

SEQUENCE LISTING

<110> Intrexon Corporation

<120> METHODS AND MICROORGANISMS FOR MAKING 2,3-BUTANEDIOL AND
DERIVATIVES THEREOF FROM C1 CARBONS

<130> INX00382US

<160> 20

<170> PatentIn version 3.5

<210> 1

<211> 571

<212> PRT

<213> Bacillus subtilis

<400> 1

Met	Leu	Thr	Lys	Ala	Thr	Lys	Glu	Gln	Lys	Ser	Leu	Val	Lys	Asn	Arg
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Gly	Ala	Glu	Leu	Val	Val	Asp	Cys	Leu	Val	Glu	Gln	Gly	Val	Thr	His
			20					25					30		

Val	Phe	Gly	Ile	Pro	Gly	Ala	Lys	Ile	Asp	Ala	Val	Phe	Asp	Ala	Leu
		35					40					45			

Gln	Asp	Lys	Gly	Pro	Glu	Ile	Ile	Val	Ala	Arg	His	Glu	Gln	Asn	Ala
	50					55					60				

Ala	Phe	Met	Ala	Gln	Ala	Val	Gly	Arg	Leu	Thr	Gly	Lys	Pro	Gly	Val
65					70					75					80

Val	Leu	Val	Thr	Ser	Gly	Pro	Gly	Ala	Ser	Asn	Leu	Ala	Thr	Gly	Leu
				85					90					95	

Leu	Thr	Ala	Asn	Thr	Glu	Gly	Asp	Pro	Val	Val	Ala	Leu	Ala	Gly	Asn
			100					105					110		

Val	Ile	Arg	Ala	Asp	Arg	Leu	Lys	Arg	Thr	His	Gln	Ser	Leu	Asp	Asn
		115					120					125			

Ala	Ala	Leu	Phe	Gln	Pro	Ile	Thr	Lys	Tyr	Ser	Val	Glu	Val	Gln	Asp
	130					135					140				

