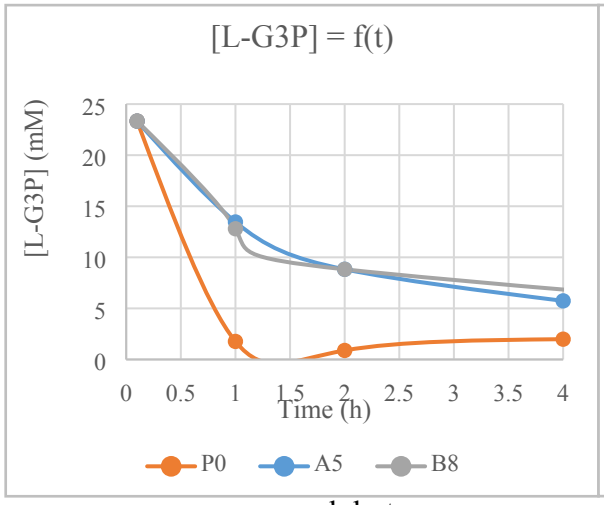
An aliquot of 4 µL was mixed with 945 µL of Glygly buffer (50 mM, pH 8.0), 20 µl of NADPH (12 mg.mL^{-1} solution) and 30 µL of a L-G3P reductase solution. One mmol of NADPH oxidized was equivalent to the reduction of 1 mmol of L-G3P.

2.6 Analytical scale syntheses

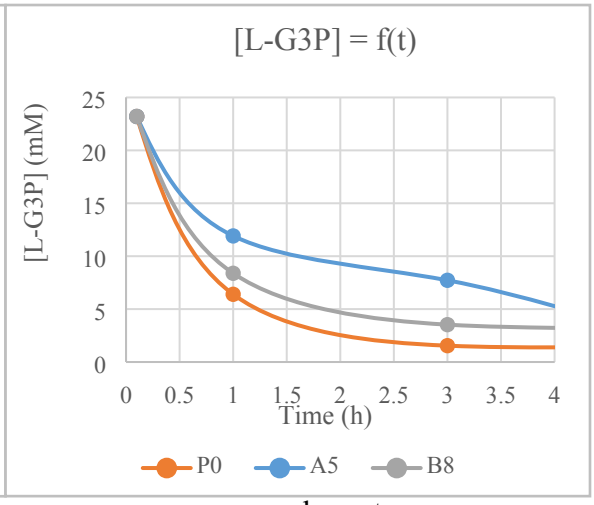
100 µL of a solution of D,L-G3P (30 mM) were mixed with 25 µL of a solution of nucleophile (1M) and x mg of enzyme, x being 0,2 for propanal, acetone and cyclobutanone nucleophiles and equal to 0,5 for glycolaldehyde and 1 for cyclopentanone and DHA. Aliquots over time, from the reaction vessel, were assayed for L-G3P content as described above.



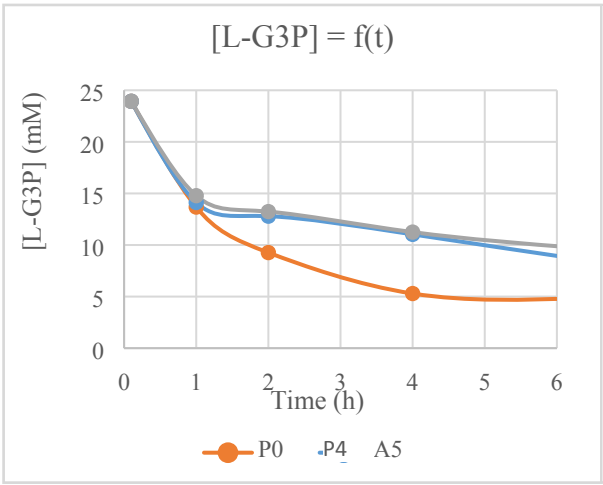
propanal acetone



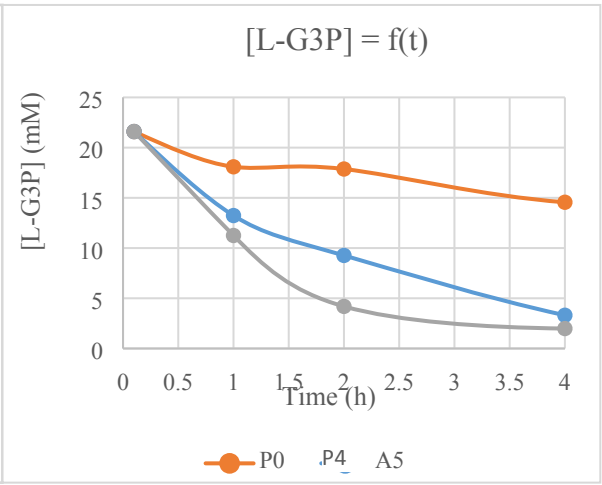
cyclobutanone



cyclopentanone



glycolaldehyde



dihydroxyacetone

P0 = P0A6L0; P4 = P44430; B8 = B8HFF3

2.7 General protocol for the preparation of terminally phosphorylated monosaccharides

To a solution of L-G3P in water (100 mM) was added the nucleophile and the pH was adjusted to 7.5 using a NaOH 0.1M solution. 50 mg (25 U/mg) of B8HFF3 DERA lyophilized powder was then added and the reaction mixture was allowed to gently stir at room temperature. After total disappearance of L-G3P (using the L-G3P reductase assay), the reaction mixture was passed through an IMAC column to remove the enzyme. The eluate was partially evaporated to remove the excess of volatile nucleophile, and acetone was added to precipitate the aldol product. After centrifugation, the precipitate was washed twice with acetone, solubilized in water, and then lyophilized.

2.7.1 *(2S,3S,4R)-2,3-dihydroxy-4-methyl-5-oxopentyl phosphate **11** (2-deoxy-2-methyl-L-xylose-5-phosphate)*

L-G3P solution (70 mM, 3 mL, 201 µmoles) and propanal (60 µL, 810 µmoles, 4 eq.) gave 48 mg (88 %) of compound **11**.

2.7.2 *(2S,3S)-2,3-dihydroxy-5-oxohexylphosphate **12** (1,3-dideoxy-L-sorbose-6-phosphate)*

L-G3P solution (105 mM, 1.9 mL, 201 µmoles) and acetone (60 µL, 810 µmoles, 4 eq.) gave 36 mg (72%) of compound **12**.

2.7.3 *(2S,3S)-2,3-dihydroxy-3-(2-oxocyclobutyl)propyl phosphate **13***

L-G3P solution (107 mM, 1.9 mL, 201 µmoles) and cyclobutanone (61 µL, 810 µmoles, 4 eq.) gave 39 mg (74 %) of compound **13**.

2.7.4 *(2S,3S)-2,3-dihydroxy-3-(2-oxocyclopentyl)propyl phosphate **14***

L-G3P solution (40 mM, 4.9 mL, 201 µmoles) and cyclopentanone (72 µL, 810 µmoles, 4 eq.) gave 37 mg (68 %) of compound **14**.

2.7.5 *(2S,3R,4R)-2,3,4-trihydroxy-5-oxopentyl phosphate **15** (L-lyxose-5-phosphate)*

L-G3P solution (31 mM, 6 mL, 186 µmoles) and glycolaldehyde (44 mg, 744 µmoles, 4 eq.) gave 42 mg (89%) of compound **15**.

2.7.6 *(2S,3R,4R)-2,3,4,6-tetrahydroxy-5-oxohexyl phosphate **16** (L-tagatose-6-phosphate)*

L-G3P solution (70 mM, 3 mL, 201 µmoles) and DHA (73 mg, 810 µmoles, 4 eq.) gave 40 mg (65 %) of compound **16**.

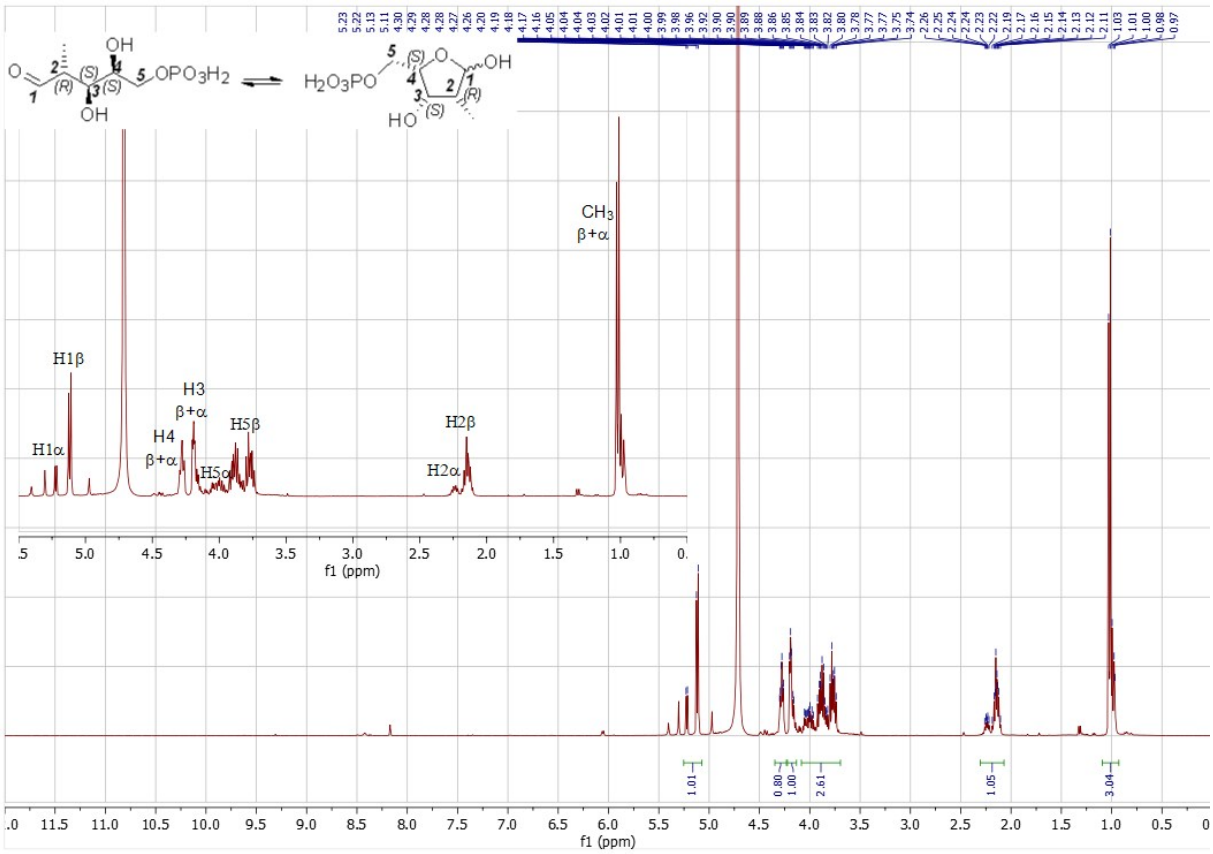
2.8 Characterization of the aldols

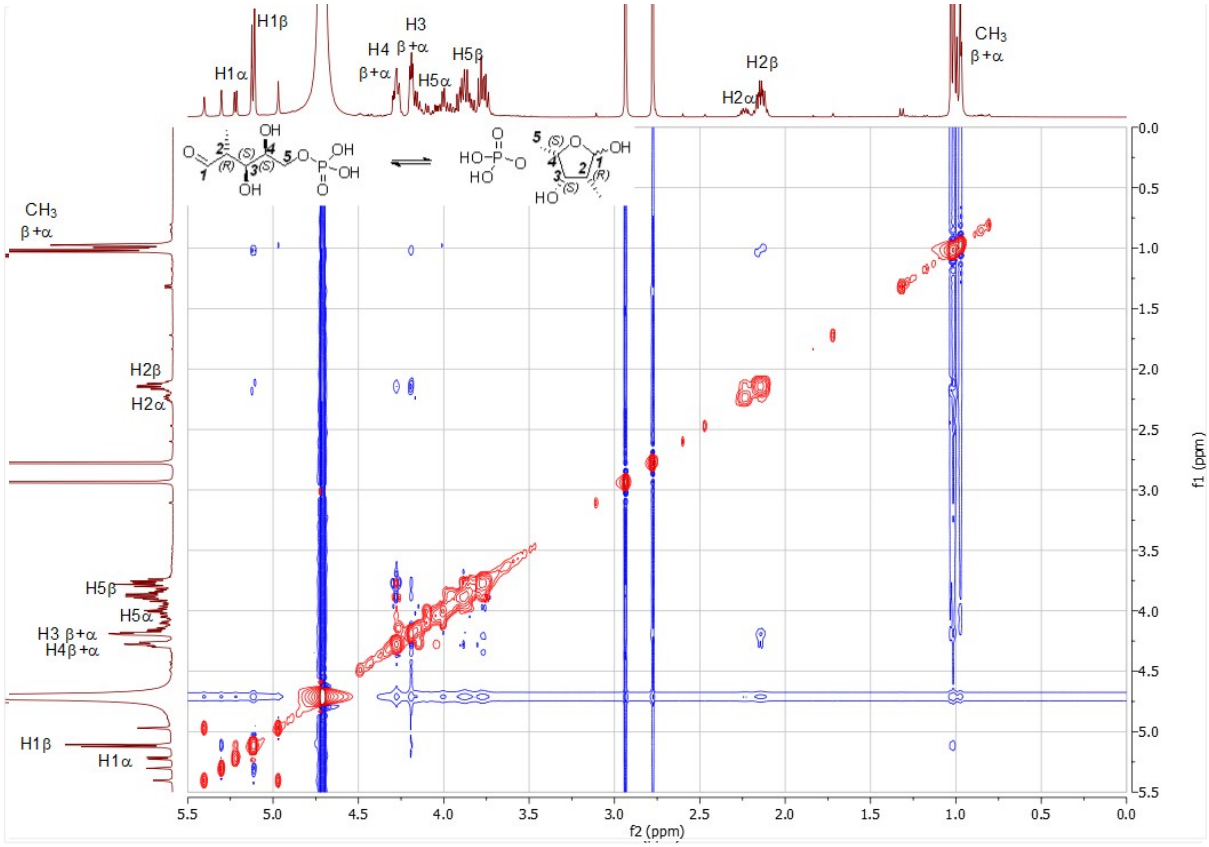
Nuclear magnetic resonance (NMR) spectra were measured in deuterated solvents (D_2O) on a Bruker AC-400 spectrometer (400 MHz for ^1H and 100 MHz for ^{13}C) spectrometer. Conventional 1D ^1H and 1D ^{13}C, selective 1D NOESY and 2D COSY, 2D HSQC, 2D multiplicity-edited HSQC and 2D NOESY experiments were collected using a standard Bruker software and acquired under routine conditions and variable temperature. The residual solvent signal was used as the internal standard; chemical shifts (δ) are expressed in parts per million and coupling constants (*J*) in Hertz. Electrospray ionization mass spectra (ESI-MS) were recorded on a micro q-tof Micromass (3000 V) and high-resolution mass spectra (HR-MS) were recorded on the same instrument with an internal lock mass (H_3PO_4) and an external lock mass (Leu-enkephalin).

2.8.1 *(2S,3S,4R)-2,3-dihydroxy-4-methyl-5-oxopentyl phosphate **11** (2-deoxy-2-methyl-L-xylose-5-phosphate)*

Mixture of anomers α and β, the latter being the major compound.
β-anomer: ^{1}H NMR (400 MHz, D_2O) δ 5.12 (d, *J* = 6.8 Hz, 1H, H1), 4.28 (m, 1H, H4), 4.19 (m, 1H, H3), 3.88 (m, 1H, H5), 3.82 (m, 1H, H5'), 2.15 (td, *J* = 7.0, 4.6 Hz, 1H, H2), 1.02 (d, *J* = 7.1 Hz, 3H, CH_3).
^{13}C NMR (101 MHz, D_2O) δ 103.6 (C1), 81.4 (d, *J* = 7.2 Hz, C4), 73.6 (C3), 62.5 (d, *J* = 4.2 Hz, C5), 45.7 (C2), 9.0 (CH_3).
α-anomer: ^{1}H NMR (400 MHz, D_2O) δ 5.22 (d, *J* = 5.3 Hz, 1H, H1), 4.28 (m, 1H, H4), 4.19 (m, 1H, H3), 4.16 (m, 1H, H5), 4.01 (m, 1H, H5'), 2.24 (dt, *J* = 7.2, 5.0 Hz, 1H, H2), 0.98 (d, *J* = 7.1 Hz, 3H).
^{13}C NMR (101 MHz, D_2O) δ 99.6 (C1), 82.4 (d, *J* = 7.3 Hz, C4), 72.2 (C3), 63.4 (d, *J* = 4.5 Hz, C5), 42.2 (C2), 7.2 (CH_3).
HRMS ESI-: m/z calculated for [$C_6H_{13}O_7P$-H] = 227.0326, found: 227.0319.

^{1}H, ^{13}C, 2D 1H- 1H COSY and HSQC NMR as well as NOESY spectra (D_2O) of the aldol adduct from the addition of propanal to L-G3P.

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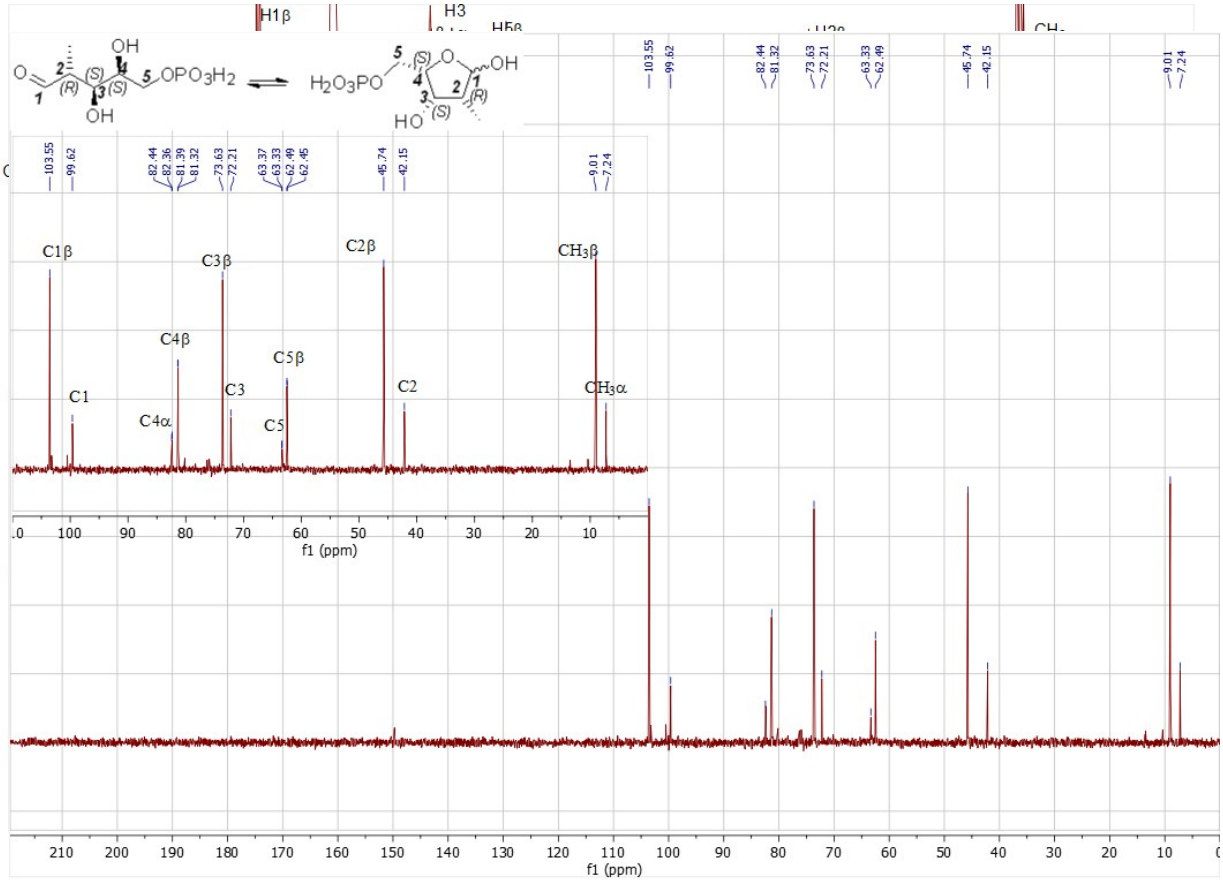
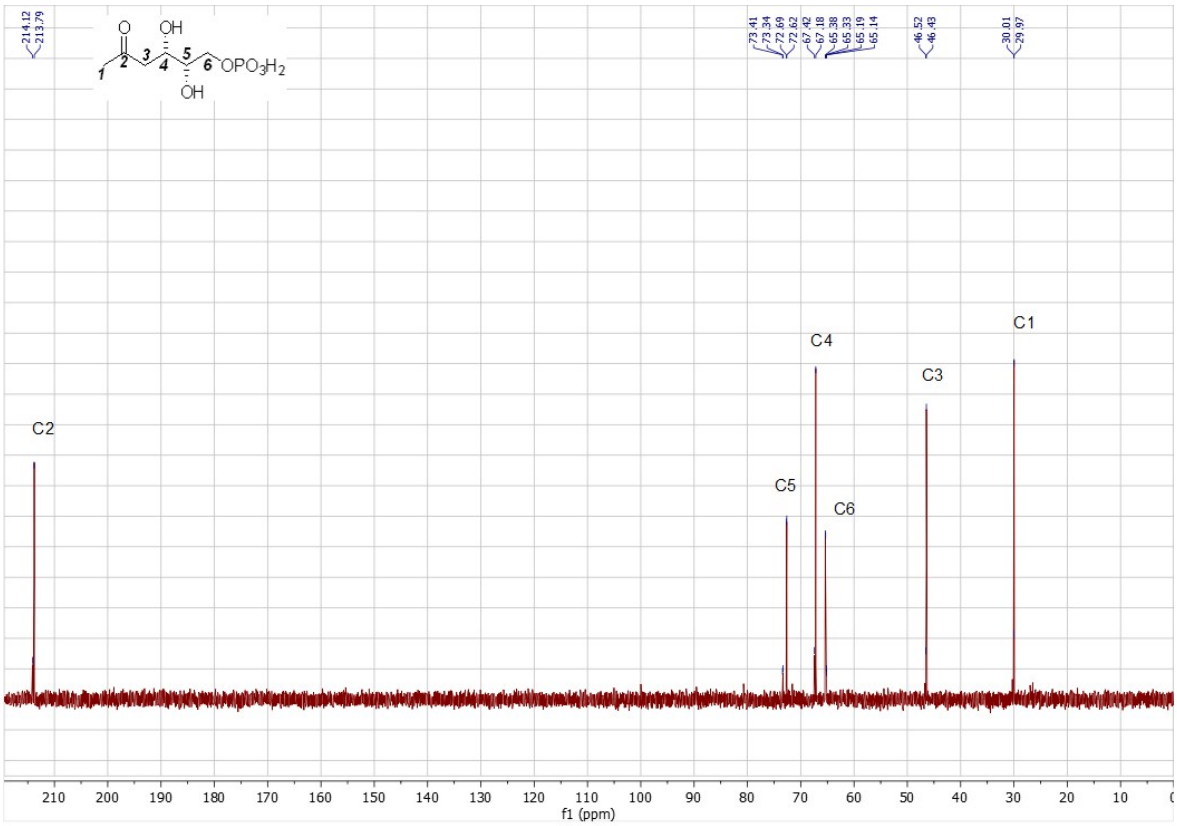
H1α
H3
H4 β+α
β+α
H5α
H5β
H2β
H2α
CH3
β+α
CH3
β+α
H2β
H2α
H5β
H5α
H3 β+α
H4β+α
H1β
H1α
f2 (ppm)
f1 (ppm)

