

CX2_151USP1_ST25
SEQUENCE LISTING

<110> Codexis, Inc.
Borra-Garske, Margie Tabuga
Alvizo, Oscar
Mayo, Melissa Ann
Jenne, Stephan
Sowell-Kantz, Auric Anthony
Molinaro, Carmela

<120> ENGINEERED IMINE REDUCTASES AND METHODS FOR THE REDUCTIVE AMINATION OF KETONE
AND AMINE COMPOUNDS

<130> CX2-151USP1

<140> Not Yet Assigned

<141> Submitted Herewith

<160> 270

<210> 1

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase from Pseudonocardia spinosispora

<400> 1

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gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
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cgcagtacct tcgatgaaca tgaaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
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tacgcagatc agattgatgc cggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgtgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
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<210> 2

CX2_151USP1_ST25

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase from Pseudonocardia spinosispora

<400> 2

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1      5      10      15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20      25      30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35      40      45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50      55      60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65      70      75      80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85      90      95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100     105     110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115     120     125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130     135     140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145     150     155     160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
165     170     175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180     185     190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195     200     205
Gln Gly Ile Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210     215     220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225     230     235     240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245     250     255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260     265     270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275     280     285
Arg Lys Ser Ala
290

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CX2_151USP1_ST25

<210> 3

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 3

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gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcca actgctggaa 240
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gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
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cgcagtacct tcgatgaaca tgaaaagcga ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct gggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgaag tcagcttaa 879

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<210> 4

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 4

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln

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CX2_151USP1_ST25

	100		105		110										
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Gly	Ile	Pro	Ser	Gly	Ile
	115		120		125										
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
	130		135		140										
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145			150		155				160						
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	Met	Leu
	165		170		175										
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
	180		185		190										
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
	195		200		205										
Gln	Gly	Ile	Glu	Ala	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210		215		220										
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225			230		235				240						
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
	245		250		255										
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
	260		265		270										
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275		280		285										
Arg	Lys	Ser	Ala												
	290														

<210> 5

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 5

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gctgatgaac tgggttggtcg cgggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccacatgcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtagggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggttttct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccg 720

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CX2_151USP1_ST25

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 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtgg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 6

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 6

Met	Ser	Asp	Ser	Pro	Val	Pro	Val	Thr	Val	Leu	Gly	Leu	Gly	Leu	Met
1				5				10						15	
Gly	Gln	Ala	Leu	Ala	Gly	Ala	Phe	Leu	Ala	Ala	Gly	His	Pro	Thr	Thr
			20					25					30		
Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35					40					45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
	50					55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
				85					90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	His	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	Met	Leu
				165					170					175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195					200						205		
Gln	Gly	Ile	Glu	Ala	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		

CX2_151USP1_ST25

Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
 275 280 285
 Arg Lys Ser Ala
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<210> 7

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 7

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tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
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<210> 8

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 8

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Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20 25 30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35 40 45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Gly Ser Leu
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CX2_151USP1_ST25

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Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
			85						90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ala	Pro	Ser	Gly	Ile
		115					120						125		
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	Met	Leu
				165						170					175
Ser	Ile	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195					200						205		
Gln	Gly	Ile	Glu	Ala	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
		275					280						285		
Arg	Lys	Ser	Ala												
	290														

<210> 9

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 9

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gctgatgaac tggttggctc cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtaacc tgacgagcgg tacgtcgcgt 300
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CX2_151USP1_ST25

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gtaggggaag atcacggact ggctgcaact tatgatgcag caatgctgag cgtcatgttg 540
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ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
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<210> 10

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosipora

<400> 10

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Gly Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
165         170         175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195         200         205
Gln Gly Ile Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210         215         220

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CX2_151USP1_ST25

Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245						250					255
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260							265				270	
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
		275						280					285		
Arg	Lys	Ser	Ala												
			290												

<210> 11

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 11

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gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgcga actgctggaa 240
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tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
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ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
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<210> 12

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 12

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met

CX2_151USP1_ST25

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Gly	Gln	Ala	Leu	Ala	Gly	Ala	Phe	Leu	Ala	Ala	Gly	His	Pro	Thr	Thr
		20				25						30			
Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35				40						45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
		50				55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
				85					90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115				120						125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	His	Ala	Met	Leu
			165						170					175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195				200						205			
Gln	Gly	Ile	Glu	Ala	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
		210				215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
			245						250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
		260						265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
		275				280						285			
Arg	Lys	Ser	Ala												
		290													