Val Lys Asn Ile Pro Glu Ala Val Thr Asn Ala Phe Arg Ile Ala Ser
145 150 155 160

Ala Gly Gln Ala Gly Ala Ala Phe Val Ser Phe Pro Gln Asp Val Val
165 170 175

Asn Glu Val Thr Asn Thr Lys Asn Val Arg Ala Val Ala Ala Pro Lys
180 185 190

Leu Gly Pro Ala Ala Asp Asp Ala Ile Ser Ala Ala Ile Ala Lys Ile
195 200 205

Gln Thr Ala Lys Leu Pro Val Val Leu Val Gly Met Lys Gly Gly Arg
210 215 220

Pro Glu Ala Ile Lys Ala Val Arg Lys Leu Leu Lys Lys Val Gln Leu
225 230 235 240

Pro Phe Val Glu Thr Tyr Gln Ala Ala Gly Thr Leu Ser Arg Asp Leu
245 250 255

Glu Asp Gln Tyr Phe Gly Arg Ile Gly Leu Phe Arg Asn Gln Pro Gly
260 265 270

Asp Leu Leu Leu Glu Gln Ala Asp Val Val Leu Thr Ile Gly Tyr Asp
275 280 285

Pro Ile Glu Tyr Asp Pro Lys Phe Trp Asn Ile Asn Gly Asp Arg Thr
290 295 300

Ile Ile His Leu Asp Glu Ile Ile Ala Asp Ile Asp His Ala Tyr Gln
305 310 315 320

Pro Asp Leu Glu Leu Ile Gly Asp Ile Pro Ser Thr Ile Asn His Ile
325 330 335

Glu His Asp Ala Val Lys Val Glu Phe Ala Glu Arg Glu Gln Lys Ile
340 345 350

Leu Ser Asp Leu Lys Gln Tyr Met His Glu Gly Glu Gln Val Pro Ala
355 360 365

Asp Trp Lys Ser Asp Arg Ala His Pro Leu Glu Ile Val Lys Glu Leu
370 375 380

Arg Asn Ala Val Asp Asp His Val Thr Val Thr Cys Asp Ile Gly Ser
385 390 395 400

His Ala Ile Trp Met Ser Arg Tyr Phe Arg Ser Tyr Glu Pro Leu Thr
405 410 415

Leu Met Ile Ser Asn Gly Met Gln Thr Leu Gly Val Ala Leu Pro Trp
420 425 430

Ala Ile Gly Ala Ser Leu Val Lys Pro Gly Glu Lys Val Val Ser Val
435 440 445

Ser Gly Asp Gly Gly Phe Leu Phe Ser Ala Met Glu Leu Glu Thr Ala
450 455 460

Val Arg Leu Lys Ala Pro Ile Val His Ile Val Trp Asn Asp Ser Thr
465 470 475 480

Tyr Asp Met Val Ala Phe Gln Gln Leu Lys Lys Tyr Asn Arg Thr Ser
485 490 495

Ala Val Asp Phe Gly Asn Ile Asp Ile Val Lys Tyr Ala Glu Ser Phe
500 505 510

Gly Ala Thr Gly Leu Arg Val Glu Ser Pro Asp Gln Leu Ala Asp Val
515 520 525

Leu Arg Gln Gly Met Asn Ala Glu Gly Pro Val Ile Ile Asp Val Pro
530 535 540

Val Asp Tyr Ser Asp Asn Ile Asn Leu Ala Ser Asp Lys Leu Pro Lys
545 550 555 560

Glu Phe Gly Glu Leu Met Lys Thr Lys Ala Leu
565 570

<210> 2
<211> 1713
<212> DNA
<213> *Bacillus subtilis*

<400> 2
atgaccaagg ccaccaagga acagaaaagc ctggtcaaga accgcggtgc tgaactggtt 60
gtggactgcc tcgtggaaca gggcgtgacc catgtcttcg gcatcccggg cgccaagatc 120
gacgccgtct tcgacgccct gcaggataaa ggtccggaaa tcatcgtggc acgcatgag 180
cagaacgcag ccttcattggc ccaggccgtc ggtcggctga cgggtaagcc cggcgtggtg 240
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ggccaagcag gggcagcatt cgtgagcttc ccccaggacg tggatcaatga agtgaccaac 540
acaaaaaacg tcagagccgt agccgccccg aagctggggc ctgcagcaga tgacgccatc 600
tccgtgcca tcgcaagat ccagaccgca aagctgccgg tcgtgctggt cggaatgaag 660
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gccatttggg tgagccgcta cttccggagc tatgaaccgc tgaccctgat gatctccaac 1260
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gaaaccgcgg tccgcctgaa ggccccgatc gtgcatatcg tgtggaacga cagcacctac 1440
 gacatggtcg ccttcagca gctgaaaaag tacaaccgca ccagcgccgt ggacttcggc 1500
 aatatcgaca tcgtgaagta tgccgaatcc ttcggagcca ccggactgcg cgtggaatcc 1560
 ccggaccagc tggcggacgt tctgcgtcag ggcatgaatg ccgaaggtcc cgtgattatc 1620
 gatgtgcccg tcgactacag cgacaacatc aacctggcct cggacaaatt gccgaaggag 1680
 ttcggcgaac tgatgaaaac aaaagcacta taa 1713