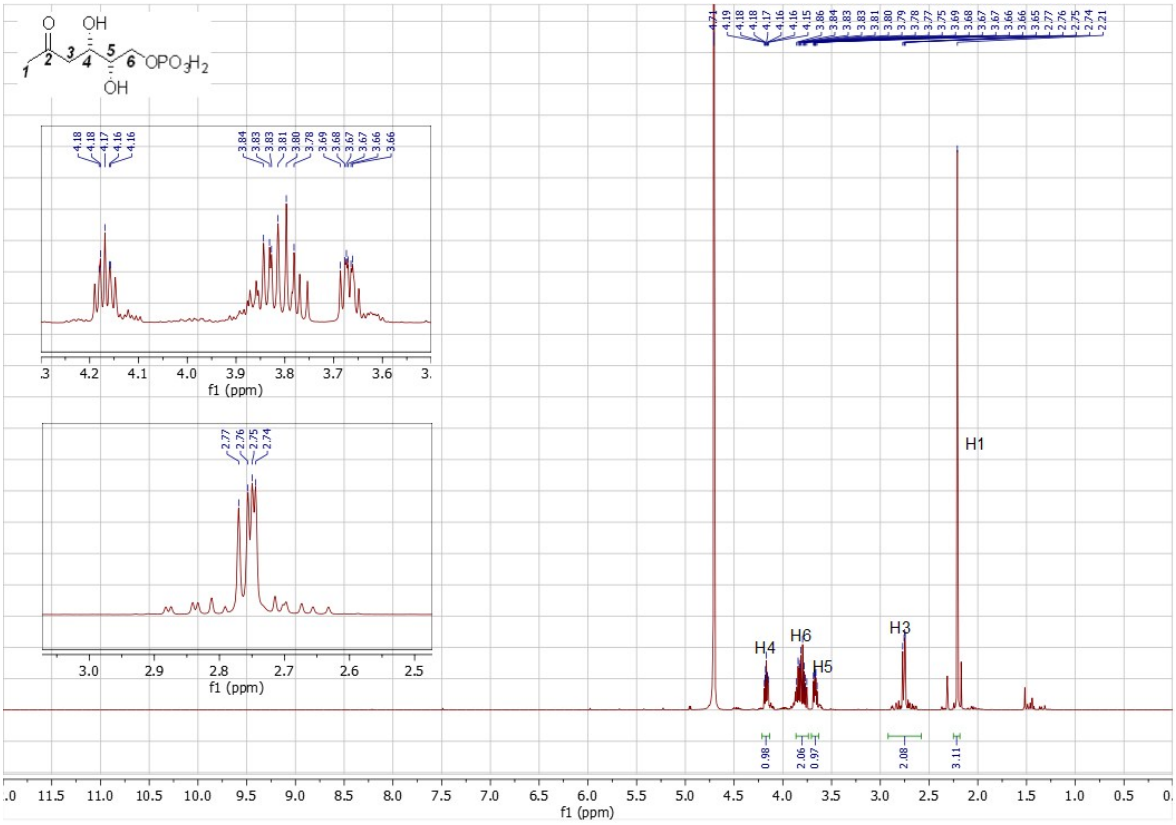

C1β
C3β
C2β
CH3β
C4β
C5β
C1
C3
C2
C4α
C5
CH3α
f1 (ppm)
f1 (ppm)

2.8.2 *(2S,3S)-2,3-dihydroxy-5-oxohexylphosphate* ***12*** *(1,3-dideoxy-L-sorbose-6-phosphate)*

The ultra-major product is the linear compound:
^{1}H NMR (400 MHz, D_2O) δ 4.17 (ddd, *J* = 8.4, 4.8, 3.7 Hz, 1H, H4), 3.81 (2d, *J* = 14.3, 8.4 Hz, 2H, H6), 3.67 (ddd, *J* = 12.1, 8.4, 4.3 Hz, 1H, H5), 2.75 (m, 2H, H3), 2.21 (s, 3H, H1).
^{13}C NMR (101 MHz, D_2O) δ 213.8 (C2), 72.7 (d, *J* = 7.3 Hz, C5), 67.2 (C4), 65.4 (d, *J* = 5.1 Hz, C6), 46.4 (C3), 29.9 (C1).
HRMS ESI-: m/z calculated for $[C_6H_{13}O_7P\text{-}H]$ = 227.0326, found: 227.0321.

^{1}H and ^{13}C NMR spectra (D_2O) of the aldol adduct from the addition of acetone to L-G3P.

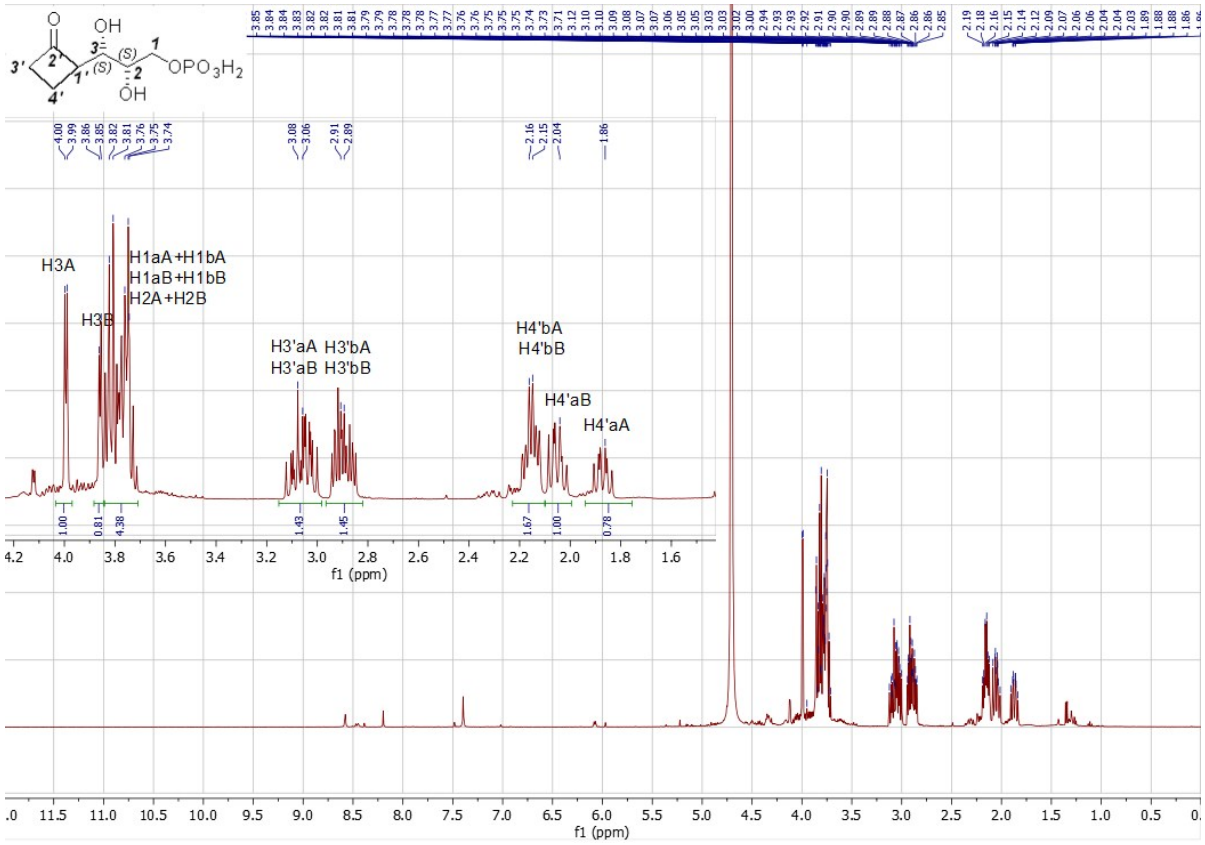


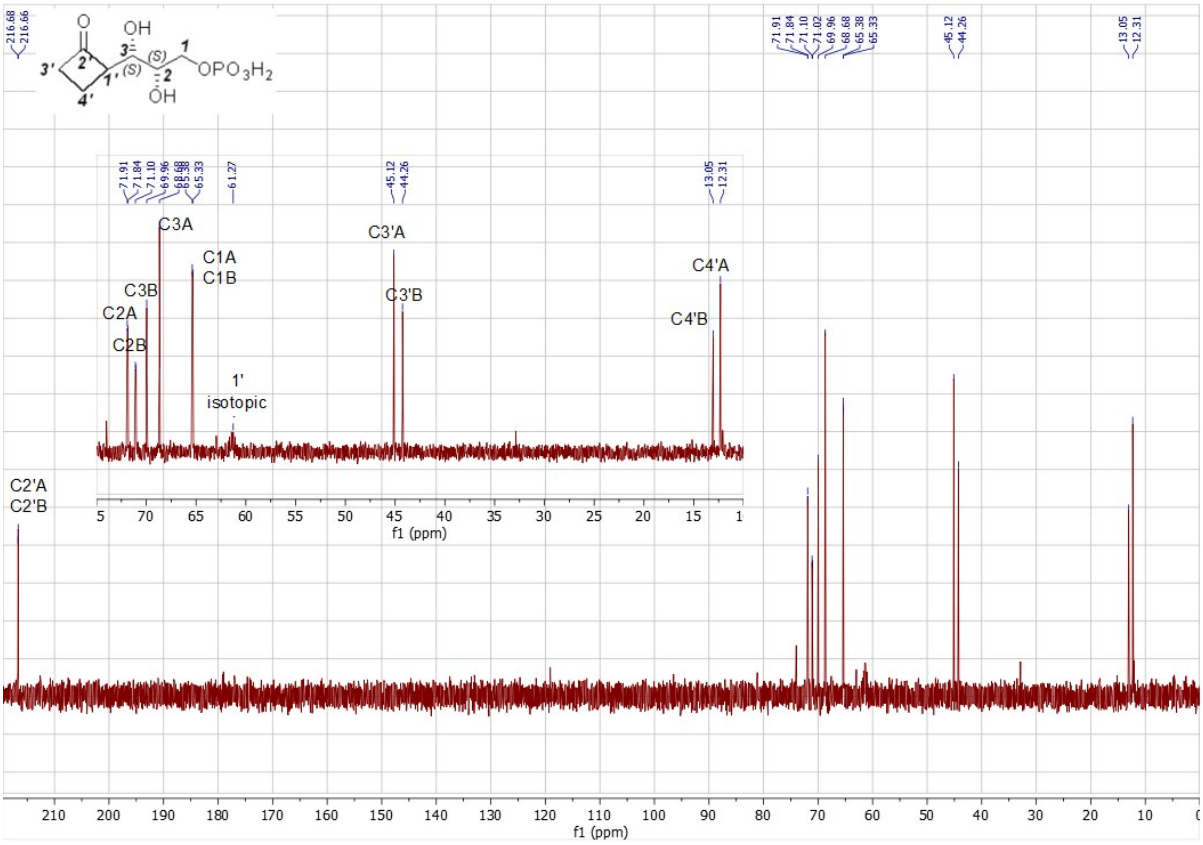


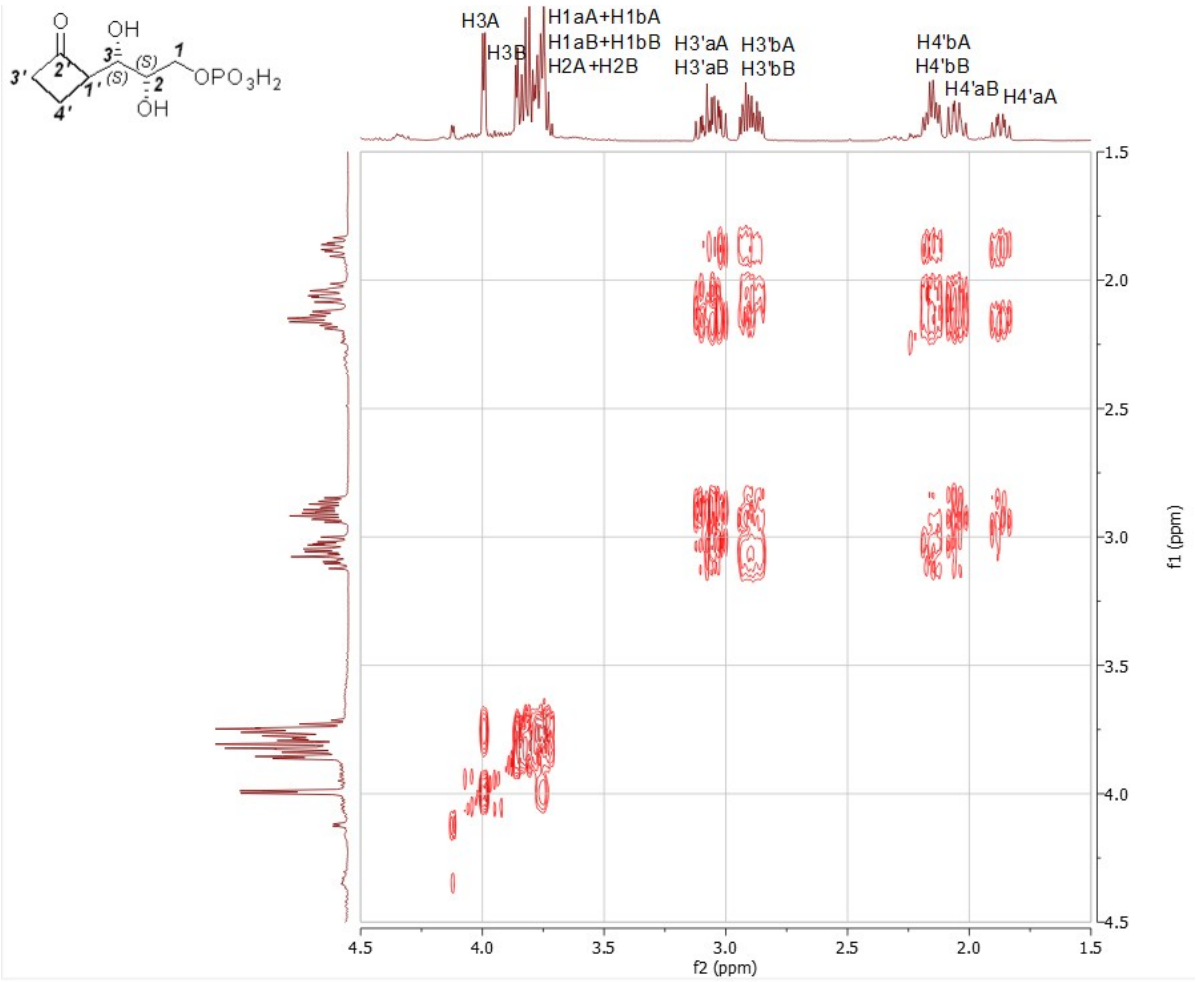
2.8.3 *(2S,3S)-2,3-dihydroxy-3-(2-oxocyclobutyl)propyl phosphate* ***13***

The ultra-major product is the linear compound in two epimeric forms (A and B) at C1' (deuterium isotopic exchange of H1' in D_2O):
Form A: ^{1}H NMR (400 MHz, D_2O) δ 3.99 (d, *J* = 3.8 Hz, 1H, H3), 3.78 (m, 3H, H1a+H1b+H2), 3.06 (m, 1H, H3'a), 2.90 (m, 1H, H3'b), 2.16 (m, 1H, H4'b), 1.87 (ddd, *J* = 11.1, 10.0, 7.5 Hz, 1H, H4'a).
^{13}C NMR (101 MHz, D_2O) δ 216.6 (C2'), 71.9 (d, *J* = 7.4 Hz, C2), 68.7 (C3), 65.4 (d, *J* = 5.1 Hz, C1), 61.3 (C1', isotopic exchange), 45.1 (C3'), 12.3 (C4').
Form B: ^{1}H NMR (400 MHz, D_2O) δ 3.86 (d, *J* = 3.2 Hz, 1H, H3), 3.78 (m, 3H, H1a+H1b+H2), 3.06 (m, 1H, H3'a), 2.90 (m, 1H, H3'b), 2.16 (m, 1H, H4'b), 2.05 (ddd, *J* = 11.1, 9.8, 7.6 Hz, 1H, H4'a).
^{13}C NMR (101 MHz, D_2O) δ 216.7 (C2'), 71.1 (d, *J* = 7.4 Hz, C2), 70.0 (C3), 65.4 (d, *J* = 5.1 Hz, C1), 61.3 (C1', isotopic exchange), 44.26 (C3'), 13.1 (C4').
HRMS ESI-: m/z calculated for [$C_7H_{12}DO_7P$-H] = 240.0389, found: 240.0385.

1H, 13C, 2D 1H- 1H COSY and HSQC NMR spectra (D_2O) of the aldol adduct from the addition of cyclobutanone to L-G3P.



