

LISTA DE SECUENCIAS

<110> Philip Morris Products S.A.

<120> Reducción de la conversión de nicotina a nornicotina en plantas

<130> P4362PC00

<150> EP 14167598.3

<151> 2014-05-08

<150> EP 14001645.2

<151> 2014-05-09

<160> 47

<170> PatentIn versión 3.3

<210> 1

<211> 2088

<212> ADN

<213> Nicotiana tabacum

<400> 1

atgggttttc ccatagaagc cattgtagga ctagtaacct tcacatttct cttctacttc 60

ctatggacaa aaaaatctca aaaccttca aaacccttac caccgaaaat ccccgagga 120

tggccggtta ttggccatct tttccacttc aatgacgacg gcaacgaccg tccattagct 180

cgaaaactcg gagacttagc tgacaaatac ggccccgttt tcacttttcg gctaggcctt 240

ccccttggtg tagttgtaag cagttacgaa gctataaaag actgtttctc taaaaatgat 300

gccattttct ctaatcgtcc agcttttctt tacggcgaat accttggtca caataatgcc 360

atgctatfff tggcaaatta cggaccttac tggcgaaaaa atcgtaaatt agttattcag 420

gaagttctct cagctagtcg tctcaaaaaa ttcaaacacg tgagattcgc cagaattcaa 480

acgagcatta agaatttata cactcgaatt gatagaaatt cgagtacgat aaatttaact 540

gattggtagg aagaattgaa ttttggcttc atcgtgaaga tgatagctgg gaaaaattat 600

gaatccggtg aaggagatga acaagtgag agatttaaga aagcgtttaa ggattttatg 660

attatatcaa tggagtttgt gttatgggat gcatttcaa ttccattatt taaatgggtg 720

gattttcaag ggcattgtaa ggctatgaaa aggacattta aggatataga ttctgttttt 780

cagaattggt tagaggaaca tattaacaaa agagaaaaaa tggaggttaa tgcagaaggg 840
 aatgaacaag atttcattga tgtggtgctt tcaaaaatga gtaatgaata tcttggtgaa 900
 ggttactctc gtgatactgt cataaaagca acagttttg taagttcatc tgcactccc 960
 gaattctgct tgaatgcaga caccgagttg cctttttatt agactatcta aatattaagg 1020
 atgattatat atagcaaaaa tatagtagga tttctcgggc ttgggatag aagaatattc 1080
 atcattatat aacttttgat ggtaaaagat gagatctaac ctcttataat tgcccaacca 1140
 cgttgatata tagaacaaaa cctttttact cccattgagc ataacgaaaa tgaaagcaaa 1200
 gggacttctt ctcttttta ggaaaaaat ctttgattgc ttgttgaata tacattcatg 1260
 ttttctttt tctatttcta ataataatgg tgcttgaatc aggttgctg cctcgtgact 1320
 ttgagaaaa aaaaacaaat tcattagtat aatgaggtgt gcatactga caactactat 1380
 actaactaga acaaggttcg gcagataatg acgctaacct acttttatat tgaattatca 1440
 ttgtattta actgtattct atttgtcca cagagtttgg tcttgatgc tgcggacaca 1500
 gttgctcttc acataaattg gggatggca ttactgatca acaatcaaaa tgccttgaag 1560
 aaagcacaag aagagataga cacaaaagtt ggcaaggata gatgggtaga agagagtgat 1620
 attaaggatt tgggtgacct ccaagctatt gttaaagaag tgttacgatt atatccaccg 1680
 ggacctttgt tagtaccaca tgaaaatata gaggattgtg ttgttagtgg atattacatt 1740
 tctaaaggga ctgactatt cgcaaatggt atgaaactgc agcgcgatcc taaactctgg 1800
 ccaaatcctg ataatttca tccagagaga ttgtcgctg caggtattga ctttcgtggt 1860
 cagcattatg agtatatccc gtttggttct ggaagacgat ctgtccggg gatgacttat 1920
 gcattgcaag tggaacactt aacaatggca catttgatcc agggtttcaa ttacagcact 1980
 ccaaatgacg agcccttgga tatgaaggaa ggtgcaggta taactatacg taaggtaaat 2040
 cccgtggaag tgataattat gcctgcctg gcacctgagc ttatttaa 2088

<210> 2

<211> 1554

<212> ADN

<213> Nicotiana tabacum

<400> 2

atggtttttc ccatagaagc cattgtagga ctagtaacct tcacatttct cttctacttc 60
ctatggacaa aaaaatctca aaaaccttca aaacccttac caccgaaaat ccccgaggga 120
tggccggtta ttggccatct tttccacttc aatgacgacg gcaacgaccg tccattagct 180
cgaaaactcg gagacttagc tgacaaatac ggccccgttt tcacttttcg gctaggcctt 240
ccccctgtgt tagttgtaag cagttacgaa gctataaaag actgtttctc taaaaatgat 300
gccattttct ctaatcgtcc agcttttctt tacggcgaat accttggtta caataatgcc 360
atgctatttt tggcaaatta cggaccttac tggcgaaaaa atcgtaaatt agttattcag 420
gaagttctct cagctagtgc tctcaaaaaa ttcaaacacg tgagattcgc cagaattcaa 480
acgagcatta agaattata cactcgaatt gatagaaatt cgagtacgat aaatttaact 540
gattggttag aagaattgaa ttttggcttc atcgtgaaga tgatagctgg gaaaaattat 600
gaatccggtta aaggagatga acaagtggag agatttaaga aagcgtttaa ggattttatg 660
attatatcaa tggagtttgt gttatgggat gcatttcaa ttccattatt taaatgggtg 720
gattttcaag ggcatgttaa ggctatgaaa aggacattta aggatataga ttctgttttt 780
cagaatttgt tagaggaaca tattaacaaa agagaaaaaa tggagggttaa tgcagaaggg 840
aatgaacaag atttcattga tgtgtgtgctt tcaaaaatga gtaatgaata tcttggtgaa 900
ggttactctc gtgatactgt cataaaagca acagttttta gtttggctct ggatgctgcg 960
gacacagttg ctcttcacat aaattggggg atggcattac tgatcaacaa tcaaatgcc 1020
ttgaagaaag cacaagaaga gatagacaca aaagttggca aggatagatg ggtagaagag 1080
agtgatatta aggatttgtt gtacctcaa gctattgtta aagaagtgtt acgattatat 1140
ccaccgggac ctttgttagt accacatgaa aatatagagg attgtgttgt tagtgatat 1200
tacatttcta aagggactag actattcgca aatgttatga aactgcagcg cgatcctaaa 1260
ctctggccaa atcctgataa ttctgatcca gagagatttg tcgctgcagg tattgacttt 1320
cgtggtcagc attatgagta tatccggtt ggttctggaa gacgatcttg tccggggatg 1380
acttatgcat tgcaagtgga acacttaaca atggcacatt tgatccaggg tttaattac 1440
agcactcaa atgacgagcc cttggatatg aaggaagggt caggtataac tatacgttaag 1500

gtaaatcccg tggaagtgat aattatgcct cgcctggcac ctgagcttta ttaa 1554

<210> 3

<211> 517

<212> PRT

<213> Nicotiana tabacum

<400> 3

Met Val Phe Pro Ile Glu Ala Ile Val Gly Leu Val Thr Phe Thr Phe
1 5 10 15

Leu Phe Tyr Phe Leu Trp Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

His Phe Asn Asp Asp Gly Asn Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Ile Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Glu Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Ala Asn Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser
130 135 140

Ala Ser Arg Leu Lys Lys Phe Lys His Val Arg Phe Ala Arg Ile Gln
145 150 155 160

Thr Ser Ile Lys Asn Leu Tyr Thr Arg Ile Asp Arg Asn Ser Ser Thr
165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Lys Lys Ala Phe Lys Asp Phe Met Ile Ile Ser Met
210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Ile Asn Lys Arg Glu
260 265 270

Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Gly Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Ile Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln Asn Ala Leu Lys Lys Ala Gln Glu Glu Ile Asp Thr Lys Val
340 345 350

Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr

355	360	365
Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro		
370	375	380
Leu Leu Val Pro His Glu Asn Ile Glu Asp Cys Val Val Ser Gly Tyr		
385	390	395 400
Tyr Ile Ser Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln		
405	410	415
Arg Asp Pro Lys Leu Trp Pro Asn Pro Asp Asn Phe Asp Pro Glu Arg		
420	425	430
Phe Val Ala Ala Gly Ile Asp Phe Arg Gly Gln His Tyr Glu Tyr Ile		
435	440	445
Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Leu		
450	455	460
Gln Val Glu His Leu Thr Met Ala His Leu Ile Gln Gly Phe Asn Tyr		
465	470	475 480
Ser Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Ile		
485	490	495
Thr Ile Arg Lys Val Asn Pro Val Glu Val Ile Ile Met Pro Arg Leu		
500	505	510
Ala Pro Glu Leu Tyr		
515		

<210> 4

<211> 469

<212> ADN

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia polinucleotídica de un constructo de ARNi

con el uso de una secuencia única de 100 pb de NND3 en dirección directa e inversa separada por una secuencia intrónica encontrada en el gen gene IPMS2

<400> 4

gcgatcctaa actctggcca aatcctgata atttcgatcc agagagattt gtcgctgcag 60

gtattgactt tcgtggcag cattatgagt atatcccggtt tgtaacctt taatgtttaa 120

ccgttcacat ttctaattt tacttatttg taacatgtcg tcacgtgtta gtttcattct 180

ttttatgaac caaacatgca tgcaaagata ttttagata ttggacggc gaggagatt 240

tgaactagg accgttgcc tgatacaata ttaaaatag taaccatttt atgtacaagt 300

ttaaactgtt gatagtagca tttttttac ttttatttaa gtatactata ttcaacagg 360

taagttaaca acgggatata ctcataatgc tgaccacgaa agtcaatacc tgcagcgaca 420

aatctctctg gatcgaaatt atcaggattt ggccagagtt taggatcgc 469

<210> 5

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la nicotina desmetilasa CYP82E4

<400> 5

Met Leu Ser Pro Ile Glu Ala Ile Val Gly Leu Val Thr Phe Thr Phe

1 5 10 15

Leu Phe Phe Phe Leu Trp Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro

20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe

35 40 45

His Phe Asn Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly

50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu

65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Asp Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Ala Asn Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser
130 135 140

Ala Ser Arg Leu Glu Lys Phe Lys His Val Arg Phe Ala Arg Ile Gln
145 150 155 160

Ala Ser Ile Lys Asn Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Lys Lys Ala Phe Lys Asp Phe Met Ile Leu Ser Met
210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Ile Asn Lys Arg Glu
260 265 270

Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Gly Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Ile Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln Lys Ala Leu Thr Lys Ala Gln Glu Glu Ile Asp Thr Lys Val
340 345 350

Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
405 410 415

Arg Asp Pro Lys Leu Trp Ser Asp Pro Asp Thr Phe Asp Pro Glu Arg
420 425 430

Phe Ile Ala Thr Asp Ile Asp Phe Arg Gly Gln Tyr Tyr Lys Tyr Ile
435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Arg Met Thr Tyr Ala Leu
450 455 460

Gln Val Glu His Leu Thr Met Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Arg Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Ile
485 490 495

Thr Ile Arg Lys Val Asn Pro Val Glu Leu Ile Ile Ala Pro Arg Leu
500 505 510

Ala Pro Glu Leu Tyr
515

<210> 6

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante P38L de nicotina
desmetilasa CYP82E4

<400> 6

Met Leu Ser Pro Ile Glu Ala Ile Val Gly Leu Val Thr Phe Thr Phe
1 5 10 15

Leu Phe Phe Phe Leu Trp Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Leu Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

His Phe Asn Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly

100	105	110
Asp Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Ala Asn Tyr Gly		
115	120	125
Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser		
130	135	140
Ala Ser Arg Leu Glu Lys Phe Lys His Val Arg Phe Ala Arg Ile Gln		
145	150	155
Ala Ser Ile Lys Asn Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr		
165	170	175
Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val		
180	185	190
Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln		
195	200	205
Val Glu Arg Phe Lys Lys Ala Phe Lys Asp Phe Met Ile Leu Ser Met		
210	215	220
Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val		
225	230	235
Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile		
245	250	255
Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Ile Asn Lys Arg Glu		
260	265	270
Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val		
275	280	285
Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Gly Glu Gly Tyr Ser Arg		
290	295	300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Ile Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln Lys Ala Leu Thr Lys Ala Gln Glu Glu Ile Asp Thr Lys Val
340 345 350

Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
405 410 415

Arg Asp Pro Lys Leu Trp Ser Asp Pro Asp Thr Phe Asp Pro Glu Arg
420 425 430

Phe Ile Ala Thr Asp Ile Asp Phe Arg Gly Gln Tyr Tyr Lys Tyr Ile
435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Leu
450 455 460

Gln Val Glu His Leu Thr Met Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Arg Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Ile
485 490 495

Thr Ile Arg Lys Val Asn Pro Val Glu Leu Ile Ile Ala Pro Arg Leu

500 505 510

Ala Pro Glu Leu Tyr
515

<210> 7

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante D171N de nicotina
desmetilasa CYP82E4

<400> 7

Met Leu Ser Pro Ile Glu Ala Ile Val Gly Leu Val Thr Phe Thr Phe
1 5 10 15

Leu Phe Phe Phe Leu Trp Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

His Phe Asn Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Asp Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Ala Asn Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser
130 135 140

Ala Ser Arg Leu Glu Lys Phe Lys His Val Arg Phe Ala Arg Ile Gln
145 150 155 160

Ala Ser Ile Lys Asn Leu Tyr Thr Arg Ile Asn Gly Asn Ser Ser Thr
165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Lys Lys Ala Phe Lys Asp Phe Met Ile Leu Ser Met
210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Ile Asn Lys Arg Glu
260 265 270

Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Gly Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Ile Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln Lys Ala Leu Thr Lys Ala Gln Glu Glu Ile Asp Thr Lys Val
340 345 350

Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
405 410 415

Arg Asp Pro Lys Leu Trp Ser Asp Pro Asp Thr Phe Asp Pro Glu Arg
420 425 430

Phe Ile Ala Thr Asp Ile Asp Phe Arg Gly Gln Tyr Tyr Lys Tyr Ile
435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Leu
450 455 460

Gln Val Glu His Leu Thr Met Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Arg Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Ile
485 490 495

Thr Ile Arg Lys Val Asn Pro Val Glu Leu Ile Ile Ala Pro Arg Leu
500 505 510

Ala Pro Glu Leu Tyr
515

<210> 8

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante E201K de nicotina desmetilasa CYP82E4

<400> 8

Met Leu Ser Pro Ile Glu Ala Ile Val Gly Leu Val Thr Phe Thr Phe
1 5 10 15

Leu Phe Phe Phe Leu Trp Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

His Phe Asn Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Asp Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Ala Asn Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser
130 135 140

Ala Ser Arg Leu Glu Lys Phe Lys His Val Arg Phe Ala Arg Ile Gln
145 150 155 160

Ala Ser Ile Lys Asn Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Lys Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Lys Lys Ala Phe Lys Asp Phe Met Ile Leu Ser Met
210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Ile Asn Lys Arg Glu
260 265 270

Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Gly Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Ile Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln Lys Ala Leu Thr Lys Ala Gln Glu Glu Ile Asp Thr Lys Val
340 345 350

Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr

355	360	365
Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro		
370	375	380
Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr		
385	390	395 400
His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln		
405	410	415
Arg Asp Pro Lys Leu Trp Ser Asp Pro Asp Thr Phe Asp Pro Glu Arg		
420	425	430
Phe Ile Ala Thr Asp Ile Asp Phe Arg Gly Gln Tyr Tyr Lys Tyr Ile		
435	440	445
Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Leu		
450	455	460
Gln Val Glu His Leu Thr Met Ala His Leu Ile Gln Gly Phe Asn Tyr		
465	470	475 480
Arg Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Ile		
485	490	495
Thr Ile Arg Lys Val Asn Pro Val Glu Leu Ile Ile Ala Pro Arg Leu		
500	505	510
Ala Pro Glu Leu Tyr		
515		