<210> 13

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 13

CX2_151USP1_ST25

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atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgagctacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtagggggaag atcacggact ggctaactctg tatgatgcag caatgctgag cgatcatgtg 540
ggcctgctga atggttttct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 14

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 14

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Leu
165         170         175

```

CX2_151USP1_ST25

Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180 185 190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195 200 205
Gln Gly Ile Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210 215 220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225 230 235 240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245 250 255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260 265 270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275 280 285
Arg Lys Ser Ala
290

<210> 15

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 15

atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcggtgt ttgcgtcaca gatcatcggt cggtgctgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagact tggccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtagctct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 16

<211> 292

<212> PRT

<213> Artificial Sequence

CX2_151USP1_ST25

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 16

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1      5      10      15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20      25      30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35      40      45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50      55      60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65      70      75      80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85      90      95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100     105     110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115     120     125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130     135     140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145     150     155     160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
165     170     175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180     185     190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195     200     205
Gln Gly Ile Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210     215     220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Leu Ala Thr Ile Asp Thr Gln
225     230     235     240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245     250     255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260     265     270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275     280     285
Arg Lys Ser Ala
290

```

<210> 17

<211> 879

<212> DNA

CX2_151USP1_ST25

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 17

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atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcggt cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgactg tgggatgcag caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgtgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 18

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 18

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125

```

CX2_151USP1_ST25

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

<210> 19

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 19

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gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcaact tatgatgcag caatgctgag catcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgttatgcaa tgcagcacct ggctgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

CX2_151USP1_ST25

<210> 20
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 20
 Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
 1 5 10 15
 Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
 20 25 30
 Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
 35 40 45
 Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
 50 55 60
 Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
 65 70 75 80
 Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
 85 90 95
 Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
 100 105 110
 Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
 115 120 125
 Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
 130 135 140
 Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
 145 150 155 160
 Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
 165 170 175
 Ser Ile Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
 180 185 190
 Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
 195 200 205
 Gln Gly Ile Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
 210 215 220
 Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
 225 230 235 240
 Arg Tyr Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
 245 250 255
 Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
 260 265 270
 Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
 275 280 285
 Arg Lys Ser Ala

290

<210> 21

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 21

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atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgccgc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgccgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atcgaaacag tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 22

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 22

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1           5           10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80

```

CX2_151USP1_ST25

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

<210> 23

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 23

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atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tgggtgggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540

```

CX2_151USP1_ST25

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ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgaagcgg tgaccgggtct tattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct gggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 24

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 24

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20        25        30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35        40        45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50        55        60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65        70        75        80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85        90        95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100       105       110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115       120       125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130       135       140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145       150       155       160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
165       170       175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180       185       190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195       200       205
Gln Gly Ile Glu Ala Val Thr Gly Leu Ile Ala Arg Tyr Ala Asp Gln
210       215       220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225       230       235       240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile

```

CX2_151USP1_ST25

				245						250					255				
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val				
			260							265					270				
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe				
		275					280						285						
Arg	Lys	Ser	Ala																
	290																		

<210> 25
 <211> 879
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 25
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 gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
 ggctgtctga atggtttcct gcatggaacc gactgtctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atcgaaaggg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
 cgtgtctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 26
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 26
 Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
 1 5 10 15
 Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
 20 25 30

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Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35					40					45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
		50				55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
				85					90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	Met	Leu
				165					170					175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195					200					205			
Gln	Gly	Ile	Glu	Arg	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
		210				215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
		275					280					285			
Arg	Lys	Ser	Ala												
		290													

<210> 27

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 27

atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
 gctgatgaac tgggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180

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gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccaagggcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcaactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggatcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtagactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 28

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 28

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Arg Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
165         170         175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly

```

CX2_151USP1_ST25

195	200	205
Gln Gly Ile Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln		
210	215	220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln		
225	230	235
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile		
245	250	255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val		
260	265	270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe		
275	280	285
Arg Lys Ser Ala		
290		

<210> 29
 <211> 879
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 29
 atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
 gctgatgaac tggttggctcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
 ccacttggcg atgcactgtc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtagct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caggtctgag cgtcatgttg 540
 ggcttctgta atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
 cgtgttgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tgggtgactct 840
 tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 30
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

CX2_151USP1_ST25

<400> 30

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Ser Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Gly Leu
165         170         175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195         200         205
Gln Gly Ile Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210         215         220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225         230         235         240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245         250         255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260         265         270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275         280         285
Arg Lys Ser Ala
290

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<210> 31

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

CX2_151USP1_ST25

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 31

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atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttgggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgagtag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgttat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 32

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 32

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe