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H3B
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H1aB+H1bB
H2A+H2B
H3'aA
H3'aB
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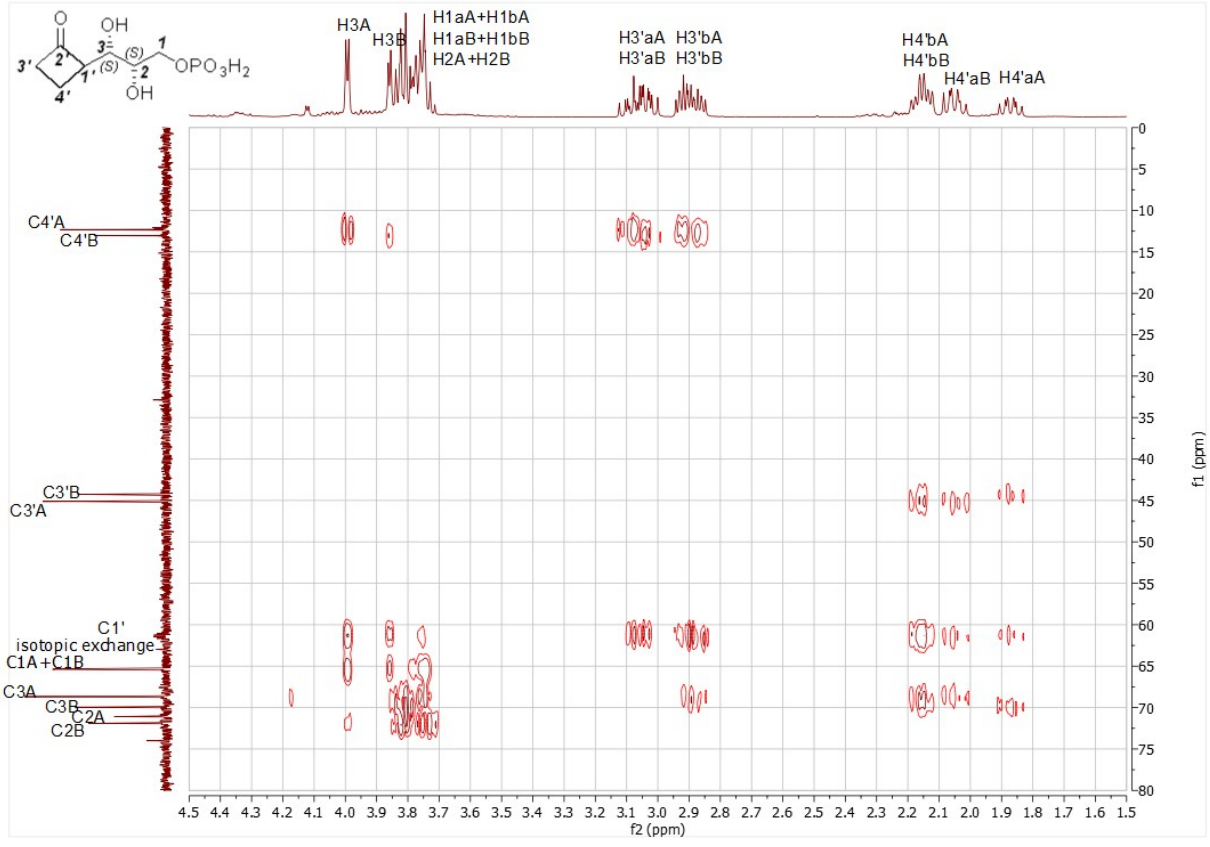
f2 (ppm)
f1 (ppm)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H3B
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H1aB+H1bB
H2A+H2B
H3'aA
H3'aB
H3'bA
H3'bB
H4'bA
H4'bB
H4'aB
H4'aA
C4'A
C4'B
C3'B
C3'A
C1'
isotopic exchange
C1A+C1B
C3A
C3B
C2A
C2B
f2 (ppm)
f1 (ppm)

2.8.4 *(2S,3S)-2,3-dihydroxy-3-(2-oxocyclopentyl)propyl phosphate* ***14***

The spectra are identical to those already published.[6]

The major product is the linear compound in two epimeric forms (A and B) at C1' (deuterium isotopic exchange of H1' in D_2O):

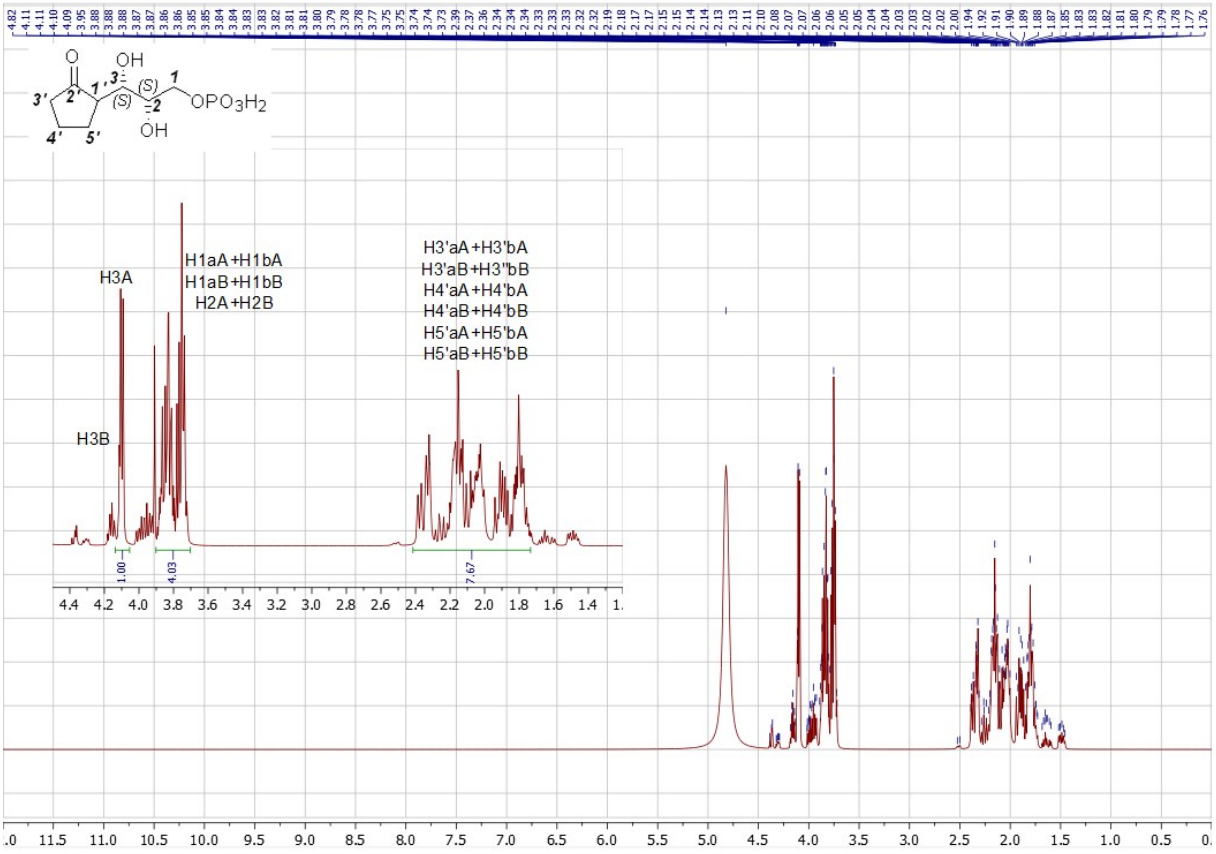
Form A: ^{1}H NMR (400 MHz, D_2O) δ 4.11 (d, *J* = 4.6 Hz, 1H, H3), 4.05-3.50 (m, 3H, H1a+H1b+H2), 2.45-1.70 (m, 6H, H3'a+H3'b+H4'a+H4'b+H5'a+H5'b).

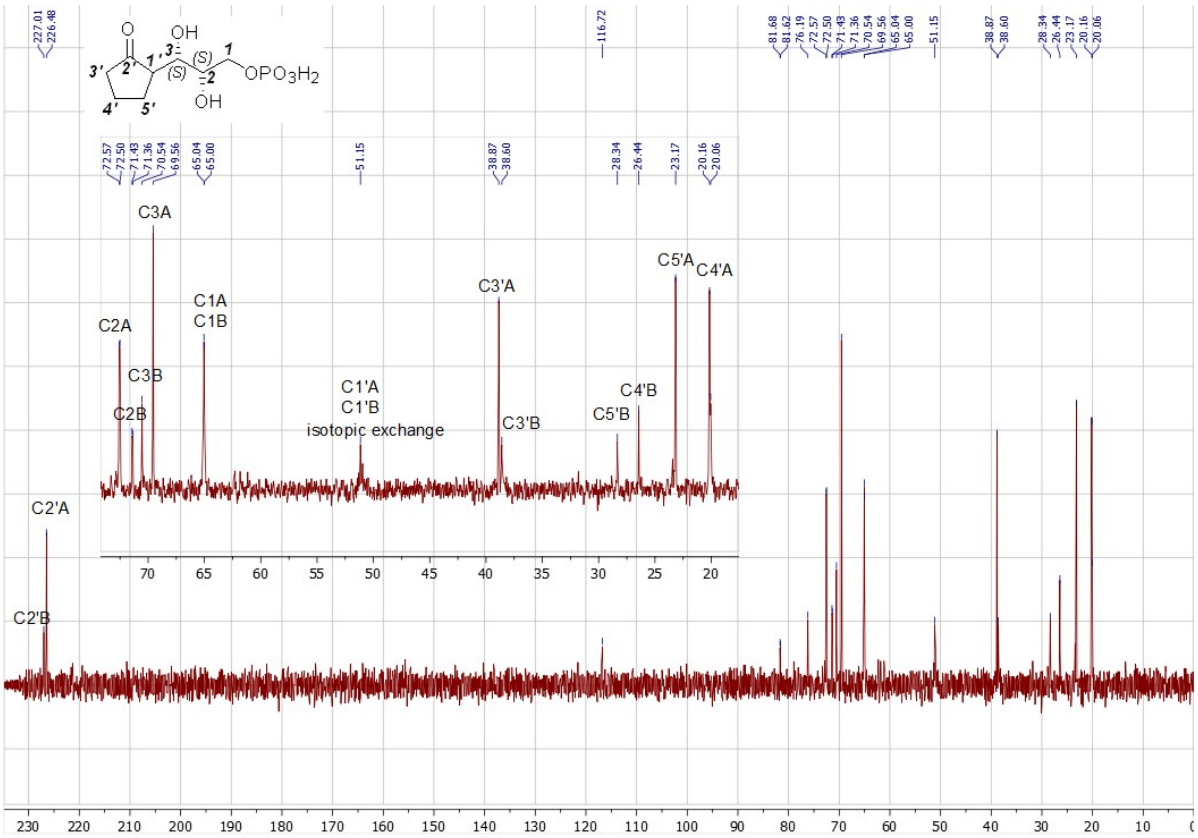
^{13}C NMR (101 MHz, D_2O) δ 226.5 (C2'), 72.6 (d, *J* = 6.8 Hz, C2), 69.6 (C3), 65.0 (d, *J* = 4.4 Hz, C1), 51.2 (C1': isotopic exchange), 38.9 (C3'), 23.2 (C5'), 20.16 (C4').

Form B: ^{1}H NMR (400 MHz, D_2O) δ 4.10 (d, *J* = 5.6 Hz, 1H, H3), 4.05-3.50 (m, 3H, H1a+H1b+H2), 2.45-1.70 (m, 6H, H3'a+H3'b+H4'a+H4'b+H5'a+H5'b).

^{13}C NMR (101 MHz, D_2O) δ 227.0 (C2'), 71.4 (d, *J* = 6.8 Hz, C2), 70.5 (C3), 65.0 (d, *J* = 4.4 Hz, C1), 51.2 (C1': isotopic exchange), 38.6 (C3'), 28.3 (C5'), 26.4 (C4').

^{1}H and ^{13}C NMR spectra (D_2O) of the aldol adduct from the addition of cyclopentanone to L-G3P.

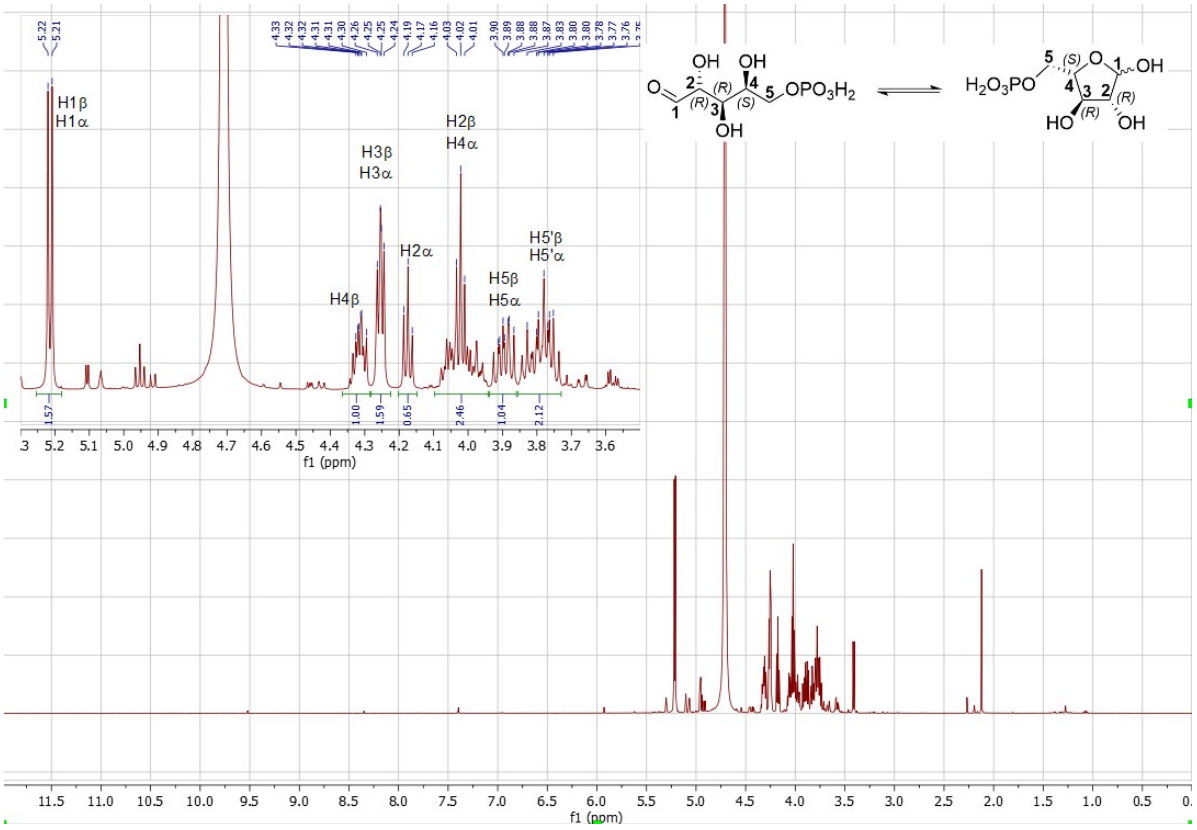


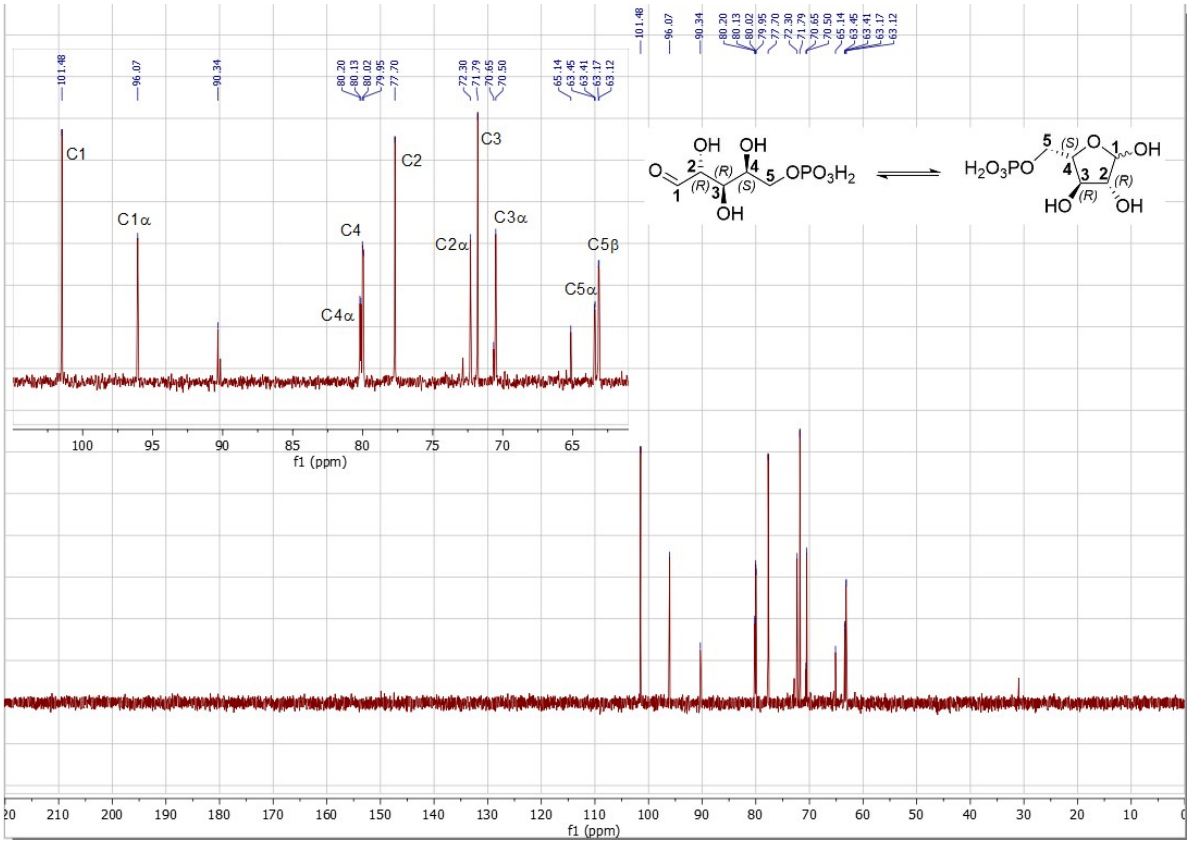


2.8.5 *(2S,3R,4R)-2,3,4-trihydroxy-5-oxopentyl phosphate* ***15*** *(L-lyxose-5-phosphate)*

The spectra were identical to those already published[77]
Mixture of anomers α and β, the latter being the major compound.
β-anomer: ^{1}H NMR (400 MHz, D_2O) δ 5.21 (d, *J* = 4.8 Hz, 1H, H1), 4.31 (m, 1H, H4), 4.25 (dd, *J* = 4.5, 3.3 Hz, 1H, H3), 4.02 (t, *J* = 4.5 Hz, 1H, H2), 3.90 (m, 1H, H5), 3.79 (m, 1H, H5'). ^{13}C NMR (101 MHz, D_2O) δ 101.5 (C1), 80.0 (d, *J* = 6.9 Hz, C4), 77.7 (C2), 71.8 (C3), 63.1 (d, *J* = 4.5 Hz, C5).
α-anomer: ^{1}H NMR (400 MHz, D_2O) δ 5.20 (d, *J* = 4.8 Hz, 1H, H1), 4.25 (dd, *J* = 4.7, 3.3 Hz, 1H, H3), 4.17 (t, *J* = 4.7 Hz, 1H, H2), 4.02 (m, 1H, H4), 3.90 (m, 1H, H5), 3.79 (m, 1H, H5'). ^{13}C NMR (101 MHz, D_2O) δ 96.1 (C1), 80.2 (d, *J* = 6.9 Hz, C4), 72.3 (C2), 70.5 (C3), 63.4 (d, *J* = 4.5 Hz, C5).
HRMS ESI–, m/z calcd. for $[C_6H_{12}O_9P\text{-}H]$=229.0119, found 229.0114.

^{1}H, ^{13}C, spectra (D_2O) of the aldol adduct from the addition of glycolaldehyde to L-G3P.