<210> 9

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante R169Q de nicotina

desmetilasa CYP82E4

<400> 9

Met Leu Ser Pro Ile Glu Ala Ile Val Gly Leu Val Thr Phe Thr Phe
1 5 10 15

Leu Phe Phe Phe Leu Trp Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

His Phe Asn Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Asp Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Ala Asn Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser
130 135 140

Ala Ser Arg Leu Glu Lys Phe Lys His Val Arg Phe Ala Arg Ile Gln
145 150 155 160

Ala Ser Ile Lys Asn Leu Tyr Thr Gln Ile Asp Gly Asn Ser Ser Thr
165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Lys Lys Ala Phe Lys Asp Phe Met Ile Leu Ser Met
210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Ile Asn Lys Arg Glu
260 265 270

Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Gly Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Ile Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln Lys Ala Leu Thr Lys Ala Gln Glu Glu Ile Asp Thr Lys Val
340 345 350

Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
 405 410 415

Arg Asp Pro Lys Leu Trp Ser Asp Pro Asp Thr Phe Asp Pro Glu Arg
 420 425 430

Phe Ile Ala Thr Asp Ile Asp Phe Arg Gly Gln Tyr Tyr Lys Tyr Ile
 435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Leu
 450 455 460

Gln Val Glu His Leu Thr Met Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Arg Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Ile
 485 490 495

Thr Ile Arg Lys Val Asn Pro Val Glu Leu Ile Ile Ala Pro Arg Leu
 500 505 510

Ala Pro Glu Leu Tyr
 515

<210> 10

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante G459R de nicotina
desmetilasa CYP82E4

<400> 10

Met Leu Ser Pro Ile Glu Ala Ile Val Gly Leu Val Thr Phe Thr Phe
1 5 10 15

Leu Phe Phe Phe Leu Trp Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

His Phe Asn Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Asp Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Ala Asn Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser
130 135 140

Ala Ser Arg Leu Glu Lys Phe Lys His Val Arg Phe Ala Arg Ile Gln
145 150 155 160

Ala Ser Ile Lys Asn Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Lys Lys Ala Phe Lys Asp Phe Met Ile Leu Ser Met

210	215	220	
Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val			
225	230	235	240
Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile			
245	250	255	
Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Ile Asn Lys Arg Glu			
260	265	270	
Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val			
275	280	285	
Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Gly Glu Gly Tyr Ser Arg			
290	295	300	
Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala			
305	310	315	320
Asp Thr Val Ala Leu His Ile Asn Trp Gly Met Ala Leu Leu Ile Asn			
325	330	335	
Asn Gln Lys Ala Leu Thr Lys Ala Gln Glu Glu Ile Asp Thr Lys Val			
340	345	350	
Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr			
355	360	365	
Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro			
370	375	380	
Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr			
385	390	395	400
His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln			
405	410	415	

Arg Asp Pro Lys Leu Trp Ser Asp Pro Asp Thr Phe Asp Pro Glu Arg
420 425 430

Phe Ile Ala Thr Asp Ile Asp Phe Arg Gly Gln Tyr Tyr Lys Tyr Ile
435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Arg Met Thr Tyr Ala Leu
450 455 460

Gln Val Glu His Leu Thr Met Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Arg Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Ile
485 490 495

Thr Ile Arg Lys Val Asn Pro Val Glu Leu Ile Ile Ala Pro Arg Leu
500 505 510

Ala Pro Glu Leu Tyr
515

<210> 11

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante T427I de nicotina
desmetilasa CYP82E4

<400> 11

Met Leu Ser Pro Ile Glu Ala Ile Val Gly Leu Val Thr Phe Thr Phe
1 5 10 15

Leu Phe Phe Phe Leu Trp Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe

35	40	45
His Phe Asn Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly		
50	55	60
Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu		
65	70	75 80
Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe		
85	90	95
Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly		
100	105	110
Asp Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Ala Asn Tyr Gly		
115	120	125
Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser		
130	135	140
Ala Ser Arg Leu Glu Lys Phe Lys His Val Arg Phe Ala Arg Ile Gln		
145	150	155 160
Ala Ser Ile Lys Asn Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr		
165	170	175
Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val		
180	185	190
Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln		
195	200	205
Val Glu Arg Phe Lys Lys Ala Phe Lys Asp Phe Met Ile Leu Ser Met		
210	215	220
Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val		
225	230	235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Ile Asn Lys Arg Glu
260 265 270

Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Gly Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Ile Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln Lys Ala Leu Thr Lys Ala Gln Glu Glu Ile Asp Thr Lys Val
340 345 350

Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
405 410 415

Arg Asp Pro Lys Leu Trp Ser Asp Pro Asp Ile Phe Asp Pro Glu Arg
420 425 430

Phe Ile Ala Thr Asp Ile Asp Phe Arg Gly Gln Tyr Tyr Lys Tyr Ile

435 440 445
 Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Leu
 450 455 460
 Gln Val Glu His Leu Thr Met Ala His Leu Ile Gln Gly Phe Asn Tyr
 465 470 475 480
 Arg Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Ile
 485 490 495
 Thr Ile Arg Lys Val Asn Pro Val Glu Leu Ile Ile Ala Pro Arg Leu
 500 505 510
 Ala Pro Glu Leu Tyr
 515

<210> 12

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante V376M de nicotina
desmetilasa CYP82E4

<400> 12

Met Leu Ser Pro Ile Glu Ala Ile Val Gly Leu Val Thr Phe Thr Phe
 1 5 10 15

Leu Phe Phe Phe Leu Trp Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
 20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
 35 40 45

His Phe Asn Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
 50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe
 85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
 100 105 110

Asp Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Ala Asn Tyr Gly
 115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser
 130 135 140

Ala Ser Arg Leu Glu Lys Phe Lys His Val Arg Phe Ala Arg Ile Gln
145 150 155 160

Ala Ser Ile Lys Asn Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
 165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
 180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
 195 200 205

Val Glu Arg Phe Lys Lys Ala Phe Lys Asp Phe Met Ile Leu Ser Met
 210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
 245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Ile Asn Lys Arg Glu
 260 265 270

Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Gly Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Ile Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln Lys Ala Leu Thr Lys Ala Gln Glu Glu Ile Asp Thr Lys Val
340 345 350

Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Ala Ile Val Lys Glu Met Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
405 410 415

Arg Asp Pro Lys Leu Trp Ser Asp Pro Asp Thr Phe Asp Pro Glu Arg
420 425 430

Phe Ile Ala Thr Asp Ile Asp Phe Arg Gly Gln Tyr Tyr Lys Tyr Ile
435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Leu
450 455 460

Gln Val Glu His Leu Thr Met Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Arg Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Ile
 485 490 495

Thr Ile Arg Lys Val Asn Pro Val Glu Leu Ile Ile Ala Pro Arg Leu
 500 505 510

Ala Pro Glu Leu Tyr
515

<210> 13

<211> 328

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante W329Stop de nicotina
desmetilasa CYP82E4

<400> 13

Met Leu Ser Pro Ile Glu Ala Ile Val Gly Leu Val Thr Phe Thr Phe
1 5 10 15

Leu Phe Phe Phe Leu Trp Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
 20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
 35 40 45

His Phe Asn Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe
 85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Asp Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Ala Asn Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser
130 135 140

Ala Ser Arg Leu Glu Lys Phe Lys His Val Arg Phe Ala Arg Ile Gln
145 150 155 160

Ala Ser Ile Lys Asn Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Lys Lys Ala Phe Lys Asp Phe Met Ile Leu Ser Met
210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Ile Asn Lys Arg Glu
260 265 270

Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Gly Glu Gly Tyr Ser Arg

290 295 300
 Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
 305 310 315 320

 Asp Thr Val Ala Leu His Ile Asn
 325

 <210> 14
 <211> 517
 <212> PRT
 <213> Secuencia Artificial

 <220>
 <223> Secuencia Sintética: Secuencia proteica de la variante K364N de nicotina
 desmetilasa CYP82E4

 <400> 14

 Met Leu Ser Pro Ile Glu Ala Ile Val Gly Leu Val Thr Phe Thr Phe
 1 5 10 15

 Leu Phe Phe Phe Leu Trp Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
 20 25 30

 Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
 35 40 45

 His Phe Asn Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
 50 55 60

 Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
 65 70 75 80

 Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe
 85 90 95

 Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
 100 105 110

Asp Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Ala Asn Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser
130 135 140

Ala Ser Arg Leu Glu Lys Phe Lys His Val Arg Phe Ala Arg Ile Gln
145 150 155 160

Ala Ser Ile Lys Asn Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Lys Lys Ala Phe Lys Asp Phe Met Ile Leu Ser Met
210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Ile Asn Lys Arg Glu
260 265 270

Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Gly Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala

305	310	315	320
Asp Thr Val Ala Leu His Ile Asn Trp Gly Met Ala Leu Leu Ile Asn			
	325	330	335
Asn Gln Lys Ala Leu Thr Lys Ala Gln Glu Glu Ile Asp Thr Lys Val			
	340	345	350
Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Asn Asp Leu Val Tyr			
	355	360	365
Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro			
	370	375	380
Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr			
385	390	395	400
His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln			
	405	410	415
Arg Asp Pro Lys Leu Trp Ser Asp Pro Asp Thr Phe Asp Pro Glu Arg			
	420	425	430
Phe Ile Ala Thr Asp Ile Asp Phe Arg Gly Gln Tyr Tyr Lys Tyr Ile			
	435	440	445
Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Leu			
	450	455	460
Gln Val Glu His Leu Thr Met Ala His Leu Ile Gln Gly Phe Asn Tyr			
465	470	475	480
Arg Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Ile			
	485	490	495
Thr Ile Arg Lys Val Asn Pro Val Glu Leu Ile Ile Ala Pro Arg Leu			
	500	505	510

Ala Pro Glu Leu Tyr
515

<210> 15

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante P382S de nicotina
desmetilasa CYP82E4

<400> 15

Met Leu Ser Pro Ile Glu Ala Ile Val Gly Leu Val Thr Phe Thr Phe
1 5 10 15

Leu Phe Phe Phe Leu Trp Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

His Phe Asn Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Asp Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Ala Asn Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser

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

Asn Gln Lys Ala Leu Thr Lys Ala Gln Glu Glu Ile Asp Thr Lys Val
340 345 350

Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Ser Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
405 410 415

Arg Asp Pro Lys Leu Trp Ser Asp Pro Asp Thr Phe Asp Pro Glu Arg
420 425 430

Phe Ile Ala Thr Asp Ile Asp Phe Arg Gly Gln Tyr Tyr Lys Tyr Ile
435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Leu
450 455 460

Gln Val Glu His Leu Thr Met Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Arg Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Ile
485 490 495

Thr Ile Arg Lys Val Asn Pro Val Glu Leu Ile Ile Ala Pro Arg Leu
500 505 510

Ala Pro Glu Leu Tyr
515

<210> 16

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante P458S de nicotina desmetilasa CYP82E4

<400> 16

Met Leu Ser Pro Ile Glu Ala Ile Val Gly Leu Val Thr Phe Thr Phe
1 5 10 15

Leu Phe Phe Phe Leu Trp Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

His Phe Asn Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Asp Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Ala Asn Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser
130 135 140

Ala Ser Arg Leu Glu Lys Phe Lys His Val Arg Phe Ala Arg Ile Gln
145 150 155 160

Ala Ser Ile Lys Asn Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Lys Lys Ala Phe Lys Asp Phe Met Ile Leu Ser Met
210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Ile Asn Lys Arg Glu
260 265 270

Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Gly Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Ile Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln Lys Ala Leu Thr Lys Ala Gln Glu Glu Ile Asp Thr Lys Val
340 345 350

Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr

355	360	365
Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro		
370	375	380
Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr		
385	390	395 400
His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln		
405	410	415
Arg Asp Pro Lys Leu Trp Ser Asp Pro Asp Thr Phe Asp Pro Glu Arg		
420	425	430
Phe Ile Ala Thr Asp Ile Asp Phe Arg Gly Gln Tyr Tyr Lys Tyr Ile		
435	440	445
Pro Phe Gly Ser Gly Arg Arg Ser Cys Ser Gly Met Thr Tyr Ala Leu		
450	455	460
Gln Val Glu His Leu Thr Met Ala His Leu Ile Gln Gly Phe Asn Tyr		
465	470	475 480
Arg Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Ile		
485	490	495
Thr Ile Arg Lys Val Asn Pro Val Glu Leu Ile Ile Ala Pro Arg Leu		
500	505	510
Ala Pro Glu Leu Tyr		
515		

<210> 17

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la nicotina desmetilasa CYP82E5

<400> 17

Met Val Ser Pro Val Glu Ala Ile Val Gly Leu Val Thr Leu Thr Leu
1 5 10 15

Leu Phe Tyr Phe Leu Trp Pro Lys Lys Phe Gln Ile Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

Tyr Phe Asp Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Glu Tyr Leu Gly Tyr Ser Asn Ala Met Leu Phe Leu Thr Lys Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser
130 135 140

Ala Ser Arg Leu Glu Lys Leu Lys His Val Arg Phe Gly Lys Ile Gln
145 150 155 160

Thr Ser Ile Lys Ser Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Arg Lys Ala Phe Lys Asp Phe Ile Ile Leu Ser Met
210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Val Lys Lys Arg Glu
260 265 270

Lys Met Glu Val Asn Ala Gln Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Asp Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Met Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln His Ala Leu Lys Lys Ala Gln Glu Glu Ile Asp Lys Lys Val
340 345 350

Gly Lys Glu Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
 405 410 415

Arg Asp Pro Lys Leu Trp Ser Asn Pro Asp Lys Phe Asp Pro Glu Arg
 420 425 430

Phe Phe Ala Asp Asp Ile Asp Tyr Arg Gly Gln His Tyr Glu Phe Ile
 435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Leu
 450 455 460

Gln Ala Glu His Leu Thr Ile Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Lys Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Leu
 485 490 495

Thr Ile Arg Lys Val Asn Pro Val Glu Val Thr Ile Thr Ala Arg Leu
 500 505 510

Ala Pro Glu Leu Tyr
 515

<210> 18

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante P72L de nicotina
 desmetilasa CYP82E5

<400> 18

Met Val Ser Pro Val Glu Ala Ile Val Gly Leu Val Thr Leu Thr Leu
1 5 10 15

Leu Phe Tyr Phe Leu Trp Pro Lys Lys Phe Gln Ile Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

Tyr Phe Asp Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

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

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Glu Tyr Leu Gly Tyr Ser Asn Ala Met Leu Phe Leu Thr Lys Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser
130 135 140

Ala Ser Arg Leu Glu Lys Leu Lys His Val Arg Phe Gly Lys Ile Gln
145 150 155 160

Thr Ser Ile Lys Ser Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Arg Lys Ala Phe Lys Asp Phe Ile Ile Leu Ser Met
210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Val Lys Lys Arg Glu
260 265 270

Lys Met Glu Val Asn Ala Gln Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Asp Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Met Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln His Ala Leu Lys Lys Ala Gln Glu Glu Ile Asp Lys Lys Val
340 345 350

Gly Lys Glu Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
405 410 415

Arg Asp Pro Lys Leu Trp Ser Asn Pro Asp Lys Phe Asp Pro Glu Arg
420 425 430

Phe Phe Ala Asp Asp Ile Asp Tyr Arg Gly Gln His Tyr Glu Phe Ile
435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Leu
450 455 460

Gln Ala Glu His Leu Thr Ile Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Lys Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Leu
485 490 495

