

SEQUENCE LISTING

<110> BASF Plant Science GmbH

<120> Desaturases and process for the production of polyunsaturated fatty acids in transgenic organisms

<130> BPS66115PC

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<170> PatentIn version 3.5

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Tyr Tyr Leu Gly Pro Tyr Leu Val Phe Val Ile Trp Leu Asp Leu Val
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Leu Gly Tyr Val Ala Arg Asp Leu Ala Met Leu Ala Thr Thr Phe Tyr
 100 105 110

Leu Ser Tyr Thr Phe Ile Arg Pro Glu Tyr Ile Ser Ser Lys Ala Val
 115 120 125

Arg Ala Val Leu Trp Ala Gly Tyr Thr Val Ile Gln Gly Leu Val Gly
 130 135 140

Thr Gly Leu Trp Val Leu Ala His Glu Cys Gly His Gln Ala Phe Ser
 145 150 155 160

Pro Ser Lys Val Leu Asn Asp Thr Val Gly Trp Val Cys His Ser Leu
 165 170 175

Leu Leu Val Pro Tyr Phe Ser Trp Lys Ile Ser His Gly Lys His His
 180 185 190

Lys Ala Thr Gly His Met Glu Arg Asp Met Val Phe Ile Pro Lys Thr
 195 200 205

Arg Asp Val Tyr Ala Thr Arg Val Ser Lys Leu Ile His Glu Ile Ser
 210 215 220

Glu Leu Ala Glu Glu Thr Pro Ile Val Thr Phe Ile His Met Leu Gly
 225 230 235 240

Gln Gln Ile Gly Gly Trp Gln Met Tyr Leu Phe Ala Asn Val Thr Gly
 245 250 255

His Thr His His Asp Arg Gln Ser Glu Gly Lys Gly Val Gly Lys Gln
 260 265 270

Asn Gly Met Phe Gly Gly Val Asn His Phe Asn Pro Ser Ser Pro Leu
 275 280 285

Tyr Glu Lys Arg Asp Glu His Leu Ile Leu Leu Ser Asp Leu Gly Leu
 290 295 300

Ala Ile Val Ile Ala Ala Leu Thr Tyr Val Gly Lys Ile His Gly Phe
 305 310 315 320

Ser Ser Val Leu Val Trp Tyr Ile Ile Pro Tyr Phe Trp Val His His
 325 330 335

Trp Leu Val Met Ile Thr Phe Leu Gln His Thr Asp Pro Ser Leu Pro
 340 345 350

His Tyr Asp Ala Glu Thr Trp Thr Tyr Ala Arg Gly Ala Gly Ala Thr
 355 360 365

Ile Asp Arg Glu Phe Gly Phe Ile Gly Arg Thr Leu Phe His Gly Ile
 370 375 380

Ile Glu Thr His Val Leu His His Tyr Ile Ser Ser Ile Pro Phe Tyr
 385 390 395 400

Asn Ala Asp Glu Ala Ser Glu Ala Ile Lys Lys Val Met Gly Ser His
 405 410 415

Tyr Arg Ser Asp Val Glu Gly Gly Ser Ile Gly Phe Leu Lys Ser Phe
 420 425 430

Trp Arg Ser Ala Arg Met Cys Gln Phe Val Glu Pro Ser Glu Gly Ala
 435 440 445

Glu Gly Glu Gly Lys Gly Val Leu Phe Phe Arg Asn His Asn Gly Leu
 450 455 460

Gly Val Gln Pro Arg Lys Leu Asp Ala Ser Gly Lys Pro Val Val Ser
 465 470 475 480

Lys Arg Ala Thr Lys Met Glu Val Gly Pro Glu Ser Asp Asn Glu
 485 490 495

<210> 18
 <211> 21
 <212> DNA
 <213> Artificial

<220>
 <223> Primer

<400> 18
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<210> 19
 <211> 32
 <212> DNA
 <213> Artificial