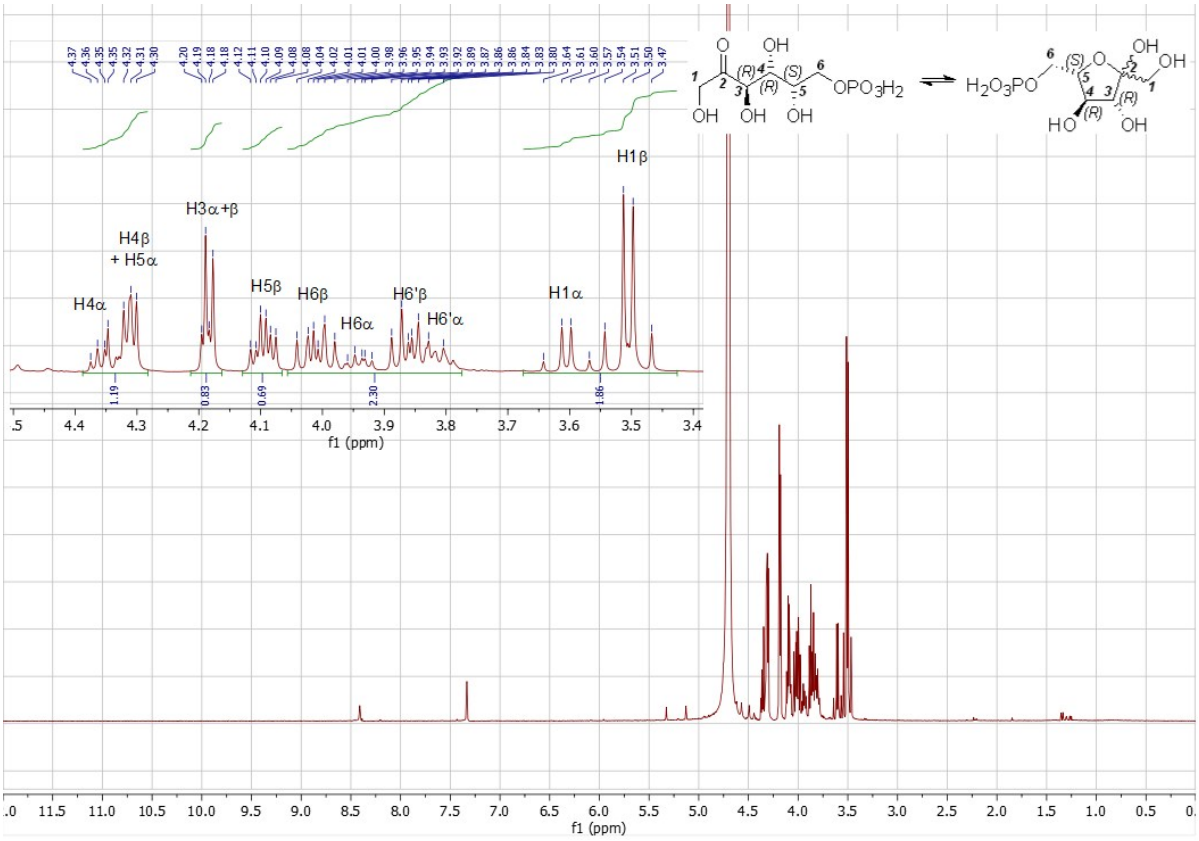


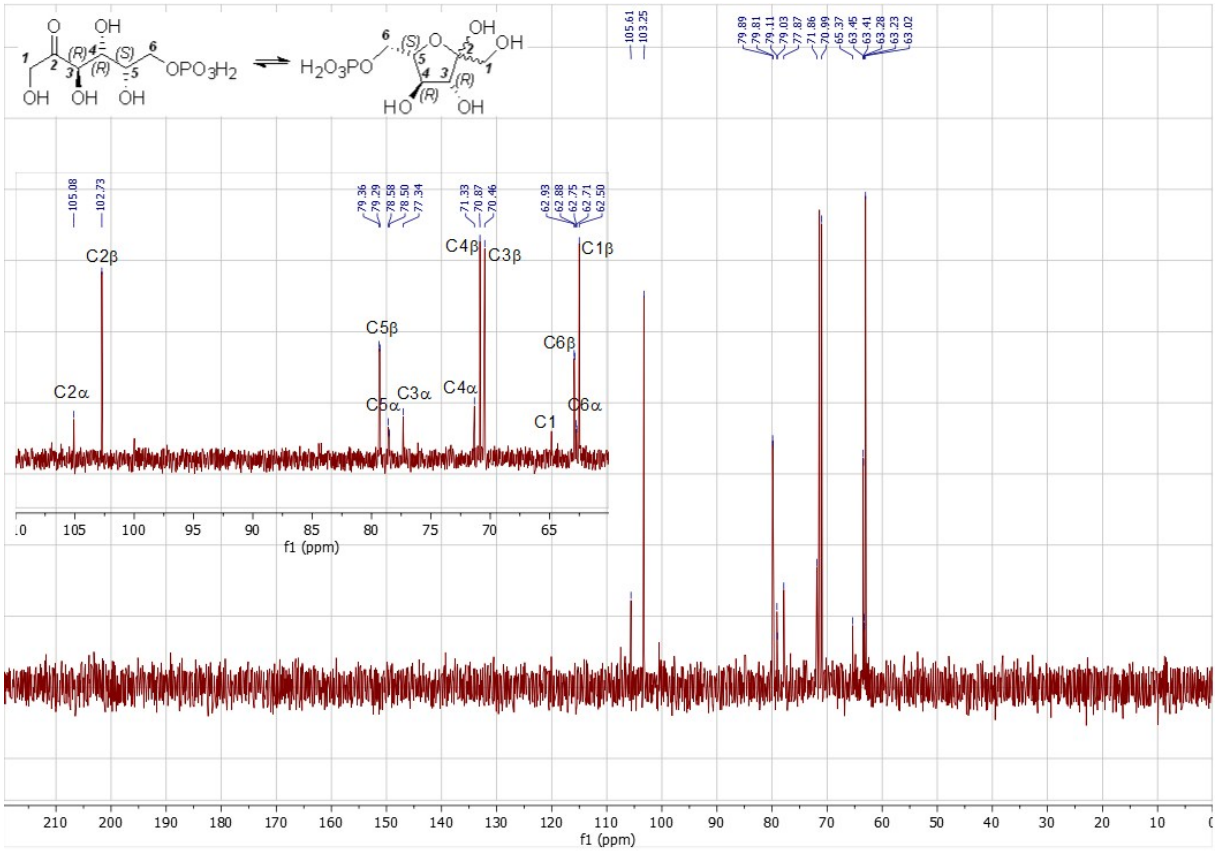


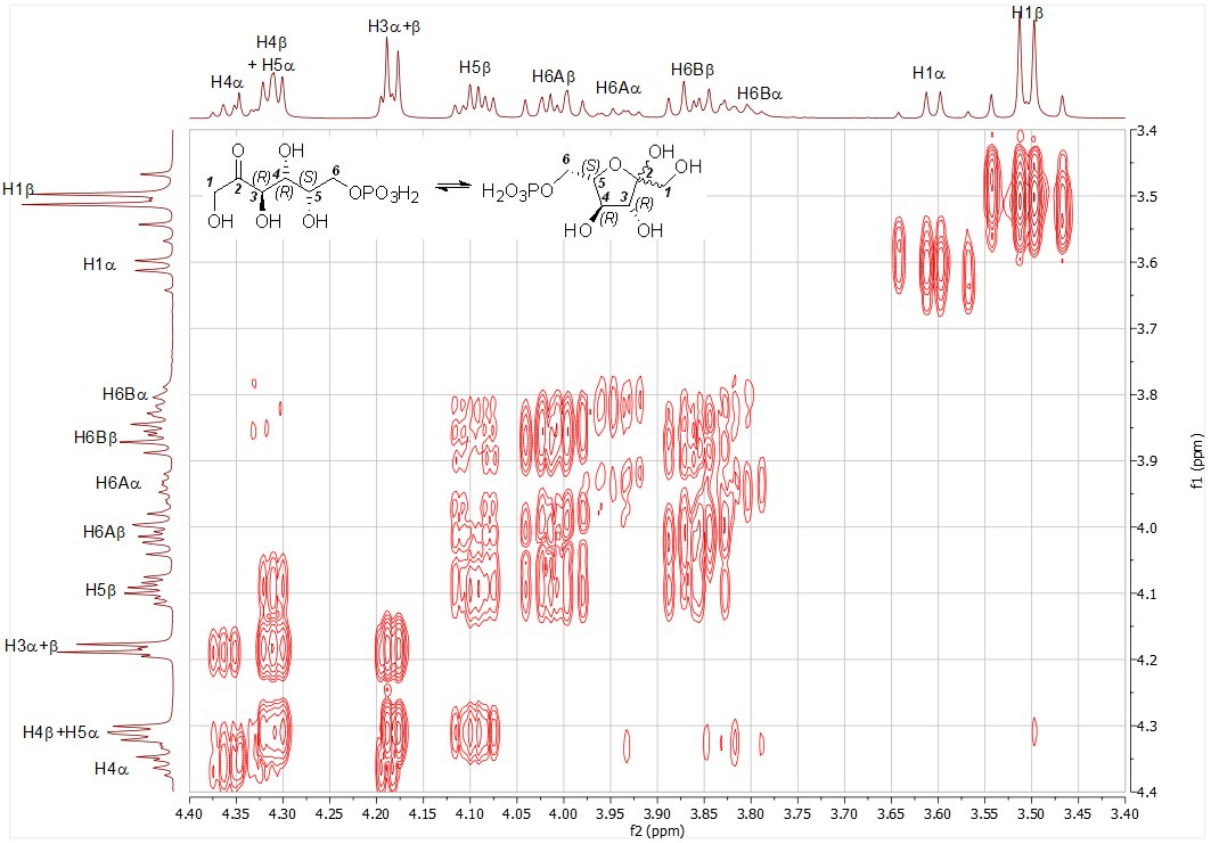
2.8.6 *(2S,3R,4R)-2,3,4,6-tetrahydroxy-5-oxohexyl phosphate* ***16*** *(L-tagatose-6-phosphate)*

The spectra were identical to those already published.[8]
Mixture of anomers α and β, β being the major compound.
β-anomer: ^{1}H NMR (400 MHz, D_2O) δ 4.31 (m, 1H, H4), 4.18 (d, *J* = 4.8 Hz, 1H, H3), 4.10 (td, *J* = 6.6, 3.5 Hz, 1H, H5), 4.02 (dt, *J* = 10.8, 6.6 Hz, 1H, H6), 3.85 (m, 1H, H6'), 3.53 (d, *J* = 12.1 Hz, 1H, H1), 3.48 (d, *J* = 12.1 Hz, 1H, H1').
^{13}C NMR (101 MHz, D_2O) δ 102.7 (C2), 79.3 (d, *J* = 7.2 Hz, C5), 70.9 (C4), 70.5 (C3), 62.9 (d, *J* = 4.6 Hz, C6), 62.5 (C1).
α-anomer: ^{1}H NMR (400 MHz, D_2O) δ 4.35 (m, 1H, H4), 4.31 (m, 1H, H5), 4.18 (d, *J* = 4.8 Hz, 1H, H3), 3.95 (m, 1H, H6), 3.82 (m, 1H, H6'), 3.63 (d, *J* = 11.9 Hz, 1H, H1), 3.58 (d, *J* = 11.9 Hz, 1H, H1').
^{13}C NMR (101 MHz, D_2O) δ 105.1 (C2), 78.5 (d, *J* = 7.7 Hz, C5), 77.3 (C3), 71.3 (C4), 64.8 (C1), 62.7 (d, *J* = 4.6 Hz, C6).
HRMS ESI–, m/z calcd. for $[C_6H_{12}O_9P\text{-}H]$=253.0224, found 259.0226.

^{1}H, ^{13}C, 2D 1H- 1H COSY and HSQC NMR spectra (D_2O) of the aldol adduct from the addition of DHA to L-G3P.




C2β
C2α
C5β
C5α
C3α
C4β
C3β
C4α
C1
C1β
C6β
C6α
f1 (ppm)


H4α
H4β
+ H5α
H3α+β
H5β
H6Aβ
H6Aα
H6Bβ
H6Bα
H1α
H1β
f2 (ppm)
f1 (ppm)

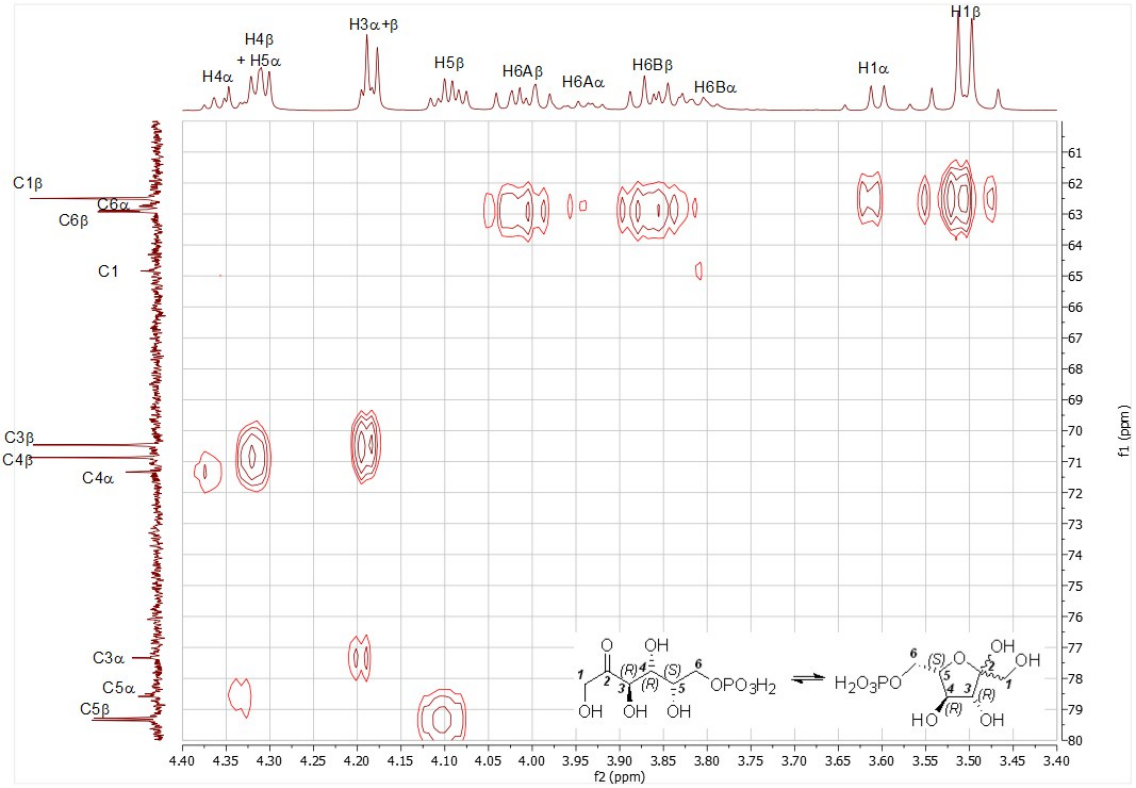

H1β
H3α+β
H4β
+ H5α
H4α
H5β
H6Aβ
H6Aα
H6Bβ
H6Bα
H1α
C1β
C6α
C6β
C1
C3β
C4β
C4α
C3α
C5α
C5β
f1 (ppm)
f2 (ppm)
4.40 4.35 4.30 4.25 4.20 4.15 4.10 4.05 4.00 3.95 3.90 3.85 3.80 3.75 3.70 3.65 3.60 3.55 3.50 3.45 3.40
61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80
O
OH
OPO3H2
OH OH OH
H2O3PO
HO
OH
OH