Thr Ile Arg Lys Val Asn Pro Val Glu Val Thr Ile Thr Ala Arg Leu
500 505 510

Ala Pro Glu Leu Tyr
515

<210> 19

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante L143F de nicotina
desmetilasa CYP82E5

<400> 19

Met Val Ser Pro Val Glu Ala Ile Val Gly Leu Val Thr Leu Thr Leu
1 5 10 15

Leu Phe Tyr Phe Leu Trp Pro Lys Lys Phe Gln Ile Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

Tyr Phe Asp Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Glu Tyr Leu Gly Tyr Ser Asn Ala Met Leu Phe Leu Thr Lys Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Phe Ser
130 135 140

Ala Ser Arg Leu Glu Lys Leu Lys His Val Arg Phe Gly Lys Ile Gln
145 150 155 160

Thr Ser Ile Lys Ser Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Arg Lys Ala Phe Lys Asp Phe Ile Ile Leu Ser Met
210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Val Lys Lys Arg Glu
260 265 270

Lys Met Glu Val Asn Ala Gln Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Asp Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Met Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln His Ala Leu Lys Lys Ala Gln Glu Glu Ile Asp Lys Lys Val
340 345 350

Gly Lys Glu Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
405 410 415

Arg Asp Pro Lys Leu Trp Ser Asn Pro Asp Lys Phe Asp Pro Glu Arg
420 425 430

Phe Phe Ala Asp Asp Ile Asp Tyr Arg Gly Gln His Tyr Glu Phe Ile
435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Leu
450 455 460

Gln Ala Glu His Leu Thr Ile Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Lys Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Leu
485 490 495

Thr Ile Arg Lys Val Asn Pro Val Glu Val Thr Ile Thr Ala Arg Leu
500 505 510

Ala Pro Glu Leu Tyr
515

<210> 20

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante S174L de nicotina
desmetilasa CYP82E5

<400> 20

Met Val Ser Pro Val Glu Ala Ile Val Gly Leu Val Thr Leu Thr Leu
1 5 10 15

Leu Phe Tyr Phe Leu Trp Pro Lys Lys Phe Gln Ile Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

Tyr Phe Asp Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe
 85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
 100 105 110

Glu Tyr Leu Gly Tyr Ser Asn Ala Met Leu Phe Leu Thr Lys Tyr Gly
 115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser
 130 135 140

Ala Ser Arg Leu Glu Lys Leu Lys His Val Arg Phe Gly Lys Ile Gln
145 150 155 160

Thr Ser Ile Lys Ser Leu Tyr Thr Arg Ile Asp Gly Asn Leu Ser Thr
 165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
 180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
 195 200 205

Val Glu Arg Phe Arg Lys Ala Phe Lys Asp Phe Ile Ile Leu Ser Met
 210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
 245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Val Lys Lys Arg Glu
260 265 270

Lys Met Glu Val Asn Ala Gln Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Asp Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Met Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln His Ala Leu Lys Lys Ala Gln Glu Glu Ile Asp Lys Lys Val
340 345 350

Gly Lys Glu Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
405 410 415

Arg Asp Pro Lys Leu Trp Ser Asn Pro Asp Lys Phe Asp Pro Glu Arg
420 425 430

Phe Phe Ala Asp Asp Ile Asp Tyr Arg Gly Gln His Tyr Glu Phe Ile
435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Leu
450 455 460

Gln Ala Glu His Leu Thr Ile Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Lys Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Leu
 485 490 495

Thr Ile Arg Lys Val Asn Pro Val Glu Val Thr Ile Thr Ala Arg Leu
 500 505 510

Ala Pro Glu Leu Tyr
 515

<210> 21

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante M224I de nicotina
desmetilasa CYP82E5

<400> 21

Met Val Ser Pro Val Glu Ala Ile Val Gly Leu Val Thr Leu Thr Leu
1 5 10 15

Leu Phe Tyr Phe Leu Trp Pro Lys Lys Phe Gln Ile Pro Ser Lys Pro
 20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
 35 40 45

Tyr Phe Asp Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
 50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Glu Tyr Leu Gly Tyr Ser Asn Ala Met Leu Phe Leu Thr Lys Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser
130 135 140

Ala Ser Arg Leu Glu Lys Leu Lys His Val Arg Phe Gly Lys Ile Gln
145 150 155 160

Thr Ser Ile Lys Ser Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Arg Lys Ala Phe Lys Asp Phe Ile Ile Leu Ser Ile
210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Val Lys Lys Arg Glu
260 265 270

Lys Met Glu Val Asn Ala Gln Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Asp Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Met Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln His Ala Leu Lys Lys Ala Gln Glu Glu Ile Asp Lys Lys Val
340 345 350

Gly Lys Glu Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
405 410 415

Arg Asp Pro Lys Leu Trp Ser Asn Pro Asp Lys Phe Asp Pro Glu Arg
420 425 430

Phe Phe Ala Asp Asp Ile Asp Tyr Arg Gly Gln His Tyr Glu Phe Ile
435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Leu
450 455 460

Gln Ala Glu His Leu Thr Ile Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Lys Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Leu
485 490 495

Thr Ile Arg Lys Val Asn Pro Val Glu Val Thr Ile Thr Ala Arg Leu
500 505 510

Ala Pro Glu Leu Tyr
515

<210> 22

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante P235S de nicotina
desmetilasa CYP82E5

<400> 22

Met Val Ser Pro Val Glu Ala Ile Val Gly Leu Val Thr Leu Thr Leu
1 5 10 15

Leu Phe Tyr Phe Leu Trp Pro Lys Lys Phe Gln Ile Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

Tyr Phe Asp Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Glu Tyr Leu Gly Tyr Ser Asn Ala Met Leu Phe Leu Thr Lys Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser
130 135 140

Ala Ser Arg Leu Glu Lys Leu Lys His Val Arg Phe Gly Lys Ile Gln
145 150 155 160

Thr Ser Ile Lys Ser Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Arg Lys Ala Phe Lys Asp Phe Ile Ile Leu Ser Met
210 215 220

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

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Val Lys Lys Arg Glu
260 265 270

Lys Met Glu Val Asn Ala Gln Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Asp Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Met Asn Trp Gly Met Ala Leu Leu Ile Asn
 325 330 335

Asn Gln His Ala Leu Lys Lys Ala Gln Glu Glu Ile Asp Lys Lys Val
 340 345 350

Gly Lys Glu Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
 355 360 365

Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
 370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
 405 410 415

Arg Asp Pro Lys Leu Trp Ser Asn Pro Asp Lys Phe Asp Pro Glu Arg
 420 425 430

Phe Phe Ala Asp Asp Ile Asp Tyr Arg Gly Gln His Tyr Glu Phe Ile
 435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Leu
 450 455 460

Gln Ala Glu His Leu Thr Ile Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Lys Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Leu
 485 490 495

Thr Ile Arg Lys Val Asn Pro Val Glu Val Thr Ile Thr Ala Arg Leu
 500 505 510

Ala Pro Glu Leu Tyr
515

<210> 23

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante A410V de nicotina
desmetilasa CYP82E5

<400> 23

Met Val Ser Pro Val Glu Ala Ile Val Gly Leu Val Thr Leu Thr Leu
1 5 10 15

Leu Phe Tyr Phe Leu Trp Pro Lys Lys Phe Gln Ile Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

Tyr Phe Asp Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Glu Tyr Leu Gly Tyr Ser Asn Ala Met Leu Phe Leu Thr Lys Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser

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

Asn Gln His Ala Leu Lys Lys Ala Gln Glu Glu Ile Asp Lys Lys Val
340 345 350

Gly Lys Glu Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Val Asn Val Met Lys Leu Gln
405 410 415

Arg Asp Pro Lys Leu Trp Ser Asn Pro Asp Lys Phe Asp Pro Glu Arg
420 425 430

Phe Phe Ala Asp Asp Ile Asp Tyr Arg Gly Gln His Tyr Glu Phe Ile
435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Leu
450 455 460