```

CX2_151USP1_ST25

145		150		155		160
Val	Gly	Glu	Asp	His	Gly	Leu
		165		170		175
Ser	Val	Met	Trp	Gly	Leu	Leu
		180		185		190
Leu	Gly	Thr	Ala	Gly	Val	Ser
		195		200		205
Gln	Gly	Ile	Glu	Ala	Val	Thr
		210		215		220
Ile	Asp	Ala	Gly	Val	Tyr	Pro
		225		230		235
Arg	Ala	Ala	Met	Gln	His	Leu
		245		250		255
Asn	Gly	Glu	Leu	Pro	Ala	Phe
		260		265		270
Ala	Glu	Gly	Arg	Gly	Gly	Asp
		275		280		285
Arg	Lys	Ser	Ala			
		290				

<210> 33

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 33

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gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cgggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgctgcaca gatcatcgtg cgggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaaagcga ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caggctctgag cgatcatgtg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgtgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 34

CX2_151USP1_ST25

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 34

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1      5      10      15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20      25      30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35      40      45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Val Ala Ala Gly Ser Leu
50      55      60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65      70      75      80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85      90      95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100     105     110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115     120     125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130     135     140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145     150     155     160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Gly Leu
165     170     175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180     185     190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195     200     205
Gln Gly Ile Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210     215     220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225     230     235     240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245     250     255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260     265     270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275     280     285
Arg Lys Ser Ala
290

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CX2_151USP1_ST25

<210> 35
<211> 879
<212> DNA
<213> Artificial Sequence

<220>
<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 35
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gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagttg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct gggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 36
<211> 292
<212> PRT
<213> Artificial Sequence

<220>
<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 36
Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1 5 10 15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20 25 30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35 40 45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Val Ala Ala Gly Ser Leu
50 55 60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65 70 75 80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85 90 95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln

CX2_151USP1_ST25

	100		105		110										
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
	115						120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
	130						135					140			
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	Met	Leu
			165						170					175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
		180						185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
	195						200					205			
Gln	Gly	Ile	Glu	Val	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
			245						250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
	260							265				270			
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275						280					285			
Arg	Lys	Ser	Ala												
	290														

<210> 37

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 37

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gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgat taggtccggg ggcgaccttt 480
gtagggggaa atcacggact ggctgcactg tatgatattg caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccg 720

```

CX2_151USP1_ST25

cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtgg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 38

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 38

Met	Ser	Asp	Ser	Pro	Val	Pro	Val	Thr	Val	Leu	Gly	Leu	Gly	Leu	Met
1				5				10						15	
Gly	Gln	Ala	Leu	Ala	Gly	Ala	Phe	Leu	Ala	Ala	Gly	His	Pro	Thr	Thr
			20					25					30		
Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35					40					45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
	50					55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
				85					90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ile	Ala	Met	Leu
				165						170				175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195					200						205		
Gln	Gly	Ile	Glu	Ala	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		

CX2_151USP1_ST25

Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
 275 280 285
 Arg Lys Ser Ala
 290

<210> 39

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 39

```
atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attgaaacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcaact tatgatgcag caatgctgag cgatcatgtg 540
ggcctgctga atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgcttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 40

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 40

```
Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1 5 10 15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20 25 30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35 40 45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Gly Ser Leu
```

CX2_151USP1_ST25

50	55	60													
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
			85						90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Glu	Thr	Ile	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
	130					135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	Met	Leu
			165						170					175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
	195						200					205			
Gln	Gly	Ile	Glu	Ala	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
			245					250						255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
		260					265					270			
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275					280						285			
Arg	Lys	Ser	Ala												
	290														

<210> 41

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 41

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atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tgggtggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgag gctcaggag ccacctacct ggatggtgtg 360

```

CX2_151USP1_ST25

```

attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcaact tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaaccag tgaccgggtg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 42

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 42

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
165         170         175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195         200         205
Gln Gly Ile Glu Pro Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210         215         220

```

CX2_151USP1_ST25

Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
			245						250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
		260						265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275						280					285			
Arg	Lys	Ser	Ala												
290															

<210> 43

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 43

```

atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacgggtt ggaatcgag cgagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcaact tatgatgcag caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccgggtat tattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 44

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 44

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met

CX2_151USP1_ST25

1		5		10		15									
Gly	Gln	Ala	Leu	Ala	Gly	Ala	Phe	Leu	Ala	Ala	Gly	His	Pro	Thr	Thr
		20				25						30			
Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35				40						45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
		50				55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
			85					90						95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115				120						125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	Met	Leu
			165					170						175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195				200						205			
Gln	Gly	Ile	Glu	Ala	Val	Thr	Gly	Ile	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
		210				215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
			245					250						255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
		260						265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
		275				280						285			
Arg	Lys	Ser	Ala												
		290													