Table S3. DERA collection

Uniprot ID	Organisms	Strain used for PCR	Primer 5prim	Primer 3prim
A3DLD3	*Staphylothermus marinus (strain ATCC 43588 / DSM 3639 / JCM 9404 / F1)*	DSMZ-3639	AAAGAAGGAGATAGGATCATGGGTGTTGGTTCGCTTG	GTGTAATGGATAGTGATCTTATTTTCCCTCCTTTAACTTGATG
A5FJC8	*Flavobacterium johnsoniae (strain ATCC 17061 / DSM 2064 / UW101) (Cytophaga johnsonae)*	DSMZ-2064	AAAGAAGGAGATAGGATCATGTACTTTTGCGCCATTC	GTGTAATGGATAGTGATCTTAATATTGATTTGTGGTATTTTCTC
A5VHQ9	*Lactobacillus reuteri (strain DSM 20016)*	DSMZ-20016	AAAGAAGGAGATAGGATCATGAAGTTAACGCAAGCACAATTAG	GTGTAATGGATAGTGATCTTATTGTTTTGCGGCTTCTTC
A6H1F6	*Flavobacterium psychrophilum (strain JIP02/86 / ATCC 49511)*	DSMZ-21280	AAAGAAGGAGATAGGATCATGAATATTAAGCAATATCTA	GTGTAATGGATAGTGATCTTAATAATTTTCAGCGCTAA
A7HN67	*Fervidobacterium nodosum (strain ATCC 35602 / DSM 5306 / Rt17-B1)*	DSMZ-5306	AAAGAAGGAGATAGGATCATGGATATTGTTAAATTTGTAGAAGAAAAG	GTGTAATGGATAGTGATCTTAGCGTTTTACTATGTTAGTACCAG
A8F3L9	*Pseudothermotoga lettingae (strain ATCC BAA-301 / DSM 14385 / NBRC 107922 / TMO) (Thermotoga lettingae)*	DSMZ-14385	AAAGAAGGAGATAGGATCATGTTTATAAAGTTTTCCGAGAGGG	GTGTAATGGATAGTGATCTTACTTCCTCCTATGCCTTTC
A8MH18	*Alkaliphilus oremlandii (strain OhILAs) (Clostridium oremlandii (strain OhILAs))*	DSMZ-21761	AAAGAAGGAGATAGGATCATGAATATAGCAAAATATATCGATCAC	GTGTAATGGATAGTGATCTTAATACCCCGCCGTATT
A9BEN0	*Petrotoga mobilis (strain DSM 10674 / SJ95)*	DSMZ-10674	AAAGAAGGAGATAGGATCATGAGAATTTCAGAATTAGAAAAG	GTGTAATGGATAGTGATCTTATATACTTTCTTGAATTATCTTTAATC
A9KKG9	*Lachnoclostridium phytofermentans (strain ATCC 700394 / DSM 18823 / ISDg) (Clostridium phytofermentans)*	DSMZ-18823	AAAGAAGGAGATAGGATCATGGCGCTAAAGCGCGGA	GTGTAATGGATAGTGATCTTAATAGCCGTTTGCAGACTC
B0S0N1	*Finegoldia magna (strain ATCC 29328) (Peptostreptococcus magnus)*	ATCC-29328	AAAGAAGGAGATAGGATCATGGAATTAAATAAATATATCG	GTGTAATGGATAGTGATCTTATCCTTCTACTATTTTAAT
B1C5N8	*Anaerofustis stercorihominis DSM 17244*	DSMZ-17244	AAAGAAGGAGATAGGATCATGAAAAAAGAAGTAGATTTA	GTGTAATGGATAGTGATCTTAACCATTAACTCTTTTTTT
B1C7X1	*Anaerofustis stercorihominis DSM 17244*	DSMZ-17244	AAAGAAGGAGATAGGATCATGAGAGAGTATAAAGACCTTGAAAA	GTGTAATGGATAGTGATCTTATTTACCAAGTATTTTATATGCGTC
B1C9V1	*Anaerofustis stercorihominis DSM 17244*	DSMZ-17244	AAAGAAGGAGATAGGATCATGATAACAAAATATGAATTAGCAAG	GTGTAATGGATAGTGATCTTATTTGCTTGCTGCGTC
B5YES7	*Dictyoglomus thermophilum (strain ATCC 35947 / DSM 3960 / H-6-12)*	DSMZ-3960	AAAGAAGGAGATAGGATCATGAATGAGGTGAAAAAAAT	GTGTAATGGATAGTGATCTTACTCTCTAAGCTCATTTATTATTATGTTC
B6FZF5	*[Clostridium] hiranonis DSM 13275*	DSMZ-13275	AAAGAAGGAGATAGGATCATGGAATTAACTAAAAAAGAG	GTGTAATGGATAGTGATCTTATTTTTCATTCTCCTTTTCAAATTC
B6WB70	*Anaerococcus hydrogenalis DSM 7454*	DSMZ-7454	AAAGAAGGAGATAGGATCATGATTATAAAGGAGAAAAAA	GTGTAATGGATAGTGATCTTATTTTTCTCCATTTACTAT
B7CBX4	*Holdemanella biformis DSM 3989*	DSMZ-3989	AAAGAAGGAGATAGGATCATGAATAAATATTTTGATCATAC	GTGTAATGGATAGTGATCTTATTCCTCCACTTTATATTCA
B7CCR8	*Holdemanella biformis DSM 3989*	DSMZ-3989	AAAGAAGGAGATAGGATCATGAACAAAACACAACTCGC	GTGTAATGGATAGTGATCTTATTTTTCCTCGGCTTCAAATTC
B8I9D0	*Clostridium cellulolyticum (strain ATCC 35319 / DSM 5812 / JCM 6584 / H10)*	DSMZ-5812	AAAGAAGGAGATAGGATCATGGTTAACGATAAAAAGGTATTTG	GTGTAATGGATAGTGATCTTATAATTTTTGACTATTCTTAAC
B9MKK9	*Caldicellulosiruptor bescii (strain ATCC BAA-1888 / DSM 6725 / Z-1320) (Anaerocellum thermophilum)*	DSMZ-6725	AAAGAAGGAGATAGGATCATGATGACCAGAGAAGAGATTG	GTGTAATGGATAGTGATCTTATTCTCTACCCACAATTGCTAC
C0EYB5	*[Eubacterium] hallii DSM 3353*	DSMZ-3353	AAAGAAGGAGATAGGATCATGATTGATTTTTCAAAGATT	GTGTAATGGATAGTGATCTTATTCTCCTTCATATGGA
C0QSF7	*Persephonella marina (strain DSM 14350 / EX-H1)*	DSMZ-14350	AAAGAAGGAGATAGGATCATGGATTTGTACTCAGACATAGCAAAAAG	GTGTAATGGATAGTGATCTTACCTCTTGCCTTTTATAATATC
C1DW64	*Sulfurihydrogenibium azorense (strain Az-Fu1 / DSM 15241 / OCM 825)*	DSMZ-15241	AAAGAAGGAGATAGGATCATGACCTATGGTACGGATTTG	GTGTAATGGATAGTGATCTTAATAAGTTTCCTTTGGGTTTCCTCTG
C6A3K7	*Thermococcus sibiricus (strain MM 739 / DSM 12597)*	DSMZ-12597	AAAGAAGGAGATAGGATCATGAATGTTGCCAAATATATAGATCAC	GTGTAATGGATAGTGATCTTACTCGTTTTTTGCCCC
C7N8Y8	*Leptotrichia buccalis (strain ATCC 14201 / DSM 1135 / JCM 12969 / NCTC 10249 / C-1013-b)*	DSMZ-1135	AAAGAAGGAGATAGGATCATGGTAATGATGAAAATAAACAAAT	GTGTAATGGATAGTGATCTTAATATCCAGTTTTTTCAC
C7RF30	*Anaerococcus prevotii (strain ATCC 9321 / DSM 20548 / JCM 6508 / PC1) (Peptostreptococcus prevotii) (Peptococcus prevotii)*	DSMZ-20548	AAAGAAGGAGATAGGATCATGGAAAACAAAGAAATCTACGCTC	GTGTAATGGATAGTGATCTTAATAATCTGACTTATTTTC
D1BL34	*Veillonella parvula (strain ATCC 10790 / DSM 2008 / JCM 12972 / Te3) (Veillonella alcalescens)*	DSMZ-2008	AAAGAAGGAGATAGGATCATGTTGGGTAAAGAATTATTAG	GTGTAATGGATAGTGATCTTATACTTCTTCGTTCAAGTGATTC
D3DYY5	*Methanobrevibacter ruminantium (strain ATCC 35063 / DSM 1093 / JCM 13430 / OCM 146 / M1) (Methanobacterium ruminantium)*	DSMZ-1093	AAAGAAGGAGATAGGATCATGATTACAGCAGAAGAATTAGCTC	GTGTAATGGATAGTGATCTTAAATAAGCCTTGGGCCTG
D3PD71	*Deferribacter desulfuricans (strain DSM 14783 / JCM 11476 / NBRC 101012 / SSM1)*	DSMZ-14783	AAAGAAGGAGATAGGATCATGAAATATGATAATTTTGTTCAGC	GTGTAATGGATAGTGATCTTATCCACATTCATATCTTCTC
D5DGD3	*Bacillus megaterium (strain DSM 319)*	DSMZ-319	AAAGAAGGAGATAGGATCATGAGTCAAAACATTACGGG	GTGTAATGGATAGTGATCTTAATAATCAGAGTTGCTTAATTGAC
D5U8N7	*Brachyspira murdochii (strain ATCC 51284 / DSM 12563 / 56-150) (Serpulina murdochii)*	DSMZ-12563	AAAGAAGGAGATAGGATCATGAACAGTATAAGTAAATTAATCG	GTGTAATGGATAGTGATCTTATTTTTTTTCTGCATTTAC
D8GI14	*Clostridium ljungdahlii (strain ATCC 55383 / DSM 13528 / PETC)*	DSMZ-13528	AAAGAAGGAGATAGGATCATGAATATTGCTAAAATGATTGACC	GTGTAATGGATAGTGATCTTATTCAGATACAATAGTAATACCTGCAC
D8KI19	*Lactococcus lactis subsp. cremoris (strain NZ9000)*	DSMZ-20069	AAAGAAGGAGATAGGATCATGCAAATTAATAAATATATTGACCATAC	GTGTAATGGATAGTGATCTTAGTAGCTGTCATTTGAGGTAAGAC
D9SKJ3	*Clostridium cellulovorans (strain ATCC 35296 / DSM 3052 / OCM 3 / 743B)*	DSMZ-3052	AAAGAAGGAGATAGGATCATGAAAAATCAAAAAATAGCA	GTGTAATGGATAGTGATCTTAATAATCGCTCTCTTTATTGTTATC
D9TPN8	*Thermoanaerobacterium thermosaccharolyticum (strain ATCC 7956 / DSM 571 / NCIB 9385 / NCA 3814) (Clostridium thermosaccharolyticum)*	DSMZ-571	AAAGAAGGAGATAGGATCATGGAAATTGCAAAAATAATTGATCATAC	GTGTAATGGATAGTGATCTTACCATCCCTTTACAATTT
E0SNU4	*Ignisphaera aggregans (strain DSM 17230 / JCM 13409 / AQ1.S1)*	DSMZ-17230	AAAGAAGGAGATAGGATCATGGTTATCACCATAAACG	GTGTAATGGATAGTGATCTTATCTAATGCTATTCCTAAGATTTTT
E2NRK0	*Catenibacterium mitsuokai (strain DSM 15897 / JCM 10609 / CIP 106738 / RCA14-39)*	DSMZ-15897	AAAGAAGGAGATAGGATCATGAAAGAATATACTATTGATGAATTGGC	GTGTAATGGATAGTGATCTTAAATCTTAATAATACCATCAACAGC
E3DLZ8	*Halanaerobium praevalens (strain ATCC 33744 / DSM 2228 / GSL)*	DSMZ-2228	AAAGAAGGAGATAGGATCATGAATAAGGAAGAAATTGCAAAAAC	GTGTAATGGATAGTGATCTTAATAACTCTGATCAGTTACTTGACCTTC
E3DQ67	*Halanaerobium praevalens (strain ATCC 33744 / DSM 2228 / GSL)*	DSMZ-2228	AAAGAAGGAGATAGGATCATGGCGATTAAACCTCGTG	GTGTAATGGATAGTGATCTTATTCTTCATCATCAGTAACA
E3H811	*Ilyobacter polytropus (strain DSM 2926 / CuHBu1)*	DSMZ-2926	AAAGAAGGAGATAGGATCATGGAAATCAACAAGTATATAGATCA	GTGTAATGGATAGTGATCTTAATATTCTCCCTCTTTGGC
E3PT30	*Acetoanaerobium sticklandii (strain ATCC 12662 / DSM 519 / JCM 1433 / NCIMB 10654) (Clostridium sticklandii)*	DSMZ-519	AAAGAAGGAGATAGGATCATGAAAAATCTTTCTAGATAT	GTGTAATGGATAGTGATCTTAATAGCCTGAAGACTGAGATTTTG
E4TDN5	*Riemerella anatipestifer (strain ATCC 11845 / DSM 15868 / JCM 9532 / NCTC 11014)*	DSMZ-15868	AAAGAAGGAGATAGGATCATGATAAATGTAAAAAACTATC	GTGTAATGGATAGTGATCTTAGTATCCTTCCGAAGC
E4TMX4	*Marivirga tractuosa (strain ATCC 23168 / DSM 4126 / NBRC 15989 / NCIMB 1408 / VKM B-1430 / H-43) (Microscilla tractuosa) (Flexibacter tractuosus)*	DSMZ-4126	AAAGAAGGAGATAGGATCATGAGAAATATACAAAAATACATTGAGC	GTGTAATGGATAGTGATCTTAGATACTTTTACAAATTTCAGGACC
E6TW33	*Bacillus cellulosilyticus (strain ATCC 21833 / DSM 2522 / FERM P-1141 / JCM 9156 / N-4)*	DSMZ-2522	AAAGAAGGAGATAGGATCATGACTACTACAAATCTTG	GTGTAATGGATAGTGATCTTAATATGTTTCAGTGCCTTTTTC
F2JSP1	*Cellulosilyticum lentocellum (strain ATCC 49066 / DSM 5427 / NCIMB 11756 / RHM5) (Clostridium lentocellum)*	DSMZ-5427	AAAGAAGGAGATAGGATCATGAACATTTCACAAACAATTGAC	GTGTAATGGATAGTGATCTTAGTAAGAACCATCATCTGTTACTTTTTG
G2PMV9	*Muricauda ruestringensis (strain DSM 13258 / CIP 107369 / LMG 19739 / B1)*	DSMZ-13258	AAAGAAGGAGATAGGATCATGTCTTTGGAAAAATATATAGATCAC	GTGTAATGGATAGTGATCTTATTCGATTAAAGAAGGTCCTG
G4L3F2	*Tetragenococcus halophilus (strain DSM 20338 / JCM 20259 / NCIMB 9735 / NBRC 12172) (Pediococcus halophilus)*	DSMZ-20338	AAAGAAGGAGATAGGATCATGGAGTTAAATCGTATAATCGAC	GTGTAATGGATAGTGATCTTATCCATTCTTCTTTTGCCTTTGC
G4L5P7	*Tetragenococcus halophilus (strain DSM 20338 / JCM 20259 / NCIMB 9735 / NBRC 12172) (Pediococcus halophilus)*	DSMZ-20338	AAAGAAGGAGATAGGATCATGACATTAAAAAAAGAAGAA	GTGTAATGGATAGTGATCTTAAGCTAAAATTTTCTTCGTCG
G4L7G6	*Tetragenococcus halophilus (strain DSM 20338 / JCM 20259 / NCIMB 9735 / NBRC 12172) (Pediococcus halophilus)*	DSMZ-20338	AAAGAAGGAGATAGGATCATGACGATAAATTTAACGG	GTGTAATGGATAGTGATCTTAACTTTGCTCTGCTCGATAC

H2J323	*Marinitoga piezophila (strain DSM 14283 / JCM 11233 / KA3)*	DSMZ-14283	AAAGAAGGAGATAGGATCATGGACTTAAAAAATATCATA	GTGTAATGGATAGTGATCTTAATATCCAGTACCTTCAGCTTTTTCG
H6LFY1	*Acetobacterium woodii (strain ATCC 29683 / DSM 1030 / JCM 2381 / KCTC 1655 / WB1)*	DSMZ-1030	AAAGAAGGAGATAGGATCATGTTAGTATTAAACGGTAAAGAA	GTGTAATGGATAGTGATCTTATTTAACTTCAATGCCTTTTG
P44430	*Haemophilus influenzae (strain ATCC 51907 / DSM 11121 / KW20 / Rd)*	DSMZ-11121	AAAGAAGGAGATAGGATCATGACATCAAATCAACTTGCTC	GTGTAATGGATAGTGATCTTAGTAAGTGCTTTGAGTGTCTTG
Q5X5D2	*Legionella pneumophila (strain Paris)*	Pasteur-PARIS	AAAGAAGGAGATAGGATCATGAGTTTGGATAAGCATTT	GTGTAATGGATAGTGATCTTATGACAATAATTTCTCAAGCAG
Q81EY8	*Bacillus cereus (strain ATCC 14579 / DSM 31 / JCM 2152 / NBRC 15305 / NCIMB 9373 / NRRL B-3711)*	DSMZ-31	AAAGAAGGAGATAGGATCATGAACATTGCAAAGTTAAT	GTGTAATGGATAGTGATCTTAGTAGTTATCTGTAGCACCTTTTGC
Q8E2U1	*Streptococcus agalactiae serotype III (strain NEM316)*	Pasteur-NEM316	AAAGAAGGAGATAGGATCATGGAAGTAAAAGATATTTTA	GTGTAATGGATAGTGATCTTAATAAGTGCCTTCTTCAACTTTTTG
Q9AIP7	*Streptococcus mutans*	DSMZ-20523	AAAGAAGGAGATAGGATCATGAAAATCAATCAATATATTG	GTGTAATGGATAGTGATCTTAATAACCACTGTTTGTTTGCTTTC
247-24-30008	*Anaerobic digestor*	Digestor	AAAGAAGGAGATAGGATCATGGAAAAGCTTAAGCAATG	GTGTAATGGATAGTGATCTTAAAAAAACACAAGGTCTTC
288-51-61502	*Anaerobic digestor*	Digestor	AAAGAAGGAGATAGGATCATGCAGGACCCCAACAGTTC	GTGTAATGGATAGTGATCTTACCCGGCTTGTTTGGATTC
3417-3-2646	*Anaerobic digestor*	Digestor	AAAGAAGGAGATAGGATCATGAAACAACAAGAGGGTATCG	GTGTAATGGATAGTGATCTTAATGTGCGCCATGTTC
4508-24-21936	*Anaerobic digestor*	Digestor	AAAGAAGGAGATAGGATCATGGACCTTGCACCTTTTATAG	GTGTAATGGATAGTGATCTTATCCGTTATCCGCTGATCT
4981-6-2647	*Anaerobic digestor*	Digestor	AAAGAAGGAGATAGGATCATGATTGCTGCCTGGATG	GTGTAATGGATAGTGATCTTATCCTTTCAGTAGTCCTCCC
506-20-27854	*Anaerobic digestor*	Digestor	AAAGAAGGAGATAGGATCATGAAACCATTGAATATATACCCC	GTGTAATGGATAGTGATCTTATATGTTGGATTCGATAAGTGC
5924-5-2218	*Anaerobic digestor*	Digestor	AAAGAAGGAGATAGGATCATGTCAGAAAACAATAAAAGCTACATC	GTGTAATGGATAGTGATCTTAATAACCACCAGCAGTTGGAC
7061-2-531	*Anaerobic digestor*	Digestor	AAAGAAGGAGATAGGATCATGAAAGAAATCAATACCTACATCGACC	GTGTAATGGATAGTGATCTTAGCCCTCGATGATCTTCTTTG
A1HNM9	*Thermosinus carboxydivorans Nor1*	DSMZ-14886	AAAGAAGGAGATAGGATCATGGGGAAGGGAGGGTCTTG	GTGTAATGGATAGTGATCTTATTTGACTAAACTAACGCCAACG
A1RU26	*Pyrobaculum islandicum (strain DSM 4184 / JCM 9189 / GEO3)*	DSMZ-4184	AAAGAAGGAGATAGGATCATGCTACATTTAGTCGATTACGC	GTGTAATGGATAGTGATCTTAGGTTTTTAACACCTCA
A2BLE9	*Hyperthermus butylicus (strain DSM 5456 / JCM 9403 / PLM1-5)*	DSMZ-5456	AAAGAAGGAGATAGGATCATGTCCGAGTCCTTCTTCTG	GTGTAATGGATAGTGATCTTAGATTCTGCAGAGTTCCTTG
A3DFT0	*Clostridium thermocellum (strain ATCC 27405 / DSM 1237 / NBRC 103400 / NCIMB 10682 / NRRL B-4536 / VPI 7372) (Ruminiclostridium thermocellum)*	DSMZ-1237	AAAGAAGGAGATAGGATCATGAATACACAAGACATATTATCCC	GTGTAATGGATAGTGATCTTAATACAAACCGTCATAC
A3DGT2	*Clostridium thermocellum (strain ATCC 27405 / DSM 1237 / NBRC 103400 / NCIMB 10682 / NRRL B-4536 / VPI 7372) (Ruminiclostridium thermocellum)*	DSMZ-1237	AAAGAAGGAGATAGGATCATGAGAAAGGATGAAAGTATTTTGG	GTGTAATGGATAGTGATCTTACCCAATTTCTTCTGCAATAGCG
A3QGT3	*Shewanella loihica (strain ATCC BAA-1088 / PV-4)*	DSMZ-17748	AAAGAAGGAGATAGGATCATGAGTGATTTAAAAAAAGC	GTGTAATGGATAGTGATCTTAGTAACCTTGAGGACCCTTAG
A4A0J5	*Blastopirellula marina DSM 3645*	DSMZ-3645	AAAGAAGGAGATAGGATCATGGATTCTCCCGTGATAGAC	GTGTAATGGATAGTGATCTTACTCGCTGGGATAGCG
A4A0J5	*Blastopirellula marina DSM 3645*	DSMZ-3645	AAAGAAGGAGATAGGATCATGGATTCTCCCGTGATAGAC	GTGTAATGGATAGTGATCTTACTCGCTGGGATAGCG
A5EY74	*Dichelobacter nodosus (strain VCS1703A)*	DSMZ-20708	AAAGAAGGAGATAGGATCATGATTCAATCTGCAAAATTTCAAC	GTGTAATGGATAGTGATCTTACGCGGATAATTCCGT
A6LG64	*Parabacteroides distasonis (strain ATCC 8503 / DSM 20701 / CIP 104284 / JCM 5825 / NCTC 11152)*	DSMZ-20701	AAAGAAGGAGATAGGATCATGGCACATCATCACGATT	GTGTAATGGATAGTGATCTTATTTCCCGAGTCGTTTTTC
A7NMK6	*Roseiflexus castenholzii (strain DSM 13941 / HLO8)*	DSMZ-13941	AAAGAAGGAGATAGGATCATGGATATTGCACGCATGA	GTGTAATGGATAGTGATCTTATTTCTCACTCATTTTTTC
A7VSD0	*[Clostridium] leptum DSM 753*	DSMZ-753	AAAGAAGGAGATAGGATCATGAAACTAAACCAATACATCGACC	GTGTAATGGATAGTGATCTTATTCAGAGACAATTTGAACAGAAGCG
A7VWB3	*[Clostridium] leptum DSM 753*	DSMZ-753	AAAGAAGGAGATAGGATCATGGAAAAAATGACAAAAGA	GTGTAATGGATAGTGATCTTACCCTTCCTCCTCTTGAAATTCTTC
A8RFU5	*Absiella dolichum DSM 3991*	DSMZ-3991	AAAGAAGGAGATAGGATCATGGAATTAAATAAATATATTGATC	GTGTAATGGATAGTGATCTTAGTTATTGATCAACTTTACCCCC
A8RNT5	*Clostridium bolteae (strain ATCC BAA-613 / WAL 16351)*	DSMZ-15670	AAAGAAGGAGATAGGATCATGGTTCAGGCGGCAATG	GTGTAATGGATAGTGATCTTAATAGGTTCCTGCCTCCTG
A8RSU8	*Clostridium bolteae (strain ATCC BAA-613 / WAL 16351)*	DSMZ-15670	AAAGAAGGAGATAGGATCATGGATAAGAAGGACATTTTAAGCAGG	GTGTAATGGATAGTGATCTTATGGAATCAGCCTGCT
A8S319	*Clostridium bolteae (strain ATCC BAA-613 / WAL 16351)*	DSMZ-15670	AAAGAAGGAGATAGGATCATGAAAATGGGAATTGAACAC	GTGTAATGGATAGTGATCTTAAATCAGTACAATCCCGTTG
B0MAA8	*Anaerostipes caccae DSM 14662*	DSMZ-14662	AAAGAAGGAGATAGGATCATGGAAATGACAAAACAAGAATTTTTAAG	GTGTAATGGATAGTGATCTTAGAATTCTTCCAGGATCGC
B0MAE3	*Anaerostipes caccae DSM 14662*	DSMZ-14662	AAAGAAGGAGATAGGATCATGGAGGGTGCAGAGATG	GTGTAATGGATAGTGATCTTATTCCTGCATCTCTTTTACAATC
B0MET2	*Anaerostipes caccae DSM 14662*	DSMZ-14662	AAAGAAGGAGATAGGATCATGGAGAGAAATGAAATCTTAAAAAC	GTGTAATGGATAGTGATCTTATTCCTCCTTCATGATCT
B0MYY8	*Alistipes putredinis DSM 17216*	DSMZ-17216	AAAGAAGGAGATAGGATCATGGAATACGCGAATCATTTGAAAG	GTGTAATGGATAGTGATCTTAGAAAAACTTGACTTCCCG
B0NSF0	*Bacteroides stercoris ATCC 43183*	DSMZ-19555	AAAGAAGGAGATAGGATCATGGAGAATAACGAATCTACACAG	GTGTAATGGATAGTGATCTTAAAAGAACTTCATTTCTTC
B0P6M5	*Anaerotruncus colihominis DSM 17241*	DSMZ-17241	AAAGAAGGAGATAGGATCATGGACAAAGAAAAAGTTTTGG	GTGTAATGGATAGTGATCTTAGCGGAGCAGCTTGAC
B0PHA1	*Anaerotruncus colihominis DSM 17241*	DSMZ-17241	AAAGAAGGAGATAGGATCATGGAGGGAACCAGTATGAC	GTGTAATGGATAGTGATCTTAGTAGCTGCCTGCCTG
B1HTK8	*Lysinibacillus sphaericus (strain C3-41)*	DSMZ-1866	AAAGAAGGAGATAGGATCATGGAACAAAATTTTGCGC	GTGTAATGGATAGTGATCTTAATAATTAGAATCTGCTAT
B1YKT7	*Exiguobacterium sibiricum (strain DSM 17290 / JCM 13490 / 255-15)*	DSMZ-17290	AAAGAAGGAGATAGGATCATGAATTTAGCAGGAATGATCG	GTGTAATGGATAGTGATCTTAGTAGTCGCTGTCTGAAGTTCC
B3QZ00	*Chloroherpeton thalassium (strain ATCC 35110 / GB-78)*	ATCC-35110	AAAGAAGGAGATAGGATCATGAATCAAAACGGATCGC	GTGTAATGGATAGTGATCTTACTTCTCCATCATCGCTTC
B5CU41	*Bacteroides plebeius (strain DSM 17135 / JCM 12973 / M2)*	DSMZ-17135	AAAGAAGGAGATAGGATCATGAATCCTAATCACGAACATGC	GTGTAATGGATAGTGATCTTAAAAAAATCCCCTTTCTT
B7B6E0	*Parabacteroides johnsonii DSM 18315*	DSMZ-18315	AAAGAAGGAGATAGGATCATGGTACACGAACACGATCAC	GTGTAATGGATAGTGATCTTATTTTCCCAAACGGTGTTC
B7GMN1	*Anoxybacillus flavithermus (strain DSM 21510 / WK1)*	DSMZ-21510	AAAGAAGGAGATAGGATCATGATGAACATTGCTAGC	GTGTAATGGATAGTGATCTTAGTATGTTTCGTTTGAC
B8CXI0	*Halothermothrix orenii (strain H 168 / OCM 544 / DSM 9562)*	DSMZ-9562	AAAGAAGGAGATAGGATCATGGCAATCAAACCTCGTG	GTGTAATGGATAGTGATCTTAATACTCTTTATCCCCGTCATC
B8FUK9	*Desulfitobacterium hafniense (strain DCB-2 / DSM 10664)*	DSMZ-10664	AAAGAAGGAGATAGGATCATGAGAACAATGAACTTAGCAGG	GTGTAATGGATAGTGATCTTATACCGTGATTATTTGCACGC
B9Y9Z6	*Holdemania filiformis DSM 12042*	DSMZ-12042	AAAGAAGGAGATAGGATCATGAAAGCAGACAGAACGAAG	GTGTAATGGATAGTGATCTTACAGCGTACCGCCTTC
B9YB21	*Holdemania filiformis DSM 12042*	DSMZ-12042	AAAGAAGGAGATAGGATCATGAAGATGAAACCGTTGAATAAG	GTGTAATGGATAGTGATCTTAATAACCCGTGGCTTCC
C0C305	*[Clostridium] hylemonae DSM 15053*	DSMZ-15053	AAAGAAGGAGATAGGATCATGGACACAAAAACTTACACCC	GTGTAATGGATAGTGATCTTAAACGAGTGAACGGATG