<220>
 <223> Primer

<400> 19
 gcggccgcgc catggcctcg accaccgccc gc 32

<210> 20
 <211> 20
 <212> DNA
 <213> Artificial

<220>
 <223> Primer

<400> 20
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<210> 21
 <211> 29
 <212> DNA
 <213> Artificial

<220>
 <223> Primer

<400> 21
 gcggccgcgt tactcgttgt cactctcag 29

<210> 22
 <211> 1380
 <212> DNA
 <213> Pythium irregulare

<400> 22
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gactcgcacc cgggtggctc cgtgatgctc acgcaggccg gcgaggacgc cacggacgcc 180
ttcgcggtct tccaccgctc ctcggcgctc aagctgctcg agcagttcta cgtcggcgac 240
gtggacgaaa cctccaaggc cgagatcgag ggggagccgg cgagcgacga ggagcgcgcg 300
cgccgcgagc gcatcaacga gttcatcgcg tcctaccgct gtctgcgcgt caaggtcaag 360
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aacgcctggc agggcttcag catgcagtgg tggaagaaca agcacaacct gcaccacgcg 660
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<210> 23
<211> 31
<212> DNA
<213> Artificial

<220>
<223> Primer

<400> 23
gcggccgcgc catggtggac ctcaagcctg g 31

<210> 24
 <211> 27
 <212> DNA
 <213> Artificial

<220>
 <223> Primer

<400> 24
 gcggccgtta catcgctggg aactcgg 27

<210> 25
 <211> 1320
 <212> DNA
 <213> Thraustochytrium sp.

<400> 25
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 gacaagcgga aaacgattct gatcgagggc gtcctgtacg acgcgacgaa ctttaagcac 120
 ccgggcggtt cgatcatcaa cttcttgacc gagggcgagg ccggcggtgga cgcgacgcag 180
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 ttcaagcgcc acaacctccc gtactacgac ctgccctaca cgagcgcggt ctcgaccacc 1260
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<210> 26
 <211> 31
 <212> DNA
 <213> Artificial

 <220>
 <223> Primer

 <400> 26
 gcggccgcgc catgggcaag ggcagcgagg g 31

 <210> 27
 <211> 32
 <212> DNA
 <213> Artificial

 <220>
 <223> Primer

 <400> 27
 gcggccgcgc ctcagtcctg cttcttggtg tc 32

 <210> 28
 <211> 1086
 <212> DNA
 <213> *Phytophthora infestans*

 <400> 28
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 atcgcggtgg ctctaacctt cggctctcaac tacgctcgcg ctctgcccga ggtcgagagc 180
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acgtaa 1086

<210> 29
<211> 31
<212> DNA
<213> Artificial

<220>
<223> Primer

<400> 29
gcggccgcgc catggcgacg aaggaggcgt a 31

<210> 30
<211> 31
<212> DNA
<213> Artificial

<220>
<223> Primer

<400> 30
gcggccgcgt tacgtggact tggctcttggc c 31

<210> 31
<211> 873
<212> DNA
<213> *Physcomitrella patens*

<400> 31
atggaggctg tggagagatt ctacggtgag ttggatggga aggtctcgca gggcgtgaat 60
gcattgctgg gtagtttttg ggtggagttg acggatacgc ccactaccaa aggcttgccc 120
ctcgttgaca gtccacacc catcgtcctc ggtgtttctg tatacttgac tattgtcatt 180
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ggcaggtact tgacacaatt ccaaagtgtc cagtttatgc tgaacttagt gcaggcttac 720
 tacgacatga aaacgaatgc gccatatcca caatggctga tcaagatttt gttctactac 780
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 gacggaaagc aaaaggagc taaaactgag tga 873

<210> 32
 <211> 32
 <212> DNA
 <213> Artificial

<220>
 <223> Primer

<400> 32
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<210> 33
 <211> 28
 <212> DNA
 <213> Artificial