<210> 45

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 45

CX2_151USP1_ST25

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atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgat taggtccggg ggcgaccttt 480
gtagggggaa atcacggact ggctagtctg tatgatgcag caatgctgag cgatcatgtg 540
ggcctgctga atggttttct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atcgaagcgg tgaccgggtg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 46

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 46

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Ser Leu Tyr Asp Ala Ala Met Leu
165         170         175

```

CX2_151USP1_ST25

Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180 185 190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195 200 205
Gln Gly Ile Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210 215 220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225 230 235 240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245 250 255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260 265 270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275 280 285
Arg Lys Ser Ala
290

<210> 47

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 47

atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tgggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag cacatctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 48

<211> 292

<212> PRT

<213> Artificial Sequence

CX2_151USP1_ST25

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 48

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1      5      10      15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20     25     30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35     40     45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50     55     60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65     70     75     80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85     90     95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100    105    110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115    120    125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130    135    140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145    150    155    160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala His Leu
165    170    175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180    185    190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195    200    205
Gln Gly Ile Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210    215    220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225    230    235    240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245    250    255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260    265    270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275    280    285
Arg Lys Ser Ala
290

```

<210> 49

<211> 879

<212> DNA

CX2_151USP1_ST25

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 49

```

atgagtgatt cccccgtacc tgtgactggt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcggt cggtcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgactg tatgatgcag caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaaaacgat tgatacccag 720
cgtgtgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 50

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 50

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125

```

CX2_151USP1_ST25

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

<210> 51

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 51

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atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccatg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcaact tatgatgcag caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atctgtgcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

CX2_151USP1_ST25

<210> 52
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 52
 Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
 1 5 10 15
 Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
 20 25 30
 Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
 35 40 45
 Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
 50 55 60
 Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
 65 70 75 80
 Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
 85 90 95
 Gly Thr Ser Arg Glu Ala His Glu Asn Ala Glu His Thr Ala Ala Gln
 100 105 110
 Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
 115 120 125
 Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
 130 135 140
 Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
 145 150 155 160
 Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
 165 170 175
 Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
 180 185 190
 Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
 195 200 205
 Gln Gly Ile Cys Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
 210 215 220
 Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
 225 230 235 240
 Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
 245 250 255
 Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
 260 265 270
 Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
 275 280 285
 Arg Lys Ser Ala

290

<210> 53

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 53

```

atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgccgc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgccgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgag gctcagggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcac taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgttgggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tgggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 54

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 54

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1           5           10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
          20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
          35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
          50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80

```

CX2_151USP1_ST25

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

<210> 55

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 55

```

atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tgggtgggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag catgatgtgg 540

```

CX2_151USP1_ST25

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ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct gggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 56

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 56

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20        25        30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35        40        45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50        55        60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65        70        75        80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85        90        95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100       105       110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115       120       125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130       135       140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145       150       155       160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
165       170       175
Ser Met Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180       185       190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195       200       205
Gln Gly Ile Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210       215       220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225       230       235       240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile

```

[illegible]

<210> 57
<211> 879
<212> DNA
<213> Artificial Sequence

<220>
<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400>	57						
atgagtgatt	ccccgtacc	tgtgactgtt	ctgggtcctt	gtctgatggg	tcaggcctta	60	
gcgggagcgt	ttctggcagc	cggtcaccct	acgacggttt	ggaatcgag	cgcagctaaa	120	
gctgatgaac	tggttggtcg	cggtgcaacc	ctggccgcgt	ctcccgcggc	tgccgtcgca	180	
gcgggtagtc	tgatcgttgt	ttgcgtcaca	gatcatcgtg	cggtgcgcga	actgctggaa	240	
ccacttggcg	atgactgcc	aggtcgcgtt	ctggtcaacc	tgacgagcgg	tacgtcgcgt	300	
gaagcccgtg	agaacgcaga	acatactgcg	gctcagggag	ccacctacct	ggaatggtgtg	360	
attctgacca	ttccaagcgg	cattggcacc	ccagaagcta	ccatttctgta	ttcgggaccg	420	
cgcagtacct	tcgatgaaca	tgaaagcgca	ctgcgcgcac	taggtccggg	ggcgaccttt	480	
gtaggggaag	atcacggact	ggctgcactg	tatgatgcag	caatgctgag	cgatcatgtg	540	
ggcctgctga	atggtttcct	gcatggaacc	gcactgctgg	gaaccgcggg	cgtttcggca	600	
acctctgtgg	ttccgatgct	gggtcaaggt	atctgtgcgg	tgaccggttg	gattgcgcgc	660	
tacgcagatc	agattgatgc	cggtgtctat	ccagcagacg	acgccacgat	tgatacccag	720	
cgtgctgcaa	tgcagcacct	ggtcgcaggag	agccgtgcgg	cgggcaccaa	tggcgaactt	780	
ccggcgtttg	tgaccaaact	ggccgatcgc	gcagtggcag	aaggtcgtgg	tggtgactct	840	
tacgtgcac	tgattgaaca	gtttcgcaag	tcagcttaa			879	