C0C3B7	*[Clostridium] hylemonae DSM 15053*	DSMZ-15053	AAAGAAGGAGATAGGATCATGAAAATAGAGGAAATATTAAGAC	GTGTAATGGATAGTGATCTTAATTCAAGCACTCCTTCTGC
C0CND6	*Blautia hydrogenotrophica DSM 10507*	DSMZ-10507	AAAGAAGGAGATAGGATCATGGAGAAAAGAGAAATTTTAAAAAGA	GTGTAATGGATAGTGATCTTATTCTTCTAACAAATGAATCAATC
C0CZD0	*[Clostridium] asparagiforme DSM 15981*	DSMZ-15981	AAAGAAGGAGATAGGATCATGAGCAATGAAGAGATGTTG	GTGTAATGGATAGTGATCTTAATCGCCGAGCTGGTTC
C0D9N4	*[Clostridium] asparagiforme DSM 15981*	DSMZ-15981	AAAGAAGGAGATAGGATCATGATTTATAAAGGTCTTGAGTTGG	GTGTAATGGATAGTGATCTTATGCGCAGCTGCTCTCG
C0DA78	*[Clostridium] asparagiforme DSM 15981*	DSMZ-15981	AAAGAAGGAGATAGGATCATGGACCGAGAGAATCTATTTCAG	GTGTAATGGATAGTGATCTTAACTGTTTTGTTCCGCC
C0W0V9	*Actinomyces coleocanis DSM 15436*	DSMZ-15436	AAAGAAGGAGATAGGATCATGACACAACTCAGCAAATACG	GTGTAATGGATAGTGATCTTAGTTTCCTTCCAGGAGGATTG
C0W106	*Actinomyces coleocanis DSM 15436*	DSMZ-15436	AAAGAAGGAGATAGGATCATGAATAAGGCGGAAGTAGC	GTGTAATGGATAGTGATCTTATGCCAGATCAGCCAAAATC
C0WZ11	*Lactobacillus fermentum ATCC 14931*	DSMZ-20052	AAAGAAGGAGATAGGATCATGGAATTTAATAACTACATTGACCAC	GTGTAATGGATAGTGATCTTATGCTTTACCGATGATGG
C0X8W3	*Enterococcus faecalis TX0104*	DSMZ-20478	AAAGAAGGAGATAGGATCATGGAATTAAACCGCATGATTG	GTGTAATGGATAGTGATCTTAATACCCTTCGCCAGTTG
C3PI20	*Corynebacterium aurimucosum (strain ATCC 700975 / DSM 44827 / CN-1) (Corynebacterium nigricans)*	DSMZ-44827	AAAGAAGGAGATAGGATCATGACTTCCCGTACTGACG	GTGTAATGGATAGTGATCTTAAGCCTCGAACCCTTC
C4LAZ1	*Tolumonas auensis (strain DSM 9187 / TA4)*	DSMZ-9187	AAAGAAGGAGATAGGATCATGCCTGATTTACAACAAGCGG	GTGTAATGGATAGTGATCTTAATACCCTGATGATGCGG
C4LJX4	*Corynebacterium kroppenstedtii (strain DSM 44385 / JCM 11950 / CIP 105744 / CCUG 35717)*	DSMZ-44385	AAAGAAGGAGATAGGATCATGCCTACTACGCCAGACAG	GTGTAATGGATAGTGATCTTAGAACCCGGTCGCTACG
C6LIB8	*Marvinbryantia formatexigens DSM 14469*	DSMZ-14469	AAAGAAGGAGATAGGATCATGGAAGCAAAGGAAATGTTG	GTGTAATGGATAGTGATCTTAATACTCTCCGGCTTCCTG
C7PV91	*Chitinophaga pinensis (strain ATCC 43595 / DSM 2588 / NCIB 11800 / UQM 2034)*	DSMZ-2588	AAAGAAGGAGATAGGATCATGAAACTCAACAGATACATCGAC	GTGTAATGGATAGTGATCTTATCCCTTCATGAGGGC
C7R2C3	*Jonesia denitrificans (strain ATCC 14870 / DSM 20603 / CIP 55134) (Listeria denitrificans)*	DSMZ-20603	AAAGAAGGAGATAGGATCATGCCTGAGAAAGTTACTGCTG	GTGTAATGGATAGTGATCTTAGTAACCCGACCCGTCAC
C7REE6	*Anaerococcus prevotii (strain ATCC 9321 / DSM 20548 / JCM 6508 / PC1) (Peptostreptococcus prevotii) (Peptococcus prevotii)*	DSMZ-20548	AAAGAAGGAGATAGGATCATGAAAAAACTAAATTCATATATAG	GTGTAATGGATAGTGATCTTACTCCTTACAAATATCAATTGACTTAC
C8W218	*Desulfotomaculum acetoxidans (strain ATCC 49208 / DSM 771 / VKM B-1644) (Desulfofarcimen acetoxidans)*	DSMZ-771	AAAGAAGGAGATAGGATCATGAAAATAACAAAACAACAAATG	GTGTAATGGATAGTGATCTTAATCCATTTCTGCTATGATTATTTTC
C8W8Y2	*Atopobium parvulum (strain ATCC 33793 / DSM 20469 / JCM 10300 / VPI 0546) (Streptococcus parvulus) (Peptostreptococcus parvulus)*	DSMZ-20469	AAAGAAGGAGATAGGATCATGGAAATCAACGGCCTTATC	GTGTAATGGATAGTGATCTTACTCGGTGACAATAGCA
C9LPE9	*Dialister invisus DSM 15470*	DSMZ-15470	AAAGAAGGAGATAGGATCATGATGAAATCACCGGAAAAC	GTGTAATGGATAGTGATCTTACAGAGAAAATGTGCGGG
D1PG70	*Prevotella copri DSM 18205*	DSMZ-18205	AAAGAAGGAGATAGGATCATGAGCAGTATTAAAGAACAGG	GTGTAATGGATAGTGATCTTAGAAGTACTTGATTTCCTTGCC
D2R096	*Pirellula staleyi (strain ATCC 27377 / DSM 6068 / ICPB 4128) (Pirella staleyi)*	DSMZ-6068	AAAGAAGGAGATAGGATCATGTCCGACTATACCGTTGC	GTGTAATGGATAGTGATCTTAAACGCCAGCTGCTAAG
D2Z780	*Dethiosulfovibrio peptidovorans DSM 11002*	DSMZ-11002	AAAGAAGGAGATAGGATCATGGATTTGTTGCGGGAT	GTGTAATGGATAGTGATCTTACAAAACCGGGCAGGTC
D3ADZ1	*Hungatella hathewayi DSM 13479*	DSMZ-13479	AAAGAAGGAGATAGGATCATGGTAAAAGGAGAAGACAAAATGAACG	GTGTAATGGATAGTGATCTTACATTCTCATAAATTCTTCTACAATC
D3AF28	*Hungatella hathewayi DSM 13479*	DSMZ-13479	AAAGAAGGAGATAGGATCATGGAGGACAACATGAATATTGCAGA	GTGTAATGGATAGTGATCTTACCCTTCCAGCAGTATG
D3AHT8	*Hungatella hathewayi DSM 13479*	DSMZ-13479	AAAGAAGGAGATAGGATCATGAAGATAACAGATAAGATAGATCATACG	GTGTAATGGATAGTGATCTTACTCTTCCAAAAGGAGCAG
D3AQA5	*Hungatella hathewayi DSM 13479*	DSMZ-13479	AAAGAAGGAGATAGGATCATGATTATGACATATTCTGA	GTGTAATGGATAGTGATCTTATTTCTGAAGCTCTGCCAC
D3AT22	*Hungatella hathewayi DSM 13479*	DSMZ-13479	AAAGAAGGAGATAGGATCATGGAAAATTGGGAAGGTATC	GTGTAATGGATAGTGATCTTAATCCGTCTTCTCCAGC
D3DHG9	*Hydrogenobacter thermophilus (strain DSM 6534 / IAM 12695 / TK-6)*	DSMZ-6534	AAAGAAGGAGATAGGATCATGGATATAAACAGCTACATAGACC	GTGTAATGGATAGTGATCTTACTCTCTTTTAAGTATGCTGAAGGTG
D4BZH8	*Providencia rettgeri DSM 1131*	DSMZ-1131	AAAGAAGGAGATAGGATCATGCAAGACTTAGCAAAATA	GTGTAATGGATAGTGATCTTAGTAGTCACTCGGCTTGG
D4E8M0	*Serratia odorifera DSM 4582*	DSMZ-4582	AAAGAAGGAGATAGGATCATGACTATTGAAAACATTGACTACGCTC	GTGTAATGGATAGTGATCTTAGTAACTGCCGGCAGC
D4RYH7	*Butyrivibrio crossotus DSM 2876*	DSMZ-2876	AAAGAAGGAGATAGGATCATGGATATTAAAGAATTATTGGCG	GTGTAATGGATAGTGATCTTACTTGTTCTCCATTTTTT
D5EHZ9	*Coraliomargarita akajimensis (strain DSM 45221 / IAM 15411 / JCM 23193 / KCTC 12865 / 04OKA010-24)*	DSMZ-45221	AAAGAAGGAGATAGGATCATGCACCCTGACAAGCTG	GTGTAATGGATAGTGATCTTAATAGTTGGAACGATCGAC
D6XYX2	*Bacillus selenitireducens (strain ATCC 700615 / DSM 15326 / MLS10)*	DSMZ-15326	AAAGAAGGAGATAGGATCATGAGTCAATCCATTGCAAGC	GTGTAATGGATAGTGATCTTAATAGTCACTCTTTGCTTCTTCACC
D7BJY9	*Arcanobacterium haemolyticum (strain ATCC 9345 / DSM 20595 / NBRC 15585 / NCTC 8452 / 11018)*	DSMZ-20595	AAAGAAGGAGATAGGATCATGGCAACACGTGAAGAAG	GTGTAATGGATAGTGATCTTACTCTGGGAGCGAATCC
D7UWC5	*Listeria grayi DSM 20601*	DSMZ-20601	AAAGAAGGAGATAGGATCATGAAACTGATTGACTTGAAGC	GTGTAATGGATAGTGATCTTATTGCTGTTCTTCCCATTC
D9PX57	*Methanothermobacter marburgensis (strain ATCC BAA-927 / DSM 2133 / JCM 14651 / NBRC 100331 / OCM 82 / Marburg) (Methanobacterium thermoautotrophicum)*	DSMZ-2133	AAAGAAGGAGATAGGATCATGAAGGTTGAAACAGCAGAG	GTGTAATGGATAGTGATCTTACCTCCACCCCTCCAT
D9QVA9	*Acetohalobium arabaticum (strain ATCC 49924 / DSM 5501 / Z-7288)*	DSMZ-5501	AAAGAAGGAGATAGGATCATGGCAATTAAACCGAAAG	GTGTAATGGATAGTGATCTTATTCTTCCTCTTCTTCCTCATC
D9R027	*Clostridium saccharolyticum (strain ATCC 35040 / DSM 2544 / NRCC 2533 / WM1)*	DSMZ-2544	AAAGAAGGAGATAGGATCATGAATATTGCAAAAATGGTG	GTGTAATGGATAGTGATCTTATAACAAGGCGATTCCATTGC
D9R1L8	*Clostridium saccharolyticum (strain ATCC 35040 / DSM 2544 / NRCC 2533 / WM1)*	DSMZ-2544	AAAGAAGGAGATAGGATCATGGAAAATACGAACATTAGCC	GTGTAATGGATAGTGATCTTACATGCGGTTTTTAAGCTC
D9RZ35	*Thermosediminibacter oceani (strain ATCC BAA-1034 / DSM 16646 / JW/IW-1228P)*	DSMZ-16646	AAAGAAGGAGATAGGATCATGGTTACAAGAGAACAGCTGGC	GTGTAATGGATAGTGATCTTACTTTAGCTCTTCTATAATGGCCACG
E0NU04	*Prevotella marshii DSM 16973 = JCM 13450*	DSMZ-16973	AAAGAAGGAGATAGGATCATGGCAATAACAAAAAACAT	GTGTAATGGATAGTGATCTTAGAAGAACTTGGTTTCCTGC
E1M465	*Streptococcus mitis NCTC 12261*	DSMZ-12643	AAAGAAGGAGATAGGATCATGAAATTAAATAAATATATCGATC	GTGTAATGGATAGTGATCTTAGTAGTCGCCATCAGCC
E1R2M2	*Sediminispirochaeta smaragdinae (strain DSM 11293 / JCM 15392 / SEBR 4228) (Spirochaeta smaragdinae)*	DSMZ-11293	AAAGAAGGAGATAGGATCATGGATAAGAAAGAACTTGCC	GTGTAATGGATAGTGATCTTAATAGTTGTCTTTCGAACCTTCACC
E1R7K7	*Sediminispirochaeta smaragdinae (strain DSM 11293 / JCM 15392 / SEBR 4228) (Spirochaeta smaragdinae)*	DSMZ-11293	AAAGAAGGAGATAGGATCATGATTACGACGCACGAC	GTGTAATGGATAGTGATCTTATTTCTCTTTCAGGGTACCGGC
E1R9R0	*Sediminispirochaeta smaragdinae (strain DSM 11293 / JCM 15392 / SEBR 4228) (Spirochaeta smaragdinae)*	DSMZ-11293	AAAGAAGGAGATAGGATCATGAAAAAGCAAGAACTTG	GTGTAATGGATAGTGATCTTATTCGGCCTCAGCGAT
E1UTS4	*Bacillus amyloliquefaciens (strain ATCC 23350 / DSM 7 / BCRC 11601 / OS NBRC 15535 / NRRL B-14393)*	DSMZ-7	AAAGAAGGAGATAGGATCATGTCAATTGCAAGTCAAATAGACCATAC	GTGTAATGGATAGTGATCTTAATAGTCGCTGCTGCC
E1VTU5	*Glutamicibacter arilaitensis (strain DSM 16368 / CIP 108037 / IAM 15318 / JCM 13566 / Re117) (Arthrobacter arilaitensis)*	DSMZ-16368	AAAGAAGGAGATAGGATCATGACTGAACTAAGCGCCC	GTGTAATGGATAGTGATCTTAGTAGCTGGAACCGCTTTG
E1X340	*Halobacteriovorax marinus (strain ATCC BAA-682 / DSM 15412 / SJ) (Bacteriovorax marinus)*	DSMZ-15412	AAAGAAGGAGATAGGATCATGAAAGAGCTAAATAGATA	GTGTAATGGATAGTGATCTTAGTAGCCACTTCCTTTCTCTC
E4HP27	*[Propionibacterium] humerusii HL044PA1*	DSMZ-16379	AAAGAAGGAGATAGGATCATGAGCATTACCGCTCTCATC	GTGTAATGGATAGTGATCTTATCGGCGAGGACGGAG
E4T6I7	*Paludibacter propionicigenes (strain DSM 17365 / JCM 13257 / WB4)*	DSMZ-17365	AAAGAAGGAGATAGGATCATGAGCAAATTTGACGACC	GTGTAATGGATAGTGATCTTAAAAATACTTGACTTCCTGGCCTTC