Gln Ala Glu His Leu Thr Ile Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Lys Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Leu
485 490 495

Thr Ile Arg Lys Val Asn Pro Val Glu Val Thr Ile Thr Ala Arg Leu
500 505 510

Ala Pro Glu Leu Tyr
515

<210> 24

<211> 421

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante W422Stop de nicotina desmetilasa CYP82E5

<400> 24

Met Val Ser Pro Val Glu Ala Ile Val Gly Leu Val Thr Leu Thr Leu
1 5 10 15

Leu Phe Tyr Phe Leu Trp Pro Lys Lys Phe Gln Ile Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

Tyr Phe Asp Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Glu Tyr Leu Gly Tyr Ser Asn Ala Met Leu Phe Leu Thr Lys Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Ser
130 135 140

Ala Ser Arg Leu Glu Lys Leu Lys His Val Arg Phe Gly Lys Ile Gln
145 150 155 160

Thr Ser Ile Lys Ser Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Arg Lys Ala Phe Lys Asp Phe Ile Ile Leu Ser Met
210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Val Lys Lys Arg Glu
260 265 270

Lys Met Glu Val Asn Ala Gln Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Asp Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Met Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln His Ala Leu Lys Lys Ala Gln Glu Glu Ile Asp Lys Lys Val
340 345 350

Gly Lys Glu Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
405 410 415

Arg Asp Pro Lys Leu
420

<210> 25

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante P449L de nicotina
desmetilasa CYP82E5

<400> 25

Met Val Ser Pro Val Glu Ala Ile Val Gly Leu Val Thr Leu Thr Leu
1 5 10 15

Leu Phe Tyr Phe Leu Trp Pro Lys Lys Phe Gln Ile Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

Tyr Phe Asp Asp Asp Gly Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Val Lys Asp Cys Phe

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

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Asp Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Met Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln His Ala Leu Lys Lys Ala Gln Glu Glu Ile Asp Lys Lys Val
340 345 350

Gly Lys Glu Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Ala Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
405 410 415

Arg Asp Pro Lys Leu Trp Ser Asn Pro Asp Lys Phe Asp Pro Glu Arg
420 425 430

Phe Phe Ala Asp Asp Ile Asp Tyr Arg Gly Gln His Tyr Glu Phe Ile
435 440 445

Leu Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Leu
450 455 460

Gln Ala Glu His Leu Thr Ile Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Lys Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Leu

485 490 495

Thr Ile Arg Lys Val Asn Pro Val Glu Val Thr Ile Thr Ala Arg Leu
500 505 510

Ala Pro Glu Leu Tyr
515

<210> 26

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la nicotina desmetilasa CYP82E10

<400> 26

Met Val Ser Pro Val Glu Ala Ile Val Gly Leu Val Thr Leu Thr Leu
1 5 10 15

Leu Phe Tyr Phe Ile Arg Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

Tyr Phe Asp Asp Asp Ser Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Ile Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Glu Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Thr Lys Tyr Gly

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

Asp Thr Val Ala Leu His Met Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln His Ala Leu Lys Lys Ala Gln Glu Glu Ile Asp Lys Lys Val
340 345 350

Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Thr Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
405 410 415

Arg Asp Pro Lys Leu Trp Ser Asn Pro Asp Lys Phe Asp Pro Glu Arg
420 425 430

Phe Phe Ala Ala Asp Ile Asp Phe Arg Gly Gln His Tyr Glu Phe Ile
435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Met
450 455 460

Gln Val Glu His Leu Thr Ile Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Lys Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Leu
485 490 495

Thr Ile Arg Lys Val Asn Pro Ile Glu Val Val Ile Thr Pro Arg Leu
500 505 510

Thr Pro Glu Leu Tyr

515

<210> 27

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante L148F de nicotina
desmetilasa CYP82E10

<400> 27

Met Val Ser Pro Val Glu Ala Ile Val Gly Leu Val Thr Leu Thr Leu
1 5 10 15

Leu Phe Tyr Phe Ile Arg Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

Tyr Phe Asp Asp Asp Ser Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Ile Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Glu Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Thr Lys Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Cys
130 135 140

Ala Ser Arg Phe Glu Lys Leu Lys His Val Arg Phe Gly Glu Ile Gln
145 150 155 160

Thr Ser Ile Lys Asn Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
 165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
 180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
 195 200 205

Val Glu Arg Phe Arg Lys Ala Phe Lys Asp Phe Ile Ile Leu Ser Met
 210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
 245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Val Lys Lys Lys Glu
 260 265 270

Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val
 275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Asp Glu Gly Tyr Ser Arg
 290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Met Asn Trp Gly Met Ala Leu Leu Ile Asn
 325 330 335

Asn Gln His Ala Leu Lys Lys Ala Gln Glu Glu Ile Asp Lys Lys Val
 340 345 350

Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Thr Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
405 410 415

Arg Asp Pro Lys Leu Trp Ser Asn Pro Asp Lys Phe Asp Pro Glu Arg
420 425 430

Phe Phe Ala Ala Asp Ile Asp Phe Arg Gly Gln His Tyr Glu Phe Ile
435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Met
450 455 460

Gln Val Glu His Leu Thr Ile Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Lys Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Leu
485 490 495

Thr Ile Arg Lys Val Asn Pro Ile Glu Val Val Ile Thr Pro Arg Leu
500 505 510

Thr Pro Glu Leu Tyr
515

<210> 28

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante G172R de nicotina desmetilasa CYP82E10

<400> 28

Met Val Ser Pro Val Glu Ala Ile Val Gly Leu Val Thr Leu Thr Leu
1 5 10 15

Leu Phe Tyr Phe Ile Arg Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

Tyr Phe Asp Asp Asp Ser Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Ile Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Glu Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Thr Lys Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Cys
130 135 140

Ala Ser Arg Leu Glu Lys Leu Lys His Val Arg Phe Gly Glu Ile Gln
145 150 155 160

Thr Ser Ile Lys Asn Leu Tyr Thr Arg Ile Asp Arg Asn Ser Ser Thr
165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Arg Lys Ala Phe Lys Asp Phe Ile Ile Leu Ser Met
210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Val Lys Lys Lys Glu
260 265 270

Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Asp Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Met Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln His Ala Leu Lys Lys Ala Gln Glu Glu Ile Asp Lys Lys Val
340 345 350

Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Thr Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro

370	375	380
Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr		
385	390	395 400
His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln		
	405	410 415
Arg Asp Pro Lys Leu Trp Ser Asn Pro Asp Lys Phe Asp Pro Glu Arg		
	420	425 430
Phe Phe Ala Ala Asp Ile Asp Phe Arg Gly Gln His Tyr Glu Phe Ile		
	435	440 445
Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Met		
	450	455 460
Gln Val Glu His Leu Thr Ile Ala His Leu Ile Gln Gly Phe Asn Tyr		
	465	470 475 480
Lys Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Leu		
	485	490 495
Thr Ile Arg Lys Val Asn Pro Ile Glu Val Val Ile Thr Pro Arg Leu		
	500	505 510
Thr Pro Glu Leu Tyr		
	515	

<210> 29

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante A344T de nicotina desmetilasa CYP82E10

<400> 29

Met Val Ser Pro Val Glu Ala Ile Val Gly Leu Val Thr Leu Thr Leu
1 5 10 15

Leu Phe Tyr Phe Ile Arg Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

Tyr Phe Asp Asp Asp Ser Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Ile Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Glu Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Thr Lys Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Cys
130 135 140

Ala Ser Arg Leu Glu Lys Leu Lys His Val Arg Phe Gly Glu Ile Gln
145 150 155 160

Thr Ser Ile Lys Asn Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Arg Lys Ala Phe Lys Asp Phe Ile Ile Leu Ser Met
210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Val Lys Lys Lys Glu
260 265 270

Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Asp Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Met Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln His Ala Leu Lys Lys Thr Gln Glu Glu Ile Asp Lys Lys Val
340 345 350

Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Thr Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
405 410 415