<210> 3
 <211> 556
 <212> PRT
 <213> Clostridium autoethanogenum

<400> 3

Met Asn Arg Asp Ile Lys Lys Glu Val Gln Leu Asn Thr Ala Gln Met
 1 5 10 15

Leu Val Lys Cys Leu Glu Ala Glu Gly Val Lys Tyr Ile Phe Gly Ile
 20 25 30

Pro Gly Glu Glu Asn Leu Glu Ile Met Asn Ala Ile Ser Asp Ser Thr
 35 40 45

Ile Glu Phe Ile Thr Thr Arg His Glu Gln Gly Ala Ala Phe Met Ala
 50 55 60

Asp Val Tyr Gly Arg Leu Thr Gly Lys Ala Gly Val Cys Leu Ser Thr
 65 70 75 80

Leu Gly Pro Gly Ala Thr Asn Leu Val Thr Gly Val Ala Asp Ala Asp
 85 90 95

Ser Asp Gly Ala Pro Val Val Ala Ile Thr Gly Gln Val Gly Thr Glu
 100 105 110

Arg Met His Ile Thr Ser His Gln Phe Leu Asp Leu Cys Lys Met Phe
 115 120 125

Glu Pro Ile Thr Lys Arg Ser Lys Gln Ile Val Arg Pro Asp Thr Val
 130 135 140

Ser Glu Ile Ile Arg Leu Val Phe Lys Tyr Ala Glu Ser Glu Lys Pro
145 150 155 160

Gly Ala Cys His Ile Asp Leu Pro Val Asn Ile Ala Lys Met Pro Val
165 170 175

Gly Ala Leu Glu Lys Pro Leu Glu Lys Lys Ile Pro Pro Lys Glu His
180 185 190

Ala Asp Leu Ser Thr Ile Glu Glu Ala Ala Ser Glu Ile Phe Lys Ala
195 200 205

Lys Asn Pro Ile Ile Leu Ala Gly Ser Gly Ala Ile Arg Gly Asn Ser
210 215 220

Ser Lys Ala Val Thr Glu Phe Ala Thr Lys Leu Lys Ile Pro Val Ile
225 230 235 240

Asn Thr Met Met Ala Lys Gly Ile Ile Pro Met Asp Asn Lys Tyr Ser
245 250 255

Met Trp Thr Ile Gly Ile Pro Gln Lys Asp Tyr Val Asn Lys Ile Ile
260 265 270

Glu Glu Ala Asp Leu Val Ile Thr Ile Gly Tyr Asp Ile Val Glu Tyr
275 280 285

Ala Pro Ser Lys Trp Asn Ile Asn Gly Asp Ile Lys Ile Val His Ile
290 295 300

Asp Ala Arg Pro Ser His Ile Asn Lys Leu Tyr Gln Pro Ile Val Glu
305 310 315 320

Val Val Gly Asp Ile Ser Asp Ala Leu Tyr Asn Ile Leu Arg Arg Thr
325 330 335

Ser Ser Lys Asp Glu Pro Val Lys Ala Leu Glu Ile Lys Ser Glu Met
340 345 350

Leu Ala Glu His Glu Ser Tyr Ala Asn Asp Asn Ala Phe Pro Met Lys
355 360 365

Pro Gln Arg Ile Leu Asn Asp Val Arg Lys Val Met Gly Pro His Asp
370 375 380

Ile Val Ile Ser Asp Val Gly Ala His Lys Met Trp Ile Ala Arg His
385 390 395 400

Tyr Asn Cys Tyr Glu Pro Asn Thr Cys Ile Ile Ser Asn Gly Phe Ala
405 410 415

Thr Met Gly Ile Gly Val Pro Gly Ala Ile Ala Ala Lys Leu Ile Asn
420 425 430

Pro Asp Lys Lys Val Leu Ala Ile Val Gly Asp Gly Gly Phe Met Met
435 440 445

Asn Asn Gln Glu Leu Glu Thr Ala Leu Arg Ile Lys Thr Pro Ile Val
450 455 460

Val Leu Ile Phe Asn Asp Ser Asn Tyr Gly Leu Ile Lys Trp Lys Gln
465 470 475 480