<220>
 <223> Primer

<400> 33
 gcggccgcgt cactcagttt tagctccc 28

<210> 34
 <211> 903
 <212> DNA
 <213> *Ostreococcus tauri*

<400> 34
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 tacgcctacg cttttgagtg gtcgcacgcg aatggcatcg acaacgtcga cgcgcgcgag 120
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caaatgctcc aattcgatcat tgtcttcgcg cacgccgtgt tcgtgctgcg tcagaagcac	720
tgcccgggtca cccttccttg ggcgcaaatg ttcgtcatga cgaacatgct cgtgctcttc	780
gggaacttct acctcaaggc gtactcgaac aagtcgcgcg gcgacggcgc gagttccgtg	840
aaaccagccg agaccacgcg cgcgcccagc gtgcgacgca cgcgatctcg aaaaattgac	900
taa	903

<210> 35
 <211> 32
 <212> DNA
 <213> Artificial

<220>
 <223> Primer

<400> 35	
gcggccgcgc catgagcgcc tccggtgcgc tg	32

<210> 36
 <211> 23
 <212> DNA
 <213> Artificial

<220>
 <223> Primer

<400> 36	
gcggccgcgt tagtcaattt ttc	23

<210> 37
 <211> 1560
 <212> DNA
 <213> *Thraustochytrium* sp.

<400> 37	
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gatgacgcct ggtgcgcgat ccacgggcac gtgtacgatg tgaccaagtt cgcgagcgtg	120
caccgggcg gcgacattat cctgctggcc gcaggcaagg aggccaccgt gctgtacgag	180
acttaccatg tgcggggcgt ctcgacgcg gtgctgcgca agtaccgcat cggcaagctg	240
ccggacggcc aaggcggcgc gaacgagaag gaaaagcgga cgtctcggg cctctcgteg	300
gcctcgact acacgtggaa cagcgacttt tacagggtaa tgcgcgagcg cgtcgtggct	360
cggctcaagg agcgcggcaa ggcccgcgc ggaggctacg agctctggat caaggcgttc	420
ctgctgctcg tcggcttctg gagctcgctg tactggatgt gcacgctgga cccctcgttc	480
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cagcacgacg gcaaccacgg cgcctttgcc cagtcgcgat gggtaacaa ggttgccggg	600

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gaggtgctcg	caaccatggt	cattgtgaac	cacatcatcg	agggcgctct	gtacgcttcc	1140
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aacaacacgc	gcaaggaggt	ggaggcggag	gcgtccaagt	ctggcgccgt	ggtcaagtca	1260
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cccgggctca	gccacgagac	gtactaccac	atccaggacg	tcgttcagtc	cacctgcgcc	1440
gagtacggcg	tcccgtacca	gcacgagcct	tcgctctgga	ccgcgtactg	gaagatgctc	1500
gagcacctcc	gtcagctcgg	caatgaggag	accacagagt	cctggcagcg	cgtgcctga	1560

<210> 38
 <211> 32
 <212> DNA
 <213> Artificial

<220>
 <223> Primer

<400> 38	
gcggccgcgc	catgacggtc ggctacgacg ag
	32

<210> 39
 <211> 29
 <212> DNA
 <213> Artificial

<220>
 <223> Primer

<400> 39	
gcggccgcgt	caggcagcgc gctgccagg
	29

<210> 40
 <211> 819
 <212> DNA

<213> *Thalassiosira pseudonana*

<400> 40

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atggacgcct acaacgctgc tatggacaag attggtgctg ctattattga ctggtctgat      60
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atcaccatcg ccctcatcta catcgccctc gtcacacctg gttccgcggt catgcaatcc      180
ctccccgcaa tggatcccta ccccatcaaa ttctcttaca acgtctccca aatcttcctt      240
tgtgcctaca tgactgtcga ggcgggattt ttggcctacc gcaatggata taccgatcatg      300
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caatcataca tggcacccaa aaagaagaag agtgcttag      819
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<210> 41