Arg Asp Pro Lys Leu Trp Ser Asn Pro Asp Lys Phe Asp Pro Glu Arg
420 425 430

Phe Phe Ala Ala Asp Ile Asp Phe Arg Gly Gln His Tyr Glu Phe Ile
435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Met
450 455 460

Gln Val Glu His Leu Thr Ile Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Lys Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Leu
485 490 495

Thr Ile Arg Lys Val Asn Pro Ile Glu Val Val Ile Thr Pro Arg Leu
500 505 510

Thr Pro Glu Leu Tyr
515

<210> 30

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante A410T de nicotina
desmetilasa CYP82E10

<400> 30

Met Val Ser Pro Val Glu Ala Ile Val Gly Leu Val Thr Leu Thr Leu
1 5 10 15

Leu Phe Tyr Phe Ile Arg Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

Tyr Phe Asp Asp Asp Ser Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Ile Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Glu Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Thr Lys Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Cys
130 135 140

Ala Ser Arg Leu Glu Lys Leu Lys His Val Arg Phe Gly Glu Ile Gln
145 150 155 160

Thr Ser Ile Lys Asn Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Arg Lys Ala Phe Lys Asp Phe Ile Ile Leu Ser Met
210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val

225	230	235	240
Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile			
245	250	255	
Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Val Lys Lys Lys Glu			
260	265	270	
Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val			
275	280	285	
Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Asp Glu Gly Tyr Ser Arg			
290	295	300	
Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala			
305	310	315	320
Asp Thr Val Ala Leu His Met Asn Trp Gly Met Ala Leu Leu Ile Asn			
325	330	335	
Asn Gln His Ala Leu Lys Lys Ala Gln Glu Glu Ile Asp Lys Lys Val			
340	345	350	
Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr			
355	360	365	
Leu Gln Thr Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro			
370	375	380	
Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr			
385	390	395	400
His Ile Pro Lys Gly Thr Arg Leu Phe Thr Asn Val Met Lys Leu Gln			
405	410	415	
Arg Asp Pro Lys Leu Trp Ser Asn Pro Asp Lys Phe Asp Pro Glu Arg			
420	425	430	

Phe Phe Ala Ala Asp Ile Asp Phe Arg Gly Gln His Tyr Glu Phe Ile
435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Met
450 455 460

Gln Val Glu His Leu Thr Ile Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Lys Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Leu
485 490 495

Thr Ile Arg Lys Val Asn Pro Ile Glu Val Val Ile Thr Pro Arg Leu
500 505 510

Thr Pro Glu Leu Tyr
515

<210> 31

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante R417H de nicotina
desmetilasa CYP82E10

<400> 31

Met Val Ser Pro Val Glu Ala Ile Val Gly Leu Val Thr Leu Thr Leu
1 5 10 15

Leu Phe Tyr Phe Ile Arg Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

Tyr Phe Asp Asp Asp Ser Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Ile Lys Asp Cys Phe
 85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
 100 105 110

Glu Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Thr Lys Tyr Gly
 115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Cys
 130 135 140

Ala Ser Arg Leu Glu Lys Leu Lys His Val Arg Phe Gly Glu Ile Gln
145 150 155 160

Thr Ser Ile Lys Asn Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
 165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
 180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
 195 200 205

Val Glu Arg Phe Arg Lys Ala Phe Lys Asp Phe Ile Ile Leu Ser Met
 210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
 245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Val Lys Lys Lys Glu
260 265 270

Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Asp Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Met Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln His Ala Leu Lys Lys Ala Gln Glu Glu Ile Asp Lys Lys Val
340 345 350

Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Thr Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
405 410 415

His Asp Pro Lys Leu Trp Ser Asn Pro Asp Lys Phe Asp Pro Glu Arg
420 425 430

Phe Phe Ala Ala Asp Ile Asp Phe Arg Gly Gln His Tyr Glu Phe Ile
435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Met
450 455 460

Gln Val Glu His Leu Thr Ile Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Lys Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Leu
 485 490 495

Thr Ile Arg Lys Val Asn Pro Ile Glu Val Val Ile Thr Pro Arg Leu
 500 505 510

Thr Pro Glu Leu Tyr
 515

<210> 32

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante P419S de nicotina
desmetilasa CYP82E10

<400> 32

Met Val Ser Pro Val Glu Ala Ile Val Gly Leu Val Thr Leu Thr Leu
1 5 10 15

Leu Phe Tyr Phe Ile Arg Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
 20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
 35 40 45

Tyr Phe Asp Asp Asp Ser Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
 50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Ile Lys Asp Cys Phe

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

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Asp Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Met Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln His Ala Leu Lys Lys Ala Gln Glu Glu Ile Asp Lys Lys Val
340 345 350

Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Thr Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
405 410 415

Arg Asp Ser Lys Leu Trp Ser Asn Pro Asp Lys Phe Asp Pro Glu Arg
420 425 430

Phe Phe Ala Ala Asp Ile Asp Phe Arg Gly Gln His Tyr Glu Phe Ile
435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Met
450 455 460

Gln Val Glu His Leu Thr Ile Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Lys Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Leu

485 490 495

Thr Ile Arg Lys Val Asn Pro Ile Glu Val Val Ile Thr Pro Arg Leu
500 505 510

Thr Pro Glu Leu Tyr
515

<210> 33

<211> 517

<212> PRT

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante G79S de nicotina
desmetilasa CYP82E10

<400> 33

Met Val Ser Pro Val Glu Ala Ile Val Gly Leu Val Thr Leu Thr Leu
1 5 10 15

Leu Phe Tyr Phe Ile Arg Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

Tyr Phe Asp Asp Asp Ser Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

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

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Ile Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
100 105 110

Glu Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Thr Lys Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Cys
130 135 140

Ala Ser Arg Leu Glu Lys Leu Lys His Val Arg Phe Gly Glu Ile Gln
145 150 155 160

Thr Ser Ile Lys Asn Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Arg Lys Ala Phe Lys Asp Phe Ile Ile Leu Ser Met
210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Val Lys Lys Lys Glu
260 265 270

Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Asp Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Met Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln His Ala Leu Lys Lys Ala Gln Glu Glu Ile Asp Lys Lys Val
340 345 350

Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Thr Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
405 410 415

Arg Asp Pro Lys Leu Trp Ser Asn Pro Asp Lys Phe Asp Pro Glu Arg
420 425 430

Phe Phe Ala Ala Asp Ile Asp Phe Arg Gly Gln His Tyr Glu Phe Ile
435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Met
450 455 460

Gln Val Glu His Leu Thr Ile Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Lys Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Leu
485 490 495

Thr Ile Arg Lys Val Asn Pro Ile Glu Val Val Ile Thr Pro Arg Leu
500 505 510

Thr Pro Glu Leu Tyr
515

<210> 34
<211> 517
<212> PRT
<213> Secuencia Artificial

<220>
<223> Secuencia Sintética: Secuencia proteica de la variante P107S de nicotina
desmetilasa CYP82E10

<400> 34

Met Val Ser Pro Val Glu Ala Ile Val Gly Leu Val Thr Leu Thr Leu
1 5 10 15

Leu Phe Tyr Phe Ile Arg Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
35 40 45

Tyr Phe Asp Asp Asp Ser Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Ile Lys Asp Cys Phe
85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Ser Ala Phe Leu Tyr Gly
100 105 110

Glu Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Thr Lys Tyr Gly
115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Cys
130 135 140

Ala Ser Arg Leu Glu Lys Leu Lys His Val Arg Phe Gly Glu Ile Gln
145 150 155 160

Thr Ser Ile Lys Asn Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
 165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
 180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
 195 200 205

Val Glu Arg Phe Arg Lys Ala Phe Lys Asp Phe Ile Ile Leu Ser Met
 210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
 245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Val Lys Lys Lys Glu
 260 265 270

Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val
 275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Asp Glu Gly Tyr Ser Arg
 290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Met Asn Trp Gly Met Ala Leu Leu Ile Asn
 325 330 335