Glu Glu His Tyr Gly Lys Ser Cys Tyr Val Asp Phe Thr Asn Pro Asp
485 490 495

Phe Val Lys Leu Ala Glu Ser Met Tyr Ala Lys Gly Tyr Arg Val Glu
500 505 510

Lys Ala Glu Asp Leu Ile Pro Thr Leu Glu Glu Ala Phe Lys Gln Asn
515 520 525

Val Pro Ala Val Ile Asp Cys Gln Val Asp Tyr Gly Glu Asn Ile Lys
530 535 540

Leu Thr Lys His Leu Lys Glu Val Tyr Glu Asn Met
545 550 555

<210> 4

<211> 1671

<212> DNA

<213> *Clostridium autoethanogenum*

<400> 4

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ctggaagccg agggcgtcaa gtatatcttc ggcatcccgg gcgaggagaa tctcgaaatc	120
atgaacgcca tctcggattc cacgatcgag ttcatcacca cccgccatga acagggcgcg	180
gccttcatgg ccgacgtgta cggccggctg accggcaagg cgggcgtgtg tctgagcacc	240
ctcggccccg gcgcgaccaa cctggtcacc ggcgtggccg acgccgactc cgacggcgcc	300
cccgtggctg cgatcaccgg ccaggtgggc acggagcgga tgcacatcac ctcccatcag	360
ttcctcgacc tctgcaagat gttcgagccg atcaccaagc ggagcaagca gatcgtccgc	420
ccggacacgg tgtcggagat catccgcctg gtgttcaagt acgccgaaag cgaaaagccc	480
ggcgcctgtc atatcgacct gccggtcaac atcgccaaga tgcccgtcgg cgccctggag	540
aagccgctgg agaaaaaaaa cccgccgaag gaacacgcgg acctgtccac catcgaggaa	600
gcggcgctcc agatcttcaa ggccaaaaac cccatcatcc tggccggcag cggcgccatc	660
cgcggcaaca gcagcaaggc ggtcaccgag ttcgccacca agctgaagat ccccgtcatc	720
aacacgatga tggccaaggg catcatcccg atggacaaca agtatagcat gtggaccatc	780
ggcatcccc agaaggacta tgtgaacaag atcatcgaag aggccgacct ggtcatcacc	840
atcggctacg acatcgtgga atatgccccg tcgaaatgga acatcaacgg cgacatcaag	900
atcgtccata tcgacgcccc cccctcgcac atcaacaaac tctaccagcc catcgtggag	960
gtggtcggcg acatcagcga cgcgctgtat aacatcctgc gccgcaccag ctcgaaagac	1020
gagccggtca aggcgctgga gatcaagtcg gaaatgctgg cggagcacga gtcctacgcg	1080
aacgacaatg cgttcccgat gaagccgcag cgcatacctca acgatgtgcg caaagtcatg	1140
ggcccgcacg acatcgtgat ctccgatgtg ggcgcccata aaatgtggat cgcccgccac	1200
tataactgct acgagccgaa tacctgcatc atctcgaacg gcttcgccac gatgggcatc	1260
ggcgtcccgg gcgcgatcgc cgccaaactc atcaaccggg ataagaaggt cctggccatc	1320
gtcggcgacg gcggcttcat gatgaataac caggaactgg agacggcgct gcgcatcaaa	1380
acgcccacgc tggctcctcat cttcaacgac tccaattacg gcctcatcaa gtggaagcag	1440
gaggagcatt atggcaaadc gtgctatgtg gacttcacca acccggactt cgtgaagctg	1500

gccgagagca tgtacgcaa aggctatcgc gtggagaaag ccgaggatct gatcccgacc 1560
 ctcgaagagg cttcaagca gaatgtcccg gcggtcatcg actgccaggt ggactatggc 1620
 gagaatatca agctcaccaa gcacctcaag gaggtctatg aaaacatgtg a 1671