E6LE39	*Enterococcus italicus DSM 15952*	DSMZ-15952	AAAGAAGGAGATAGGATCATGAAAATGGAATTAAATCGAATGATCG	GTGTAATGGATAGTGATCTTAATAGCCGATGCCCGTTTG
E6U4C4	*Ethanoligenens harbinense (strain DSM 18485 / JCM 12961 / CGMCC 1.5033 / YUAN-3)*	DSMZ-18485	AAAGAAGGAGATAGGATCATGGAGTTGTATGACGCGA	GTGTAATGGATAGTGATCTTAGTCCGGGGCGCCCGC
E6U8W2	*Ethanoligenens harbinense (strain DSM 18485 / JCM 12961 / CGMCC 1.5033 / YUAN-3)*	DSMZ-18485	AAAGAAGGAGATAGGATCATGCAAAACGGACAGATTTC	GTGTAATGGATAGTGATCTTATGCTTCATGCTGCCG
F0SVD2	*Syntrophobotulus glycolicus (strain DSM 8271 / FlGlyR)*	DSMZ-8271	AAAGAAGGAGATAGGATCATGAACTTGGGCGGAAAAATAG	GTGTAATGGATAGTGATCTTATTGGTCAACGGTGAC
F0T2U0	*Syntrophobotulus glycolicus (strain DSM 8271 / FlGlyR)*	DSMZ-8271	AAAGAAGGAGATAGGATCATGAAAAATTTATCTGTATCTGATCTTC	GTGTAATGGATAGTGATCTTATCCGCGGGCCTTTTC
F1TFH1	*Ruminiclostridium papyrosolvens DSM 2782*	DSMZ-2782	AAAGAAGGAGATAGGATCATGACTAAGTTGGCTGGCTTAATTG	GTGTAATGGATAGTGATCTTACACTTGTTCCTCATTGAC
F4A0U0	*Mahella australiensis (strain DSM 15567 / CIP 107919 / 50-1 BON)*	DSMZ-15567	AAAGAAGGAGATAGGATCATGTTGCTTACTGTTAAGGATATAG	GTGTAATGGATAGTGATCTTAATATTCTAAAGTCCCATTATTCTG
F5RMP2	*Centipeda periodontii DSM 2778*	DSMZ-2778	AAAGAAGGAGATAGGATCATGAAAGGAGCTCATATGAAACTCAGC	GTGTAATGGATAGTGATCTTATGAATGTGTTTCTTCGGC
F6B909	*Desulfotomaculum nigrificans (strain DSM 14880 / VKM B-2319 / CO-1-SRB) (Desulfotomaculum carboxydivorans)*	DSMZ-14880	AAAGAAGGAGATAGGATCATGAACATTAATCTGGCACCG	GTGTAATGGATAGTGATCTTAAAATGGTTGCTCAGTA
F6DR13	*Desulfotomaculum ruminis (strain ATCC 23193 / DSM 2154 / NCIB 8452 / DL)*	DSMZ-2154	AAAGAAGGAGATAGGATCATGACTGTTCATCTAGCCTCTATGATTG	GTGTAATGGATAGTGATCTTAATAACCCTTATTCTCACCTGAGGC
F7NJW4	*Acetonema longum DSM 6540*	DSMZ-6540	AAAGAAGGAGATAGGATCATGGAATCGATCGCAAAAC	GTGTAATGGATAGTGATCTTAATAAGCATTACTGCCG
F8LQC6	*Streptococcus salivarius (strain JIM8777)*	INTERNE	AAAGAAGGAGATAGGATCATGTCTGTTAATAGCTATAT	GTGTAATGGATAGTGATCTTATTGACCTTTCATAATGGC
G4KWG9	*Oscillibacter valericigenes (strain DSM 18026 / NBRC 101213 / Sjm18-20)*	DSMZ-18026	AAAGAAGGAGATAGGATCATGGAACTGAAAGACATTTTATCC	GTGTAATGGATAGTGATCTTATTTTTCCAGAGCCTTGAC
G5IH61	*Hungatella hathewayi WAL-18680*	DSMZ-13479	AAAGAAGGAGATAGGATCATGGACAGACAGGAAATTCTGAAAC	GTGTAATGGATAGTGATCTTATTCTTTCATAATCTTCACTAATCTG
H6LE04	*Acetobacterium woodii (strain ATCC 29683 / DSM 1030 / JCM 2381 / KCTC 1655 / WB1)*	DSMZ-1030	AAAGAAGGAGATAGGATCATGGTAGATTTATCAAAATTCG	GTGTAATGGATAGTGATCTTAATCGCCCACGTATTG
H6LE05	*Acetobacterium woodii (strain ATCC 29683 / DSM 1030 / JCM 2381 / KCTC 1655 / WB1)*	DSMZ-1030	AAAGAAGGAGATAGGATCATGATTGATTTTAAAAAAATGAC	GTGTAATGGATAGTGATCTTACCCTTCATATTCCGG
Q3A247	*Pelobacter carbinolicus (strain DSM 2380 / NBRC 103641 / GraBd1)*	DSMZ-2380	AAAGAAGGAGATAGGATCATGAAATCTCCTGCCCCA	GTGTAATGGATAGTGATCTTATAATTCCGGCGCCTC
Q3ILQ8	*Pseudoalteromonas haloplanktis (strain TAC 125)*	INTERNE	AAAGAAGGAGATAGGATCATGATTAAACAACAAAAAGAGGC	GTGTAATGGATAGTGATCTTACGCTTCATTTAATACCGC
Q5WHF4	*Bacillus clausii (strain KSM-K16)*	DSMZ-8716	AAAGAAGGAGATAGGATCATGGCAACCGATATCGCAA	GTGTAATGGATAGTGATCTTAGTAGCCGCTACTTCC
Q65H59	*Bacillus licheniformis (strain ATCC 14580 / DSM 13 / JCM 2505 / NBRC 12200 / NCIMB 9375 / NRRL NRS-1264 / Gibson 46)*	DSMZ-13	AAAGAAGGAGATAGGATCATGATGACAAAACAAATTGCG	GTGTAATGGATAGTGATCTTAGTAGTCTTCATCCGCTGTTAACCC
Q6ALS3	*Desulfotalea psychrophila (strain LSv54 / DSM 12343)*	DSMZ-12343	AAAGAAGGAGATAGGATCATGAATACAATCATTAGCCCG	GTGTAATGGATAGTGATCTTAACGAGAAGGGGGGAC
Q7UPT7	*Rhodopirellula baltica (strain DSM 10527 / NCIMB 13988 / SH1)*	DSMZ-10527	AAAGAAGGAGATAGGATCATGCGCGACACCCGACCT	GTGTAATGGATAGTGATCTTAGTAGCCGGAGCTGCC
Q89ZF2	*Bacteroides thetaiotaomicron (strain ATCC 29148 / DSM 2079 / NCTC 10582 / E50 / VPI-5482)*	DSMZ-2079	AAAGAAGGAGATAGGATCATGGAAAAGAAAAATATAAACGAAG	GTGTAATGGATAGTGATCTTACAGACCTTTCTTCAACTCTTTG
Q8NTC4	*Corynebacterium glutamicum (strain ATCC 13032 / DSM 20300 / JCM 1318 / LMG 3730 / NCIMB 10025)*	DSMZ-20300	AAAGAAGGAGATAGGATCATGACGATTTCCCGCTCC	GTGTAATGGATAGTGATCTTACTCCGGCGCACCCTC
Q8RB49	*Caldanaerobacter subterraneus subsp. tengcongensis (strain DSM 15242 / JCM 11007 / NBRC 100824 / MB4) (Thermoanaerobacter tengcongensis)*	DSMZ-15242	AAAGAAGGAGATAGGATCATGTTGAAAAAGGAGGAATC	GTGTAATGGATAGTGATCTTAACCTAAACCTTGTTTTT
Q9Y948	*Aeropyrum pernix (strain ATCC 700893 / DSM 11879 / JCM 9820 / NBRC 100138 / K1)*	DSMZ-11879	AAAGAAGGAGATAGGATCATGCCGTCGGCCAGGGAT	GTGTAATGGATAGTGATCTTAGACTAGGGATTTGAAGCTCTCC
A4A8W3	*Congregibacter litoralis KT71*	DSMZ-17192	AAAGAAGGAGATAGGATCATGAATAGCTACGACAACGC	GTGTAATGGATAGTGATCTTAGTAGGCCTCAGTCCCC
A7NMT7	*Roseiflexus castenholzii (strain DSM 13941 / HLO8)*	DSMZ-13941	AAAGAAGGAGATAGGATCATGTCCGACATCTCGCTC	GTGTAATGGATAGTGATCTTAGTACGCCCCCGGCAT
B0TAF2	*Heliobacterium modesticaldum (strain ATCC 51547 / Ice1)*	ATCC-51547	AAAGAAGGAGATAGGATCATGATAGCCGTGAGCTTCC	GTGTAATGGATAGTGATCTTACCTCGATAGGGAGACG
B8HFF3	*Pseudarthrobacter chlorophenolicus (strain ATCC 700700 / DSM 12829 / CIP 107037 / JCM 12360 / KCTC 9906 / NCIMB 13794 / A6) (Arthrobacter chlorophenolicus)*	DSMZ-12829	AAAGAAGGAGATAGGATCATGAGCAACGAAGCCACC	GTGTAATGGATAGTGATCTTAGTACGCGGACGAACC
C0CZB7	*[Clostridium] asparagiforme DSM 15981*	DSMZ-15981	AAAGAAGGAGATAGGATCATGGGATTATCAAATGTAAAA	GTGTAATGGATAGTGATCTTAAAACCTCACGAACAACTTTCC
C0D4T2	*[Clostridium] asparagiforme DSM 15981*	DSMZ-15981	AAAGAAGGAGATAGGATCATGGAGCGAAATGAGATATACAG	GTGTAATGGATAGTGATCTTAATAGCGGTCCGAATCC
C4FBU4	*Collinsella intestinalis DSM 13280*	DSMZ-13280	AAAGAAGGAGATAGGATCATGAAAGGAACCACCATGTC	GTGTAATGGATAGTGATCTTAGGCGTTGAGCTCGCT
C7LX90	*Desulfomicrobium baculatum (strain DSM 4028 / VKM B-1378) (Desulfovibrio baculatus)*	DSMZ-4028	AAAGAAGGAGATAGGATCATGCAGGATATATTGGATAGATCACGAC	GTGTAATGGATAGTGATCTTATCGGCGCTCCGCCAC
C8WY41	*Alicyclobacillus acidocaldarius subsp. acidocaldarius (strain ATCC 27009 / DSM 446 / JCM 5260 / NBRC 15652 / NCIMB 11725 / NRRL B-14509 / 104-1A) (Bacillus acidocaldarius)*	DSMZ-446	AAAGAAGGAGATAGGATCATGCGCGTGGAGCGGGCA	GTGTAATGGATAGTGATCTTACGCCTCATCCAACAG
C9KLB4	*Mitsuokella multacida DSM 20544*	DSMZ-20544	AAAGAAGGAGATAGGATCATGAAAGCAGCAGAGATCC	GTGTAATGGATAGTGATCTTAAATCTCATCCTTGAGGACC
D0L2X8	*Gordonia bronchialis (strain ATCC 25592 / DSM 43247 / JCM 3198 / NCTC 10667) (Rhodococcus bronchialis)*	DSMZ-43247	AAAGAAGGAGATAGGATCATGACCAACACCGACCTG	GTGTAATGGATAGTGATCTTAATCCGGGAACCCGTC
D0MHJ1	*Rhodothermus marinus (strain ATCC 43812 / DSM 4252 / R-10) (Rhodothermus obamensis)*	DSMZ-4252	AAAGAAGGAGATAGGATCATGACGCCCCAGGAACTC	GTGTAATGGATAGTGATCTTAGTAGCTTTCCGGATC
D1B7V1	*Thermanaerovibrio acidaminovorans (strain ATCC 49978 / DSM 6589 / Su883) (Selenomonas acidaminovorans)*	DSMZ-6589	AAAGAAGGAGATAGGATCATGGATCGCAGGGAGCTG	GTGTAATGGATAGTGATCTTACCTGAAGCGCTTGTCC
D1PP71	*Subdoligranulum variabile DSM 15176*	DSMZ-15176	AAAGAAGGAGATAGGATCATGAAATACACCAAGGAATATATGCTG	GTGTAATGGATAGTGATCTTAGTAGCCGCTGCCGGAC
D1Z232	*Methanocella paludicola (strain DSM 17711 / JCM 13418 / NBRC 101707 / SANAE)*	DSMZ-17711	AAAGAAGGAGATAGGATCATGGACGCCCGCGAGTTT	GTGTAATGGATAGTGATCTTACCTGAGGCCTCCCAC
D7BBI7	*Meiothermus silvanus (strain ATCC 700542 / DSM 9946 / VI-R2) (Thermus silvanus)*	DSMZ-9946	AAAGAAGGAGATAGGATCATGAATTTAGCCCGATTCATCGAC	GTGTAATGGATAGTGATCTTAGTAGCCTTTCGTAGCCTG
D7BDI0	*Meiothermus silvanus (strain ATCC 700542 / DSM 9946 / VI-R2) (Thermus silvanus)*	DSMZ-9946	AAAGAAGGAGATAGGATCATGCCAGTGAATTCGCATA	GTGTAATGGATAGTGATCTTAGTAACCGCTCTTCAAACC
D9Q354	*Acidilobus saccharovorans (strain DSM 16705 / JCM 18335 / VKM B-2471 / 345-15)*	DSMZ-16705	AAAGAAGGAGATAGGATCATGGGGCTCCCAGGAGCT	GTGTAATGGATAGTGATCTTAGGCCCTGCCTGAGCTG
E0RP49	*Spirochaeta thermophila (strain ATCC 49972 / DSM 6192 / RI 19.B1)*	DSMZ-6192	AAAGAAGGAGATAGGATCATGGCGGAACAATGGACG	GTGTAATGGATAGTGATCTTATTTCAGTTCGGCCACTATC
E1QXS9	*Olsenella uli (strain ATCC 49627 / DSM 7084 / CIP 109912 / JCM 12494 / NCIMB 702895 / VPI D76D-27C) (Lactobacillus uli)*	DSMZ-7084	AAAGAAGGAGATAGGATCATGAGGCTCAACCAGTACA	GTGTAATGGATAGTGATCTTACCCCTCGCAGATGGC
E1QYT1	*Olsenella uli (strain ATCC 49627 / DSM 7084 / CIP 109912 / JCM 12494 / NCIMB 702895 / VPI D76D-27C) (Lactobacillus uli)*	DSMZ-7084	AAAGAAGGAGATAGGATCATGGCACGTTACACGATC	GTGTAATGGATAGTGATCTTAGATCTCGATGTAGTCGGC
E1V588	*Halomonas elongata (strain ATCC 33173 / DSM 2581 / NBRC 15536 / NCIMB 2198 / 1H9)*	DSMZ-2581	AAAGAAGGAGATAGGATCATGAACGACCTCACCCGGAC	GTGTAATGGATAGTGATCTTAGTAGTCCTCCTCTATATCGGC
E3D079	*Aminomonas paucivorans DSM 12260*	DSMZ-12260	AAAGAAGGAGATAGGATCATGAAGAGGGACGAGTTCGC	GTGTAATGGATAGTGATCTTAGCCCCTGAAGCGCTG
E4NPT1	*Halogeometricum borinquense (strain ATCC 700274 / DSM 11551 / JCM 10706 / PR3)*	DSMZ-11551	AAAGAAGGAGATAGGATCATGGACCGCACCGAGTTC	GTGTAATGGATAGTGATCTTACGCTTCGGGGATGCC
F7X6C2	*Sinorhizobium meliloti (strain SM11)*	DSMZ-30135	AAAGAAGGAGATAGGATCATGAACAACATAAGCAACC	GTGTAATGGATAGTGATCTTAGCCCGCCTTGCCGGC
H1N0L9	*Singulisphaera acidiphila DSM 18658*	DSMZ-18658	AAAGAAGGAGATAGGATCATGGAATTCACCTACGAA	GTGTAATGGATAGTGATCTTAGCGAGCCGATCGCGC
H1P040	*Holophaga foetida DSM 6591*	DSMZ-6591	AAAGAAGGAGATAGGATCATGTCCTCTAACCTGTGCACCC	GTGTAATGGATAGTGATCTTAGTAAGGGGATTCCTGACAGGTG
I0I7R3	*Caldilinea aerophila (strain DSM 14535 / JCM 11387 / NBRC 104270 / STL-6-O1)*	DSMZ-14535	AAAGAAGGAGATAGGATCATGAAACTTGAAGAGCGCATCC	GTGTAATGGATAGTGATCTTAGTAATTTTCTCCTTGCGG
Q2KDR9	*Rhizobium etli (strain CFN 42 / ATCC 51251)*	DSMZ-11541	AAAGAAGGAGATAGGATCATGAATAGCCATTCCATCCG	GTGTAATGGATAGTGATCTTAATAGCTCGACGCCGC
Q2NW06	*Sodalis glossinidius (strain morsitans)*	DSMZ-16929	AAAGAAGGAGATAGGATCATGAATCAATTAACCCTTGCG	GTGTAATGGATAGTGATCTTAATACCCGTTTGCGTCAG
Q2RRZ2	*Rhodospirillum rubrum (strain ATCC 11170 / ATH 1.1.1 / DSM 467 / LMG 4362 / NCIB 8255 / S1)*	DSMZ-467	AAAGAAGGAGATAGGATCATGACCGAACCGACCAAC	GTGTAATGGATAGTGATCTTAGTAGCCCCCCTTCGC
Q6A655	*Cutibacterium acnes (strain DSM 16379 / KPA171202) (Propionibacterium acnes)*	DSMZ-16379	AAAGAAGGAGATAGGATCATGTCCTCTGCCCCACTG	GTGTAATGGATAGTGATCTTACTCCGTGGGAGCTCC
Q7NRS9	*Chromobacterium violaceum (strain ATCC 12472 / DSM 30191 / JCM 1249 / NBRC 12614 / NCIMB 9131 / NCTC 9757)*	DSMZ-30191	AAAGAAGGAGATAGGATCATGTCTGCACTGATTGAAGC	GTGTAATGGATAGTGATCTTAGTAGCCGCTGCTCGG
Q8FSJ0	*Corynebacterium efficiens (strain DSM 44549 / YS-314 / AJ 12310 / JCM 11189 / NBRC 100395)*	DSMZ-44549	AAAGAAGGAGATAGGATCATGCACGGATTCTACGTA	GTGTAATGGATAGTGATCTTATGCCGGCGCACCCTC
Q8UJ09	*Agrobacterium fabrum (strain C58 / ATCC 33970) (Agrobacterium tumefaciens (strain C58))*	DSMZ-5172	AAAGAAGGAGATAGGATCATGGAACTCCAGCGTCCG	GTGTAATGGATAGTGATCTTAATACCCGCTGGCGGC
A1T399	*Mycobacterium vanbaalenii (strain DSM 7251 / PYR-1)*	DSMZ-7251	AAAGAAGGAGATAGGATCATGGGTTCCTACTCGCGC	GTGTAATGGATAGTGATCTTAGTCGGGAAACCCGGC
B0RDJ3	*Clavibacter michiganensis subsp. sepedonicus (strain ATCC 33113 / DSM 20744 / JCM 9667 / LMG 2889 / C-1) (Corynebacterium sepedonicum)*	DSMZ-46364	AAAGAAGGAGATAGGATCATGAGCACCAGCCCGTCC	GTGTAATGGATAGTGATCTTAGTAGCCGCTCGATCC
B2GG36	*Kocuria rhizophila (strain ATCC 9341 / DSM 348 / NBRC 103217 / DC2201)*	DSMZ-348	AAAGAAGGAGATAGGATCATGATCACCCGCGCAGAG	GTGTAATGGATAGTGATCTTAGGAATCCAGTCCTTCCAG

Table S4. DERAs from the collection with significant activity for at least one reaction. The number represents the ratio [(product measured in presence of recombinant DERA)/(product measured in E. coli cell free extract with an empty vector of over-expression). We chose a five-fold magnitude over the blank control to be significant. Significant values are shown in green in the following table. Values under a 5 fold magnitude are shown in grey. The selected enzymes for further experiments are shown in yellow.