<211> 1371

<212> DNA

<213> *Ostreococcus tauri*

<400> 41

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ctggcgaaga cgttcgcgag gcggtacgtc gtgatcgagg ggggtggagta cgatgtgacg      180
gattttaagc acccgggagg aacggttatt ttctatgcgt tgtcaaacac cggggcggac      240
gcgacggaag cgttcaagga gtttcatcat cggtcgagaa aggcgaggaa agccttggcg      300
gcgctcccgt ctcgaccggc caagacggcc aagggtggacg acgcggagat gctccaagat      360
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cccgcggtgg cgttcttcaa caccgcggtg gaagacaatc gtccccgtgg ctttagcaag      780
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<210> 42
<211> 26
<212> DNA
<213> Artificial

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<220>
<223> Degenerate primer

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<220>
<221> modified_base
<222> (6)..(6)
<223> I

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<220>
<221> misc_feature
<222> (6)..(6)
<223> n is a, c, g, or t

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<220>
<221> modified_base
<222> (12)..(12)
<223> I

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<220>
<221> misc_feature
<222> (12)..(12)
<223> n is a, c, g, or t

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tgggtnytbg cncaygartg ygghca      26

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<210> 43
<211> 26
<212> DNA
<213> Artificial

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<220>
 <223> Degenerate primer

<220>
 <221> modified_base
 <222> (3)..(3)
 <223> I

<220>
 <221> misc_feature
 <222> (3)..(3)
 <223> n is a, c, g, or t

<220>
 <221> modified_base
 <222> (9)..(9)
 <223> I

<220>
 <221> misc_feature
 <222> (9)..(9)
 <223> n is a, c, g, or t

<220>
 <221> modified_base
 <222> (24)..(24)
 <223> I

<220>
 <221> misc_feature
 <222> (24)..(24)
 <223> n is a, c, g, or t

<400> 43
 ttnggrtcng trtgytgvar raangt

26

<210> 44
 <211> 25
 <212> DNA
 <213> Artificial

<220>
 <223> Primer

<400> 44
 atgaagacca tgtcgcgctc catgt

25

<210> 45
 <211> 23
 <212> DNA
 <213> Artificial

<220>
 <223> Primer

<400> 45
 gacgagcacc tcacctgtgct tag

23

<210> 46
 <211> 51
 <212> PRT
 <213> Artificial

<220>
 <223> Desaturase Signature 1

<220>
 <221> VARIANT
 <222> (1)..(48)
 <223> Xaa is any Aminoacid

<220>
 <221> VARIANT
 <222> (1)..(48)
 <223> Xaa is any amino acid

<220>
 <221> misc_feature
 <222> (49)..(50)
 <223> Xaa can be any naturally occurring amino acid

<400> 46

Gly Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa His Xaa Xaa Xaa His
 1 5 10 15

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gly Xaa Xaa
 20 25 30

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Pro Xaa Xaa Xaa Trp Xaa Xaa Xaa His
 35 40 45

Xaa Xaa His
 50

<210> 47
 <211> 17
 <212> PRT
 <213> Artificial

<220>
 <223> Desaturase Signature 2

<220>
 <221> VARIANT
 <222> (1)..(15)
 <223> Xaa is any amino acid

<220>
 <221> VARIANT
 <222> (16)..(16)

<223> Xaa is Gln or His

<400> 47

Pro Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1 5 10 15

His

<210> 48

<211> 13

<212> PRT

<213> Artificial

<220>

<223> Desaturase Signature 3

<220>

<221> VARIANT

<222> (1)..(13)

<223> Xaa is any amino acid

<400> 48

His Xaa Xaa His His Xaa Xaa Xaa Xaa Xaa Pro Xaa Tyr
1 5 10

<210> 49

<211> 14

<212> PRT

<213> Artificial

<220>

<223> Desaturase Signature 4

<220>

<221> VARIANT

<222> (1)..(14)