<210> 5
 <211> 239
 <212> PRT
 <213> Clostridium autoethanogenum

<400> 5

Met Asp Asp Glu Val Lys Val Pro Asn His Ile Tyr Gln Met Ser Thr
 1 5 10 15

Ile Asn Ala Leu Val Ser Gly Leu Tyr Asp Gly Cys Val Ser Leu Ser
 20 25 30

Lys Leu Leu Lys Lys Gly Asn Phe Gly Ile Gly Thr Phe Lys Gly Leu
 35 40 45

Asp Gly Glu Leu Thr Leu Leu Asn Gly Thr Phe Tyr Arg Thr Lys Pro
 50 55 60

Asp Gly Ser Val Tyr Val Cys Ser Lys Asn Val Ser Val Pro Phe Ala
 65 70 75 80

Val Val Thr Glu Leu Glu Asn Tyr Asn Thr Tyr Asn Ile Gln Asn Arg
 85 90 95

Thr Ser Tyr Glu Asp Ile Arg Lys Glu Leu Asp Ser Phe Ile Glu Ser
 100 105 110

Lys Asn Ile Phe Tyr Ala Phe Tyr Met Glu Gly Lys Phe Asn Tyr Val
 115 120 125

Lys Thr Arg Thr Val Val Lys Gln Asn Met Pro Tyr Lys Pro Met Ala
 130 135 140

Glu Val Val Lys Asp Gln Pro Met Phe Glu Tyr Asn Gly Val Asp Gly
 145 150 155 160

Tyr Val Val Gly Phe Arg Cys Pro Asp Tyr Val Glu Gly Leu Asn Val
165 170 175

Pro Gly Tyr His Phe His Phe Ile Asn Lys Asp Lys Lys Phe Gly Gly
180 185 190

His Ile Ser Glu Phe Ser Ile Glu Asn Ala Lys Val Tyr Val Gln Asn
195 200 205

Cys Ser Cys Phe Arg Met Glu Leu Pro Lys Asn Glu Ser Phe Tyr Asn
210 215 220

Met Glu Val Gln Asp Arg Asn Asp Glu Ile Thr Ser Val Glu Lys
225 230 235

<210> 6
<211> 720
<212> DNA
<213> Clostridium autoethanogenum

<400> 6
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gtcagcggcc tctacgacgg ctgtgtgtcg ctctgaagc tcctgaaaaa gggcaatttc 120
ggcatcggca cgttcaaggg cctggatggc gagctgacct tcctgaacgg cacgtttctat 180
cgcaccaaac cggatggctc cgtgtacgtg tgcagcaaga acgtgagcgt ccccttcgcg 240
gtcgtcaccg agctggagaa ctacaatacc tataacatcc agaatcgac ctcctatgag 300
gacatccgca aggagctgga ctcgttcacg gagtcgaaga acatcttcta tgccttctat 360
atggaaggca aattcaacta cgtcaaaacc cgcaccgtcg tgaagcagaa catgccgtac 420
aagccgatgg ccgaggtggt caaagaccag ccgatgttcg aatacaacgg cgtcgatggc 480
tacgtcgtcg gcttccggtg cccggattat gtggaaggcc tcaatgtgcc cggctaccat 540
ttccacttca tcaacaagga caaaaagttc ggcggccaca tctccgagtt ctcgatcgag 600
aacgccaaag tctacgtcca gaactgctcc tgtttccgca tggagctccc gaagaatgag 660
agcttctaca acatggaggt ccaggaccgc aacgacgaaa tcacgtccgt ggagaaatga 720

<210> 7
<211> 259
<212> PRT

<213> Klebsiella pneumoniae

<400> 7

Met Asn His Ser Ala Glu Cys Thr Cys Glu Glu Ser Leu Cys Glu Thr
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Leu Arg Ala Phe Ser Ala Gln His Pro Glu Ser Val Leu Tyr Gln Thr
20 25 30