			Ratio (DERA reaction/cell free extract)		
	Uniprot ID	Genome	G3P + acetone	G3P/ cyclopentanone	G3P+DHA
1	A3DLD3	*Staphylothermus marinus (strain ATCC 43588 / DSM 3639 / F1)*	2	21	1
2	A5FJC8	*Flavobacterium johnsoniae (strain ATCC 17061 / DSM 2064 / UW101)*	4	333	1
3	A5VHQ9	*Lactobacillus reuteri (strain DSM 20016)*	7	399	1
4	A6H1F6	*Flavobacterium psychrophilum (strain JIP02/86 / ATCC 49511)*	5	409	1
5	A7HN67	*Fervidobacterium nodosum (strain ATCC 35602 / DSM 5306 / Rt17-B1)*	1	16	1
6	A8F3L9	*Thermotoga lettingae (strain ATCC BAA-301 / DSM 14385 / TMO)*	2	347	1
7	A8MH18	*Alkaliphilus oremlandii (strain OhILAs)*	6	23	1
8	A9BEN0	*Petrotoga mobilis (strain DSM 10674 / SJ95)*	2	11	1
9	A9KKG9	*Clostridium phytofermentans (strain ATCC 700394 / DSM 18823 / ISDg)*	7	134	3
10	B0S0N1	*Finegoldia magna (strain ATCC 29328)*	7	134	2
11	B1C5N8	*Anaerofustis stercorihominis DSM 17244*	6	29	2
12	B1C7X1	*Anaerofustis stercorihominis DSM 17244*	8	1436	1
13	B1C9V1	*Anaerofustis stercorihominis DSM 17244*	6	2	1
14	B5YES7	*Dictyoglomus thermophilum (strain ATCC 35947 / DSM 3960 / H-6-12)*	2	14	1
15	B6FZF5	*Clostridium hiranonis DSM 13275*	3	328	2
16	B6WB70	*Anaerococcus hydrogenalis DSM 7454*	5	19	1
17	B7CBX4	*Eubacterium biforme DSM 3989*	6	44	1
18	B7CCR8	*Eubacterium biforme DSM 3989*	7	4941	13
19	B8I9D0	*Clostridium cellulolyticum (strain ATCC 35319 / DSM 5812 / JCM 6584 / H10)*	8	164	1
20	B9MKK9	*Anaerocellum thermophilum (strain DSM 6725 / Z-1320)*	3	84	1
21	C0EYB5	*Eubacterium hallii DSM 3353*	3	68	1
22	C0QSF7	*Persephonella marina (strain DSM 14350 / EX-H1)*	2	23	1
23	C1DW64	*Sulfurihydrogenibium azorense (strain Az-Fu1 / DSM 15241 / OCM 825)*	2	129	1
24	C6A3K7	*Thermococcus sibiricus (strain MM 739 / DSM 12597)*	3	7	1
25	C7N8Y8	*Leptotrichia buccalis (strain ATCC 14201 / DSM 1135 / JCM 12969 / NCTC 10249)*	8	129	2
26	C7RF30	*Anaerococcus prevotii (strain ATCC 9321 / DSM 20548 / JCM 6508 / PC1)*	5	63	1
27	D1BL34	*Veillonella parvula (strain ATCC 10790 / DSM 2008 / JCM 12972 / Te3)*	9	740	1
28	D3DYY5	*Methanobrevibacter ruminantium (strain ATCC 35063 / DSM 1093 / JCM 13430 / M1)*	9	864	1
29	D3PD71	*Deferribacter desulfuricans (strain DSM 14783 / JCM 11476 / NBRC 101012 / SSM1)*	1	16	1
30	D5DGD3	*Bacillus megaterium (strain DSM 319)*	8	103	1
31	D5U8N7	*Brachyspira murdochii (strain ATCC 51284 / DSM 12563 / 56-150)*	7	63	1
32	D8GI14	*Clostridium ljungdahlii (strain ATCC 55383 / DSM 13528 / PETC)*	5	76	1
33	A0A166TB09	*Lactococcus lactis subsp, cremoris (strain NZ9000)*	7	65	3
34	D9SKJ3	*Clostridium cellulovorans (strain ATCC 35296 / DSM 3052 / OCM 3 / 743B)*	7	49	1
35	D9TPN8	*Thermoanaerobacterium thermosaccharolyticum (strain ATCC 7956 / DSM 571 / NCIB 9385 / NCA 3814)*	1	5	1
36	E0SNU4	*Ignisphaera aggregans (strain DSM 17230 / JCM 13409 / AQ1,S1)*	4	302	1
37	E2NRK0	*Catenibacterium mitsuokai DSM 15897*	8	4791	9
38	E3DLZ8	*Halanaerobium praevalens (strain ATCC 33744 / DSM 2228 / GSL)*	7	68	2
39	E3DQ67	*Halanaerobium praevalens (strain ATCC 33744 / DSM 2228 / GSL)*	11	127	1
40	E3H811	*Ilyobacter polytropus (strain DSM 2926 / CuHBu1)*	3	13	1
41	E3PT30	*Clostridium sticklandii (strain ATCC 12662 / DSM 519 / JCM 1433 / NCIB 10654)*	9	38	1
42	E4TDN5	*Riemerella anatipestifer (strain ATCC 11845 / DSM 15868 / JCM 9532 / NCTC 11014)*	7	352	2
43	E4TMX4	*Marivirga tractuosa (strain ATCC 23168 / DSM 4126 / NBRC 15989 / NCIMB 1408 / VKM B-1430 / H-43)*	6	13	1
44	E6TW33	*Bacillus cellulosilyticus (strain ATCC 21833 / DSM 2522 / FERM P-1141 / JCM 9156 / N-4)*	9	235	2
45	F2JSP1	*Cellulosilyticum lentocellum (strain ATCC 49066 / DSM 5427 / NCIMB 11756 / RHM5)*	7	135	2
46	G2PMV9	*Muricauda ruestringensis (strain DSM 13258 / LMG 19739 / B1)*	2	9	1
47	G4L3F2	*Tetragenococcus halophilus (strain DSM 20338 / JCM 20259 / NCIMB 9735 / NBRC 12172)*	1	22	1
48	G4L5P7	*Tetragenococcus halophilus (strain DSM 20338 / JCM 20259 / NCIMB 9735 / NBRC 12172)*	5	8	1
49	G4L7G6	*Tetragenococcus halophilus (strain DSM 20338 / JCM 20259 / NCIMB 9735 / NBRC 12172)*	6	1511	5
50	H2J323	*Marinitoga piezophila (strain DSM 14283 / JCM 11233 / KA3)*	5	36	1

51	H6LFY1	*Acetobacterium woodii (strain ATCC 29683 / DSM 1030 / JCM 2381 / KCTC 1655)*	3	5	1
52	P44430	*Haemophilus influenzae (strain ATCC 51907 / DSM 11121 / KW20 / Rd)*	20	479	8
53	Q483R4	*Colwellia psychrerythraea (strain 34H / ATCC BAA-681)*	3	78	2
54	A0A1S0VED5	*Legionella pneumophila (strain Paris)*	6	204	1
55	Q73QJ5	*Treponema denticola (strain ATCC 35405 / CIP 103919 / DSM 14222)*	6	174	1
56	Q8E2U1	*Streptococcus agalactiae serotype III (strain NEM316)*	8	526	4
57	Q9AIP7	*Streptococcus mutans*	6	40	1
58	A1HNM9	*Thermosinus carboxydivorans Nor1*	5	224	1
59	A1RU26	*Pyrobaculum islandicum (strain DSM 4184 / JCM 9189)*	3	12	1
60	A2BLE9	*Hyperthermus butylicus (strain DSM 5456 / JCM 9403)*	1	17	1
61	A3DFT0	*Clostridium thermocellum (strain ATCC 27405 / DSM 1237)*	10	355	2
62	A3DGT2	*Clostridium thermocellum (strain ATCC 27405 / DSM 1237)*	6	469	1
63	A3QGT3	*Shewanella loihica (strain ATCC BAA-1088 / PV-4)*	9	1353	2
64	A4A0J5	*Blastopirellula marina DSM 3645*	8	586	1
65	A4A0J5	*Blastopirellula marina DSM 3645*	8	554	1
66	A5EY74	*Dichelobacter nodosus (strain VCS1703A)*	7	202	1
67	A6LG64	*Parabacteroides distasonis (strain ATCC 8503 / DSM 20701 / NCTC 11152)*	3	8	1
68	A7NMK6	*Roseiflexus castenholzii (strain DSM 13941 / HLO8)*	3	5	1
69	A7VSD0	*Clostridium leptum DSM 753*	8	26	1
70	A7VWB3	*Clostridium leptum DSM 753*	8	412	16
71	A8RFU5	*Eubacterium dolichum DSM 3991*	7	48	1
72	A8RNT5	*Clostridium bolteae ATCC BAA-613*	5	1	1
73	A8RSU8	*Clostridium bolteae ATCC BAA-613*	7	6	1
74	A8S319	*Clostridium bolteae ATCC BAA-613*	7	6	1
75	B0MAA8	*Anaerostipes caccae DSM 14662*	8	2	1
76	B0MAE3	*Anaerostipes caccae DSM 14662*	5	244	11
77	B0MET2	*Anaerostipes caccae DSM 14662*	7	4	1
78	B0MYY8	*Alistipes putredinis DSM 17216*	8	60	1
79	B0NSF0	*Bacteroides stercoris ATCC 43183*	8	114	1
80	B0P6M5	*Anaerotruncus colihominis DSM 17241*	8	11	1
81	B0PHA1	*Anaerotruncus colihominis DSM 17241*	8	5	1
82	B1HTK8	*Lysinibacillus sphaericus (strain C3-41)*	6	5	2
83	B1YKT7	*Exiguobacterium sibiricum (strain DSM 17290 / JCM 13490 / 255-15)*	6	9	2
84	B3QZ00	*Chloroherpeton thalassium (strain ATCC 35110 / GB-78)*	5	5	1
85	B5CU41	*Bacteroides plebeius DSM 17135*	6	58	1
86	B7B6E0	*Parabacteroides johnsonii DSM 18315*	8	139	1
87	B7GMN1	*Anoxybacillus flavithermus (strain DSM 21510 / WK1)*	7	15	2
88	B8CXI0	*Halothermothrix orenii (strain H 168 / OCM 544 / DSM 9562)*	6	30	2
89	B8FUK9	*Desulfitobacterium hafniense (strain DCB-2 / DSM 10664)*	7	8	1
90	B9Y9Z6	*Holdemania filiformis DSM 12042*	5	151	4
91	B9YB21	*Holdemania filiformis DSM 12042*	8	22	4
92	C0C305	*Clostridium hylemonae DSM 15053*	8	18	1
93	C0C3B7	*Clostridium hylemonae DSM 15053*	5	5	1
94	C0CND6	*Blautia hydrogenotrophica DSM 10507*	6	15	1
95	C0CZD0	*Clostridium asparagiforme DSM 15981*	8	5	1
96	C0D9N4	*Clostridium asparagiforme DSM 15981*	4	92	2
97	C0DA78	*Clostridium asparagiforme DSM 15981*	6	5	1
98	C0W0V9	*Actinomyces coleocanis DSM 15436*	4	12	1
99	C0W106	*Actinomyces coleocanis DSM 15436*	5	12	1
100	C0WZ11	*Lactobacillus fermentum ATCC 14931*	3	5	1

101	C0X8W3	*Enterococcus faecalis TX0104*	5	5	2
102	C3PI20	*Corynebacterium aurimucosum (strain ATCC 700975 / DSM 44827 / CN-1)*	6	4	1
103	C4LAZ1	*Tolumonas auensis (strain DSM 9187 / TA4)*	8	151	2
104	C4LJX4	*Corynebacterium kroppenstedtii (strain DSM 44385 / CCUG 35717)*	6	7	1
105	C6LIB8	*Marvinbryantia formatexigens DSM 14469*	7	35	3
106	C7PV91	*Chitinophaga pinensis (strain ATCC 43595 / DSM 2588 / NCIB 11800 / UQM 2034)*	6	5	1
107	C7R2C3	*Jonesia denitrificans (strain ATCC 14870 / DSM 20603 / CIP 55134)*	5	17	2
108	C7REE6	*Anaerococcus prevotii (strain ATCC 9321 / DSM 20548 / JCM 6508 / PC1)*	5	1	1
109	C8W218	*Desulfotomaculum acetoxidans (strain ATCC 49208 / DSM 771 / VKM B-1644)*	3	34	1
110	C8W8Y2	*Atopobium parvulum (strain ATCC 33793 / DSM 20469 / JCM 10300 / VPI 0546)*	5	90	1
111	C9LPE9	*Dialister invisus DSM 15470*	6	9	1
112	D1PG70	*Prevotella copri DSM 18205*	6	99	1
113	D2R096	*Pirellula staleyi (strain ATCC 27377 / DSM 6068 / ICPB 4128)*	5	219	12
114	D2Z780	*Dethiosulfovibrio peptidovorans DSM 11002*	3	41	1
115	D3ADZ1	*Clostridium hathewayi DSM 13479*	4	33	2
116	D3AF28	*Clostridium hathewayi DSM 13479*	6	18	1
117	D3AHT8	*Clostridium hathewayi DSM 13479*	4	7	1
118	D3AQA5	*Clostridium hathewayi DSM 13479*	5	3	1
119	D3AT22	*Clostridium hathewayi DSM 13479*	6	2	1
120	D3DHG9	*Hydrogenobacter thermophilus (strain DSM 6534 / IAM 12695 / TK-6)*	2	6	1
121	D4BZH8	*Providencia rettgeri DSM 1131*	6	3	1
122	D4E8M0	*Serratia odorifera DSM 4582*	5	16	2
123	D4RYH7	*Butyrivibrio crossotus DSM 2876*	5	3	1
124	D5EHZ9	*Coraliomargarita akajimensis (strain DSM 45221 / IAM 15411 / JCM 23193 / KCTC 12865)*	4	17	2
125	D6XYX2	*Bacillus selenitireducens (strain ATCC 700615 / DSM 15326 / MLS10)*	4	24	4
126	D7BJY9	*Arcanobacterium haemolyticum (strain ATCC 9345 / DSM 20595 / NBRC 15585 / NCTC 8452 / 11018)*	5	12	1
127	D7UWC5	*Listeria grayi DSM 20601*	4	146	8
128	D9PX57	*Methanothermobacter marburgensis (strain DSM 2133 / 14651 / NBRC 100331 / OCM 82 / Marburg)*	1	30	1
129	D9R027	*Clostridium saccharolyticum (strain ATCC 35040 / DSM 2544 / NRCC 2533 / WM1)*	3	6	1
130	D9R1L8	*Clostridium saccharolyticum (strain ATCC 35040 / DSM 2544 / NRCC 2533 / WM1)*	3	30	2
131	D9RZ35	*Thermosediminibacter oceani (strain ATCC BAA-1034 / DSM 16646 / JW/IW-1228P)*	1	7	1
132	E0NU04	*Prevotella marshii DSM 16973*	2	38	1
133	A0A380KU85	*Streptococcus mitis NCTC 12261*	3	6	4
134	E1R2M2	*Spirochaeta smaragdinae (strain DSM 11293 / JCM 15392 / SEBR 4228)*	0	26	1
135	E1R7K7	*Spirochaeta smaragdinae (strain DSM 11293 / JCM 15392 / SEBR 4228)*	1	8	1
136	E1R9R0	*Spirochaeta smaragdinae (strain DSM 11293 / JCM 15392 / SEBR 4228)*	3	6	1
137	E1VTU5	*Arthrobacter arilaitensis (strain DSM 16368 / CIP 108037 / JCM 13566 / Re117)*	3	12	3
138	E1X340	*Bacteriovorax marinus (strain ATCC BAA-682 / DSM 15412 / SJ)*	3	12	2
139	E4HP27	*Propionibacterium acnes HL044PA1*	0	10	1
140	E4T6I7	*Paludibacter propionicigenes (strain DSM 17365 / JCM 13257 / WB4)*	3	30	2
141	E6LE39	*Enterococcus italicus DSM 15952*	3	5	2
142	E6U4C4	*Ethanoligenens harbinense (strain DSM 18485 / JCM 12961 / CGMCC 1,5033 / YUAN-3)*	1	148	1
143	E6U8W2	*Ethanoligenens harbinense (strain DSM 18485 / JCM 12961 / CGMCC 1,5033 / YUAN-3)*	2	43	1
144	F0SVD2	*Syntrophobotulus glycolicus (strain DSM 8271 / FlGlyR)*	2	6	1
145	F0T2U0	*Syntrophobotulus glycolicus (strain DSM 8271 / FlGlyR)*	2	91	1
146	F4A0U0	*Mahella australiensis (strain DSM 15567 / CIP 107919 / 50-1 BON)*	1	6	1
147	F5RMP2	*Centipeda periodontii DSM 2778*	3	27	1
148	F6B909	*Desulfotomaculum carboxydivorans (strain DSM 14880 / VKM B-2319 / CO-1-SRB)*	4	17	1
149	F6DR13	*Desulfotomaculum ruminis (strain ATCC 23193 / DSM 2154 / NCIB 8452 / DL)*	3	23	2
150	F7NJW4	*Acetonema longum DSM 6540*	3	6	2

151	A0A0A1DXL6	*Streptococcus salivarius (strain JIM8777)*	3	5	1
152	G4KWG9	*Oscillibacter valericigenes (strain DSM 18026 / NBRC 101213 / Sjm18-20)*	3	5	1
153	H6LE04	*Acetobacterium woodii (strain ATCC 29683 / DSM 1030 / JCM 2381 / KCTC 1655)*	3	51	1
154	H6LE05	*Acetobacterium woodii (strain ATCC 29683 / DSM 1030 / JCM 2381 / KCTC 1655)*	0	7	1
155	Q3ILQ8	*Pseudoalteromonas haloplanktis (strain TAC 125)*	3	20	1
156	Q5WHF4	*Bacillus clausii (strain KSM-K16)*	3	20	2
157	Q65H59	*Bacillus licheniformis (strain DSM 13 / ATCC 14580)*	3	9	2
158	Q6ALS3	*Desulfotalea psychrophila (strain LSv54 / DSM 12343)*	3	5	1
159	Q89ZF2	*Bacteroides thetaiotaomicron (strain ATCC 29148 / DSM 2079 / NCTC 10582 / E50 / VPI-5482)*	3	54	10
160	Q8NTC4	*Corynebacterium glutamicum*	2	9	1
161	A4A8W3	*Congregibacter litoralis KT71*	27	25	3
162	A7NMT7	*Roseiflexus castenholzii (strain DSM 13941 / HLO8)*	41	58	2
163	B0TAF2	*Heliobacterium modesticaldum (strain ATCC 51547 / Ice1)*	28	54	2
164	B5Y7V3	*Coprothermobacter proteolyticus (strain ATCC 35245 / DSM 5265 / BT)*	15	6	2
165	B8HFF3	*Arthrobacter chlorophenolicus (strain A6 / ATCC 700700 / DSM 12829 / JCM 12360)*	38	267	7
166	C0CZB7	*Clostridium asparagiforme DSM 15981*	11	4	2
167	C0D4T2	*Clostridium asparagiforme DSM 15981*	36	42	3
168	C4FBU4	*Collinsella intestinalis DSM 13280*	27	8	2
169	C7LX90	*Desulfomicrobium baculatum (strain DSM 4028 / VKM B-1378)*	27	58	2
170	C7PZL3	*Catenulispora acidiphila (strain DSM 44928 / NRRL B-24433 / NBRC 102108 / JCM 14897)*	5	1	2
171	C8WY41	*Alicyclobacillus acidocaldarius subsp, acidocaldarius (strain ATCC 27009 / DSM 446 / 104-1A)*	7	2	2
172	C9KLB4	*Mitsuokella multacida DSM 20544*	26	177	2
173	D0L2X8	*Gordonia bronchialis (strain ATCC 25592 / DSM 43247 / JCM 3198 / NCTC 10667)*	13	2	2
174	D0MHJ1	*Rhodothermus marinus (strain ATCC 43812 / DSM 4252 / R-10)*	32	27	3
175	D1B7V1	*Thermanaerovibrio acidaminovorans (strain ATCC 49978 / DSM 6589 / Su883)*	6	34	2
176	D1PP71	*Subdoligranulum variabile DSM 15176*	44	43	4
177	D1Z232	*Methanocella paludicola (strain DSM 17711 / JCM 13418 / NBRC 101707 / SANAE)*	15	76	2
178	D7BBI7	*Meiothermus silvanus (strain ATCC 700542 / DSM 9946 / VI-R2)*	29	28	1
179	D7BDI0	*Meiothermus silvanus (strain ATCC 700542 / DSM 9946 / VI-R2)*	24	39	2
180	D9Q354	*Acidilobus saccharovorans (strain DSM 16705 / VKM B-2471 / 345-15)*	6	1	2
181	E0RP49	*Spirochaeta thermophila (strain ATCC 49972 / DSM 6192 / RI 19,B1)*	7	10	2
182	E1QXS9	*Olsenella uli (strain ATCC 49627 / DSM 7084 / CIP 109912 / JCM 12494 / VPI D76D-27C)*	29	75	2
183	E1QYT1	*Olsenella uli (strain ATCC 49627 / DSM 7084 / CIP 109912 / JCM 12494 / VPI D76D-27C)*	34	1184	15
184	E1V588	*Halomonas elongata (strain ATCC 33173 / DSM 2581 / NBRC 15536 / NCIMB 2198 / 1H9)*	41	205	2
185	E3D079	*Aminomonas paucivorans DSM 12260*	14	99	1
186	E4NPT1	*Halogeometricum borinquense (strain ATCC 700274 / DSM 11551 / JCM 10706 / PR3)*	5	3	1
187	F7X6C2	*Sinorhizobium meliloti (strain SM11)*	4	202	3
188	L0D9M4	*Singulisphaera acidiphila DSM 18658*	34	19	2
189	H1P040	*Holophaga foetida DSM 6591*	20	9	2
190	I0I7R3	*Caldilinea aerophila (strain DSM 14535 / JCM 11387 / NBRC 104270 / STL-6-O1)*	27	168	3
191	Q2KDR9	*Rhizobium etli (strain CFN 42 / ATCC 51251)*	29	138	3
192	Q2NW06	*Sodalis glossinidius (strain morsitans)*	11	8	2
193	Q2RRZ2	*Rhodospirillum rubrum (strain ATCC 11170 / NCIB 8255)*	8	4	2
194	Q6A655	*Propionibacterium acnes (strain KPA171202 / DSM 16379)*	30	8	2
195	Q7NRS9	*Chromobacterium violaceum (strain ATCC 12472 / DSM 30191 / JCM 1249 / NBRC 12614 / NCIMB 9131 / NCTC 9757)*	37	149	3
196	Q8FSJ0	*Corynebacterium efficiens (strain DSM 44549 / YS-314 / AJ 12310 / JCM 11189 / NBRC 100395)*	23	45	2
197	Q8UJ09	*Agrobacterium tumefaciens (strain C58 / ATCC 33970)*	25	31	2
198	A1T399	*Mycobacterium vanbaalenii (strain DSM 7251 / PYR-1)*	6	2	3
199	B0RDJ3	*Clavibacter michiganensis subsp, sepedonicus (strain ATCC 33113 / JCM 9667)*	19	2	1
200	B2GG36	*Kocuria rhizophila (strain ATCC 9341 / DSM 348 / NBRC 103217 / DC2201)*	19	4	1

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