<223> Xaa is any amino acid

<400> 49

His Xaa Xaa His His Xaa Xaa Xaa Xaa Xaa Xaa Pro Xaa Tyr
1 5 10

<210> 50
 <211> 1300
 <212> DNA
 <213> *Hyaloperonospora parasitica*

<400> 50
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 tgctccgtca gccacaaaaa cgtccatggc gaccaagcaa tcggtcgcgt tcccgaccct 120
 cacggacctc aagcggtcgc tcccaagcga gtgcttcgaa tcctcattgc cgctgtcact 180
 ctactacacg ctgcgctcgc tcgtgtttgc cggttccttg gctgtaagtc tcagctacgc 240
 gctcgcccag ccactcgtcc agaacttcta cccgctccgt gtcgctctaa tcgcgggcta 300
 caccgtgttc cagggcgtga tcttctgggg ctttttcacc atcgggtcatg atgccgggtca 360
 cggcgctttc agccgctacc cgggtgtcaa cttcacgcgt gggacgctca tgcactcgct 420
 catcctcacg ccgttcgagt cgtggaaact cacgcaccgc caccaccaca agaacacggg 480
 caacatcgac cgagacgaga tcttttacct ccaacgggag agcgacgacc acccagtttc 540
 tcgccatttg accttcacgc tcggagctgc gtggttcgcc tacctcgtcg aggggtttcc 600
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 tgttatcatc tcaattctcg cccagttttt cgtcgcggga ctctcgatct acctctgctt 720
 tcaagtggga gtccaggctg tggcgtctta ttactacgga ccgatctttg tctttggcac 780
 gatgctcgtc atcacgacgt ttttgacca caatgacgag gagacgccgt ggtatggaga 840
 cgaggactgg tcgtacgtca agggcaacct ctcgtcgggt gatcgggtcat acggaccgct 900
 cattgataac ttgagccaca acattggcac gcaccagggt catcacctgt tccccattat 960
 tccccactac aagctcaagc ccgcgacagc tgcttttcgt cgtgcttttc ctcacctcgt 1020
 acgcaagagt gacgagcgga ttcttcaggc gttttaccgc atcggtcggc tctatgcaaa 1080
 gtacggcgct gccgactcgt cagccaagct gtttactc aaggaagccc aattgacgtc 1140
 gaaagcagca agtgatgcca aagcagctta ggattagcgc tggaaagcagt tctcactcat 1200
 gcaagacagg ctacacaaaa cgaacgatgg acggatggat gtggcaagtg atctattgac 1260
 agatgaacgg tctacgtcac ttctactcta gtctaacgaa 1300

<210> 51
 <211> 1086
 <212> DNA
 <213> *Hyaloperonospora parasitica*

<400> 51
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agcgagtgtc tcgaatcctc attgccgctg tcaactctact acacgctgcg ctgctcgtg 120
tttgccgggt ccttggtgtg aagtctcagc tacgcgctcg cccagccact cgtccagaac 180
ttctacccgc tccgtgtcgc tctaatacgc ggctacaccg tgttccaggg cgtgatcttc 240
tggggctttt tcaccatcgg tcatgatgcc ggtcacggcg ctttcagccg ctacccgggtg 300
ctcaacttca ccgtcgggac gctcatgcac tcgctcatcc tcacgccgtt cgagtcgtgg 360
aaactcacgc accgccacca ccacaagaac acgggcaaca tcgaccgaga cgagatcttt 420
taccaccaac gggagagcga cgaccacca gtttctcgcc atttgacctt cacgctcgga 480
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ccgttcgagc cgctctttga acggagagta tctgctgtta tcatctcaat tctcgcccag 600
tttttcgtcg cgggactctc gatctacctc tgctttcaag tgggagtcca ggctgtggcg 660
ctctattact acggaccgat ctttgtcttt ggacgatgc tcgtcatcac gacgtttttg 720
caccacaatg acgaggagac gccgtgggat ggagacgagg actgggtcgta cgtcaagggc 780
aacctctcgt cggttgatcg gtcatacggg ccgctcattg ataacttgag ccacaacatt 840
ggcacgcacc aggtccatca cctgttcccc attattcccc actacaagct caagcccgcg 900
acagctgctt ttcgtcgtgc ttttcctcac ctcgtacgca agagtgcga gcggattctt 960
caggcgtttt accgcatcgg tcggctctat gcaaagtacg gcgtcgccga ctgctcagcc 1020
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gcttag 1086