Ser Leu Met Ser Ala Leu Leu Ser Gly Val Tyr Glu Gly Ser Thr Thr
35 40 45

Ile Ala Asp Leu Leu Lys His Gly Asp Phe Gly Leu Gly Thr Phe Asn
50 55 60

Glu Leu Asp Gly Glu Leu Ile Ala Phe Ser Ser Gln Val Tyr Gln Leu
65 70 75 80

Arg Ala Asp Gly Ser Ala Arg Lys Ala Gln Pro Glu Gln Lys Thr Pro
85 90 95

Phe Ala Val Met Thr Trp Phe Gln Pro Gln Tyr Arg Lys Thr Phe Asp
100 105 110

His Pro Val Ser Arg Gln Gln Leu His Glu Val Ile Asp Gln Gln Ile
115 120 125

Pro Ser Asp Asn Leu Phe Cys Ala Leu Arg Ile Asp Gly His Phe Arg
130 135 140

His Ala His Thr Arg Thr Val Pro Arg Gln Thr Pro Pro Tyr Arg Ala
145 150 155 160

Met Thr Asp Val Leu Asp Asp Gln Pro Val Phe Arg Phe Asn Gln Arg
165 170 175

Glu Gly Val Leu Val Gly Phe Arg Thr Pro Gln His Met Gln Gly Ile
180 185 190

Asn Val Ala Gly Tyr His Glu His Phe Ile Thr Asp Asp Arg Lys Gly
195 200 205

Gly Gly His Leu Leu Asp Tyr Gln Leu Asp His Gly Val Leu Thr Phe
 210 215 220

Gly Glu Ile His Lys Leu Met Ile Asp Leu Pro Ala Asp Ser Ala Phe
 225 230 235 240

Leu Gln Ala Asn Leu His Pro Asp Asn Leu Asp Ala Ala Ile Arg Ser
 245 250 255

Val Glu Ser

<210> 8
 <211> 780
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 8
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 ggctgtgatg aaggctcgac gaccatcgcc gacctgtga agcatggcga cttcggcctg 180
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 cacgaggtga tcgaccagca gatcccagc gacaacctct tctgcgccct gcgcatcgac 420
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 gtcctgacct tcggcgaaat ccataagctg atgatcgacc tccccgccga cagcgccttc 720
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<210> 9
 <211> 357
 <212> PRT