Asn Gln His Ala Leu Lys Lys Ala Gln Glu Glu Ile Asp Lys Lys Val

340	345	350
Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr		
355	360	365
Leu Gln Thr Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Pro Gly Pro		
370	375	380
Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr		
385	390	395 400
His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln		
405	410	415
Arg Asp Pro Lys Leu Trp Ser Asn Pro Asp Lys Phe Asp Pro Glu Arg		
420	425	430
Phe Phe Ala Ala Asp Ile Asp Phe Arg Gly Gln His Tyr Glu Phe Ile		
435	440	445
Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Met		
450	455	460
Gln Val Glu His Leu Thr Ile Ala His Leu Ile Gln Gly Phe Asn Tyr		
465	470	475 480
Lys Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Leu		
485	490	495
Thr Ile Arg Lys Val Asn Pro Ile Glu Val Val Ile Thr Pro Arg Leu		
500	505	510
Thr Pro Glu Leu Tyr		
515		
<210> 35		
<211> 517		
<212> PRT		

<213> Secuencia Artificial

<220>

<223> Secuencia Sintética: Secuencia proteica de la variante P382S de nicotina desmetilasa CYP82E10

<400> 35

Met Val Ser Pro Val Glu Ala Ile Val Gly Leu Val Thr Leu Thr Leu
1 5 10 15

Leu Phe Tyr Phe Ile Arg Thr Lys Lys Ser Gln Lys Pro Ser Lys Pro
 20 25 30

Leu Pro Pro Lys Ile Pro Gly Gly Trp Pro Val Ile Gly His Leu Phe
 35 40 45

Tyr Phe Asp Asp Asp Ser Asp Asp Arg Pro Leu Ala Arg Lys Leu Gly
 50 55 60

Asp Leu Ala Asp Lys Tyr Gly Pro Val Phe Thr Phe Arg Leu Gly Leu
65 70 75 80

Pro Leu Val Leu Val Val Ser Ser Tyr Glu Ala Ile Lys Asp Cys Phe
 85 90 95

Ser Thr Asn Asp Ala Ile Phe Ser Asn Arg Pro Ala Phe Leu Tyr Gly
 100 105 110

Glu Tyr Leu Gly Tyr Asn Asn Ala Met Leu Phe Leu Thr Lys Tyr Gly
 115 120 125

Pro Tyr Trp Arg Lys Asn Arg Lys Leu Val Ile Gln Glu Val Leu Cys
 130 135 140

Ala Ser Arg Leu Glu Lys Leu Lys His Val Arg Phe Gly Glu Ile Gln
145 150 155 160

Thr Ser Ile Lys Asn Leu Tyr Thr Arg Ile Asp Gly Asn Ser Ser Thr
 165 170 175

Ile Asn Leu Thr Asp Trp Leu Glu Glu Leu Asn Phe Gly Leu Ile Val
180 185 190

Lys Met Ile Ala Gly Lys Asn Tyr Glu Ser Gly Lys Gly Asp Glu Gln
195 200 205

Val Glu Arg Phe Arg Lys Ala Phe Lys Asp Phe Ile Ile Leu Ser Met
210 215 220

Glu Phe Val Leu Trp Asp Ala Phe Pro Ile Pro Leu Phe Lys Trp Val
225 230 235 240

Asp Phe Gln Gly His Val Lys Ala Met Lys Arg Thr Phe Lys Asp Ile
245 250 255

Asp Ser Val Phe Gln Asn Trp Leu Glu Glu His Val Lys Lys Lys Glu
260 265 270

Lys Met Glu Val Asn Ala Glu Gly Asn Glu Gln Asp Phe Ile Asp Val
275 280 285

Val Leu Ser Lys Met Ser Asn Glu Tyr Leu Asp Glu Gly Tyr Ser Arg
290 295 300

Asp Thr Val Ile Lys Ala Thr Val Phe Ser Leu Val Leu Asp Ala Ala
305 310 315 320

Asp Thr Val Ala Leu His Met Asn Trp Gly Met Ala Leu Leu Ile Asn
325 330 335

Asn Gln His Ala Leu Lys Lys Ala Gln Glu Glu Ile Asp Lys Lys Val
340 345 350

Gly Lys Asp Arg Trp Val Glu Glu Ser Asp Ile Lys Asp Leu Val Tyr
355 360 365

Leu Gln Thr Ile Val Lys Glu Val Leu Arg Leu Tyr Pro Ser Gly Pro
370 375 380

Leu Leu Val Pro His Glu Asn Val Glu Asp Cys Val Val Ser Gly Tyr
385 390 395 400

His Ile Pro Lys Gly Thr Arg Leu Phe Ala Asn Val Met Lys Leu Gln
405 410 415

Arg Asp Pro Lys Leu Trp Ser Asn Pro Asp Lys Phe Asp Pro Glu Arg
420 425 430

Phe Phe Ala Ala Asp Ile Asp Phe Arg Gly Gln His Tyr Glu Phe Ile
435 440 445

Pro Phe Gly Ser Gly Arg Arg Ser Cys Pro Gly Met Thr Tyr Ala Met
450 455 460

Gln Val Glu His Leu Thr Ile Ala His Leu Ile Gln Gly Phe Asn Tyr
465 470 475 480

Lys Thr Pro Asn Asp Glu Pro Leu Asp Met Lys Glu Gly Ala Gly Leu
485 490 495

Thr Ile Arg Lys Val Asn Pro Ile Glu Val Val Ile Thr Pro Arg Leu
500 505 510

Thr Pro Glu Leu Tyr
515

<210> 36

<211> 24

<212> ADN

<213> Secuencia Artificial

<220>

<223> Cebador Sintético NND3_F1

<400> 36

ttgatccagg gtttcaatta cagc

24

<210> 37
 <211> 28
 <212> ADN
 <213> Secuencia Artificial

 <220>
 <223> Cebador Sintético NND3_R2

 <400> 37
 aacgtaccaa attagaaaaa cgtgtacc 28

 <210> 38
 <211> 31
 <212> ADN
 <213> Secuencia Artificial

 <220>
 <223> Cebador Sintético E4_F1

 <400> 38
 ttttcagaat tggtagagg aacatattaa t 31

 <210> 39
 <211> 26
 <212> ADN
 <213> Secuencia Artificial

 <220>
 <223> Cebador Sintético E4_R1

 <400> 39
 tgtgtctatc tcttctgtg ctttcg 26

 <210> 40
 <211> 29
 <212> ADN
 <213> Secuencia Artificial

 <220>
 <223> Cebador Sintético E5_F1

 <400> 40
 agagattctt cgctgatgat attgactac 29

<210> 41
 <211> 29
 <212> ADN
 <213> Secuencia Artificial

 <220>
 <223> Cebador Sintético E5_R1

 <400> 41
 ccgtaattgt cacttctaca ggatttact 29

 <210> 42
 <211> 24
 <212> ADN
 <213> Secuencia Artificial

 <220>
 <223> Cebador Sintético E10_F2

 <400> 42
 gctgatattg actttcgtgg tcaa 24

 <210> 43
 <211> 24
 <212> ADN
 <213> Secuencia Artificial

 <220>
 <223> Cebador Sintético E10_R2

 <400> 43
 gcgaggcgta attaccactt ctat 24

 <210> 44
 <211> 24
 <212> ADN
 <213> Secuencia Artificial

 <220>
 <223> Cebador Sintético PQ0014_F

 <400> 44
 ctattctccg ctttggactt ggca 24

 <210> 45
 <211> 23

<212> ADN	
<213> Secuencia Artificial	
<220>	
<223> Cebador Sintético PQ0014_R	
<400> 45	
aggacctcag gacaacggaa acg	23
<210> 46	
<211> 27	
<212> ADN	
<213> Secuencia Artificial	
<220>	
<223> Cebador Sintético NND3_F6	
<400> 46	
aattttgggtc tcatcgtgaa gatgata	27
<210> 47	
<211> 27	
<212> ADN	
<213> Secuencia Artificial	
<220>	
<223> Cebador Sintético NND3_R7	
<400> 47	
tcactctctt ctacccatct atccttg	27