<210> 52
<211> 361
<212> PRT
<213> *Hyaloperonospora parasitica*

<400> 52

Met Ala Thr Lys Gln Ser Val Ala Phe Pro Thr Leu Thr Asp Leu Lys
1 5 10 15

Arg Ser Leu Pro Ser Glu Cys Phe Glu Ser Ser Leu Pro Leu Ser Leu
20 25 30

Tyr Tyr Thr Leu Arg Ser Leu Val Phe Ala Gly Ser Leu Ala Val Ser
35 40 45

Leu Ser Tyr Ala Leu Ala Gln Pro Leu Val Gln Asn Phe Tyr Pro Leu
50 55 60

Arg Val Ala Leu Ile Ala Gly Tyr Thr Val Phe Gln Gly Val Ile Phe
65 70 75 80

Trp Gly Phe Phe Thr Ile Gly His Asp Ala Gly His Gly Ala Phe Ser
 85 90 95
 Arg Tyr Pro Val Leu Asn Phe Thr Val Gly Thr Leu Met His Ser Leu
 100 105 110
 Ile Leu Thr Pro Phe Glu Ser Trp Lys Leu Thr His Arg His His His
 115 120 125
 Lys Asn Thr Gly Asn Ile Asp Arg Asp Glu Ile Phe Tyr Pro Gln Arg
 130 135 140
 Glu Ser Asp Asp His Pro Val Ser Arg His Leu Thr Phe Thr Leu Gly
 145 150 155 160
 Ala Ala Trp Phe Ala Tyr Leu Val Glu Gly Phe Pro Pro Arg Lys Leu
 165 170 175
 Asn His Tyr Asn Pro Phe Glu Pro Leu Phe Glu Arg Arg Val Ser Ala
 180 185 190
 Val Ile Ile Ser Ile Leu Ala Gln Phe Phe Val Ala Gly Leu Ser Ile
 195 200 205
 Tyr Leu Cys Phe Gln Val Gly Val Gln Ala Val Ala Leu Tyr Tyr Tyr
 210 215 220
 Gly Pro Ile Phe Val Phe Gly Thr Met Leu Val Ile Thr Thr Phe Leu
 225 230 235 240
 His His Asn Asp Glu Glu Thr Pro Trp Tyr Gly Asp Glu Asp Trp Ser
 245 250 255
 Tyr Val Lys Gly Asn Leu Ser Ser Val Asp Arg Ser Tyr Gly Pro Leu
 260 265 270
 Ile Asp Asn Leu Ser His Asn Ile Gly Thr His Gln Val His His Leu
 275 280 285
 Phe Pro Ile Ile Pro His Tyr Lys Leu Lys Pro Ala Thr Ala Ala Phe
 290 295 300
 Arg Arg Ala Phe Pro His Leu Val Arg Lys Ser Asp Glu Arg Ile Leu
 305 310 315 320
 Gln Ala Phe Tyr Arg Ile Gly Arg Leu Tyr Ala Lys Tyr Gly Val Ala
 325 330 335
 Asp Ser Ser Ala Lys Leu Phe Thr Leu Lys Glu Ala Gln Leu Thr Ser
 340 345 350

Lys Ala Ala Ser Asp Ala Lys Ala Ala
 355 360

<210> 53
 <211> 19
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<220>
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<400> 53
 atggcgacca agcaatcgg 19

<210> 54
 <211> 30
 <212> DNA
 <213> Artificial

<220>
 <223> Primer

<400> 54
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<210> 55
 <211> 20
 <212> DNA
 <213> Artificial

<220>
 <223> Primer

<400> 55
 ctaagctgct ttggcatcac 20

<210> 56
 <211> 29
 <212> DNA
 <213> Artificial

<220>
 <223> Primer

<400> 56
 gcggccgcgc taagctgctt ttggcatcac 29