<213> Clostridium autoethanogenum

<400> 9

Met Lys Ala Val Leu Trp Tyr Asp Lys Lys Asp Val Arg Val Glu Glu
1 5 10 15

Ile Glu Glu Pro Lys Val Lys Glu Asn Ala Val Lys Ile Lys Val Lys
20 25 30

Trp Cys Gly Ile Cys Gly Ser Asp Leu His Glu Tyr Leu Gly Gly Pro
35 40 45

Ile Phe Ile Pro Val Gly Thr Pro His Pro Leu Ser Lys Ser Thr Ala
50 55 60

Pro Val Val Leu Gly His Glu Phe Ser Gly Glu Val Val Glu Ile Gly
65 70 75 80

Ser Lys Val Thr Lys Phe Lys Ala Gly Asp Arg Val Ile Val Glu Pro
85 90 95

Ile Val Ala Cys Gly Lys Cys Pro Ala Cys Leu Glu Gly Lys Tyr Asn
100 105 110

Leu Cys Glu Ala Leu Gly Phe His Gly Leu Cys Gly Ser Gly Gly Gly
115 120 125

Phe Ala Glu Tyr Thr Val Phe Pro Glu Asp Phe Val His Lys Ile Pro
130 135 140

Asp Thr Met Asp Tyr Glu Gln Ala Ala Leu Val Glu Pro Met Ala Val
145 150 155 160

Ala Leu His Ser Leu Arg Val Gly Asn Phe Thr Thr Gly Asn Thr Ala
165 170 175

Leu Val Leu Gly Ala Gly Pro Ile Gly Leu Ala Thr Ile Gln Cys Leu
180 185 190

Lys Ala Ser Gly Ala Arg Ile Val Ile Val Phe Gln Arg Lys Ser Val
195 200 205

Arg Gln Glu Tyr Ala Lys Lys Phe Gly Ala Asp Val Val Leu Asp Pro
210 215 220

Asn Glu Val Asp Val Ile Glu Glu Ile Lys Lys Leu Thr Gly Gly Val
225 230 235 240

Gly Val Asp Thr Ser Phe Glu Thr Thr Gly Ala Asn Val Gly Ile Asn
245 250 255

Thr Ala Ile Gln Ala Leu Lys Tyr Glu Gly Thr Ala Val Ile Thr Ser
260 265 270

Val Trp Glu Lys Asn Ala Glu Ile Asn Pro Asn Asp Leu Val Phe Thr
275 280 285

Glu Lys Lys Val Val Gly Thr Leu Ala Tyr Arg His Glu Phe Pro Ser
290 295 300

Thr Ile Ala Leu Met Asn Asp Gly Arg Ile Lys Thr Asp Gly Tyr Ile
305 310 315 320

Thr Lys Arg Ile Ala Leu Glu Asp Ile Val Lys Glu Gly Phe Glu Thr
325 330 335

Leu Thr Gly Pro Glu Lys Lys Lys His Val Lys Ile Ile Val Thr Pro
340 345 350

Asp Lys Ser Leu Leu
355

<210> 10
<211> 1074
<212> DNA
<213> Clostridium autoethanogenum

<400> 10
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aaggtgaaag aaaacgccgt gaagatcaaa gtcaagtggg gcggcatctg cggctcggac 120
ctgcatgagt atctcggcgg cccgatcttc atcccgtcg gcacccccca cccgctgtcg 180

aagagcaccg cgcccgtcgt gctggggccac gagttctcgg gcgaagtggg ggagatcggc 240
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ggcaaattgcc cggcctgcct ggaaggcaag tacaatctgt gcgaggcgct gggcttccac 360
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cacaagatcc ccgacacgat ggattatgaa caggccgcgc tgggtggagcc gatggcggtc 480
gcgctgcact ccctgcgggt gggcaacttc accacgggca acaccgccct ggtcctgggc 540
gcgggcccga tcggcctggc caccatccag tgcctcaaag cgtcgggcgc ccggatcgtc 600
atcgtcttcc agcgcaaadc ggtgcggcag gaatacgcca agaagttcgg cgcggacgtg 660
gtcctcgacc cgaatgaggt ggacgtgatc gaggaaatca aaaagctgac cggcggcgtg 720
ggcgtggaca cgagcttcga aaccaccggc gccaacgtcg gcatcaacac cgcgatccag 780
gcgctgaaat atgagggcac cgccgtcatc acctccgtct gggagaagaa cgccgagatc 840
aatccgaacg acctggtctt caccgaaaag aaggtcgtcg gcaccctcgc gtaccggcac 900
gagttcccgt cgaccatcgc cctgatgaac gacggccgca tcaagaccga tggctatatc 960
accaagcggg tcgccctgga agacatcgtc aaggagggtc tcgaaaccct gaccggcccg 1020
gagaagaaaa agcacgtcaa aatcatcgtc acgcccgata aaagcctcct gtga 1074

<210> 11
<211> 350
<212> PRT
<213> *Bacillus subtilis*

<400> 11

Met Lys Ala Leu Leu Trp His Asn Gln Arg Asp Val Arg Val Glu Glu
1 5 10 15

Val Pro Glu Pro Ala Val Arg Ser Gly Ala Val Lys Ile Lys Val Lys
20 25 30

Trp Cys Gly Ile Cys Gly Thr Asp Leu His Glu Tyr Leu Ala Gly Pro
35 40 45

Ile Phe Ile Pro Thr Glu Glu His Pro Leu Thr His Val Lys Ala Pro
50 55 60

Val Ile Leu Gly His Glu Phe Ser Gly Glu Val Val Glu Ile Gly Glu
65 70 75 80

Gly Val Thr Asn His Lys Val Gly Asp Arg Val Val Val Glu Pro Ile
85 90 95

Tyr Ser Cys Gly Lys Cys Glu Ala Cys Lys His Gly His Tyr Asn Val
100 105 110

Cys Glu Gln Leu Val Phe His Gly Leu Gly Gly Asp Gly Gly Gly Phe
115 120 125

Ser Glu Tyr Thr Val Val Pro Ala Asp Met Val His His Ile Pro Asp
130 135 140

Glu Met Thr Tyr Glu Gln Gly Ala Leu Val Glu Pro Ala Ala Val Ala
145 150 155 160

Val His Ala Val Arg Gln Ser Lys Leu Lys Glu Gly Glu Ala Val Ala
165 170 175

Val Phe Gly Cys Gly Pro Ile Gly Leu Leu Val Ile Gln Ala Ala Lys
180 185 190

Ala Ala Gly Ala Thr Pro Val Ile Ala Val Glu Leu Ser Lys Glu Arg
195 200 205

Gln Glu Leu Ala Lys Leu Ala Gly Ala Asp Tyr Val Leu Asn Pro Ala
210 215 220

Glu Gln Asp Val Val Ala Glu Ile Arg Asn Leu Thr Asn Gly Leu Gly
225 230 235 240

Val Asn Val Ser Phe Glu Val Thr Gly Val Glu Val Val Leu Arg Gln
245 250 255

Ala Ile Glu Ser Thr Ser Phe Glu Gly Gln Thr Val Ile Val Ser Val
260 265 270

Trp Glu Lys Asp Ala Thr Ile Thr Pro Asn Asn Leu Val Leu Lys Glu
275 280 285

Lys Glu Val Val Gly Ile Leu Gly Tyr Arg His Ile Phe Pro Ser Val
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Ile Lys Leu Ile Ser Ser Gly Gln Ile Gln Ala Glu Lys Leu Ile Thr
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Trp	Cys	Gly	Ile	Cys	Gly	Ser	Asp	Leu	His	Glu	Tyr	Val	Ala	Gly	Pro
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Glu	Gly	Val	Thr	Lys	Ile	Gln	Val	Gly	Asp	Arg	Glu	Val	Val	Glu	Pro
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Leu	Cys	Asp	Lys	Met	Gly	Phe	Leu	Gly	Leu	Ala	Gly	Gly	Gly	Gly	Gly
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Phe	Ser	Glu	Tyr	Val	Ala	Ala	Asp	Glu	His	Met	Val	His	Lys	Ile	Pro
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Glu	Ser	Val	Ser	Phe	Glu	Gln	Gly	Ala	Leu	Val	Glu	Pro	Ser	Ala	Val
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180 185 190

Asn Ala Ser Gly Ala Ser Glu Ile Tyr Ala Glu Glu Leu Ser Glu Glu
195 200 205

Arg Thr Ala Lys Ala Glu Asp Leu Gly Ala Ile Val Leu Asp Pro Asn
210 215 220

Thr Tyr Asp Val Val Glu Glu Leu His Lys Arg Thr Asn Gly Gly Val
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Tyr Val Pro Tyr Glu Val Thr Glu Val Pro Pro Val Leu Thr Gln Ala
245 250 255

Ile Glu Ser Ala Lys Ile Ser Gly Glu Ile Met Ile Val Ile Ile Phe
260 265 270

Glu Lys Glu Ala Leu Ile Lys Pro Asn Asn Ile Val Met Asn Glu Arg
275 280 285

Asn Leu Thr Gly Leu Ile Cys Tyr Asp Asp Val Phe Pro Ala Leu Ile
290 295 300

Ser Leu Met Glu Asn Gly Tyr Phe Pro Ala Asp Lys Leu Val Ile Lys
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Arg Ile Lys Leu Val Asp Val Ile Glu Ala Ala Phe Glu Ser Leu Leu
325 330 335

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<212> DNA

<213> Paenibacillus polymyxa

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Lys Gly Pro Glu Leu Ile Val Cys Arg His Glu Gln Asn Ala Ala Phe
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Val Thr Ser Gly Pro Gly Ala Ser Asn Leu Ala Thr Gly Leu Val Thr
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Arg Ala Asp Arg Leu Lys Lys Thr His Gln Ser Met Asp Asn Ala Ala
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Ala Ala Ser Asp Glu Gln Ile Ser Ala Ala Ile Ala Lys Ile His Asn
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Val Glu Thr Tyr Gln Ala Ala Gly Thr Leu Ser His Asp Leu Glu Asp
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Gln Tyr Phe Gly Arg Ile Gly Leu Phe Arg Asn Gln Pro Gly Asp Met
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Lys Gly Leu Arg Val Asn Ser Pro Asp Glu Leu Ala Glu Val Leu Lys
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