```
<210> 58
<211> 292
<212> PRT
<213> Artificial Sequence
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<220>
<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 58
Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1 5 10 15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20 25 30

CX2_151USP1_ST25

Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35					40					45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
		50				55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
				85					90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	Met	Leu
				165					170					175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195					200					205			
Gln	Gly	Ile	Cys	Ala	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
		210				215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
		275					280					285			
Arg	Lys	Ser	Ala												
		290													

<210> 59

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 59

atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacgggtt ggaatcgag cgagcctaaa 120
 gctgatgaac tgggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180

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gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggatcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtagactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 60

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 60

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Arg Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
165         170         175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly

```

CX2_151USP1_ST25

195	200	205
Gln Gly Ile Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln		
210	215	220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln		
225	230	235
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile		
245	250	255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val		
260	265	270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe		
275	280	285
Arg Lys Ser Ala		
290		

<210> 61
 <211> 879
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 61
 atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
 gctgatgaac tggttgggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtagct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
 ggcttctgta atggtttcct gcatggaacc gactgtctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atcgttgcgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
 cgtgttgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcggttg tgacaaaact ggccgatcgc gcagtggcag aaggctcgtg tgggtgactct 840
 tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 62
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

CX2_151USP1_ST25

<400> 62

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
165         170         175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195         200         205
Gln Gly Ile Val Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210         215         220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225         230         235         240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245         250         255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260         265         270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275         280         285
Arg Lys Ser Ala
290

```

<210> 63

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

CX2_151USP1_ST25

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 63

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atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atcgaagcgg tgatgggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 64

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 64

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe

```

CX2_151USP1_ST25

145		150		155		160
Val	Gly	Glu	Asp	His	Gly	Leu
		165		170		175
Ser	Val	Met	Trp	Gly	Leu	Leu
		180		185		190
Leu	Gly	Thr	Ala	Gly	Val	Ser
		195		200		205
Gln	Gly	Ile	Glu	Ala	Val	Met
		210		215		220
Ile	Asp	Ala	Gly	Val	Tyr	Pro
		225		230		235
Arg	Ala	Ala	Met	Gln	His	Leu
		245		250		255
Asn	Gly	Glu	Leu	Pro	Ala	Phe
		260		265		270
Ala	Glu	Gly	Arg	Gly	Gly	Asp
		275		280		285
Arg	Lys	Ser	Ala			
		290				

<210> 65

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 65

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atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttgggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtagct tcgatgaaca tgaaaagcga ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgatcatgtg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaaggt tgggaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgtgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 66

CX2_151USP1_ST25

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 66

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1      5      10      15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20      25      30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35      40      45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50      55      60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65      70      75      80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85      90      95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100     105     110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115     120     125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130     135     140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145     150     155     160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
165     170     175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180     185     190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195     200     205
Gln Gly Trp Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210     215     220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225     230     235     240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245     250     255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260     265     270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275     280     285
Arg Lys Ser Ala
290

```

CX2_151USP1_ST25

<210> 67

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 67

```

atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcgac tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaaagcga ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt cttgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct gggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgaag tcagcttaa 879

```

<210> 68

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 68

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Thr Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln

```

CX2_151USP1_ST25

	100		105		110										
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
	115						120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
	130						135					140			
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	Met	Leu
			165						170					175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
		180						185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
	195						200					205			
Gln	Gly	Leu	Glu	Ala	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
			245						250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
	260							265				270			
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275						280					285			
Arg	Lys	Ser	Ala												
	290														

<210> 69

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 69

```

atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tgggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtagggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt cttgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccg 720

```

CX2_151USP1_ST25

cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtgg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 70

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 70

Met	Ser	Asp	Ser	Pro	Val	Pro	Val	Thr	Val	Leu	Gly	Leu	Gly	Leu	Met
1				5				10						15	
Gly	Gln	Ala	Leu	Ala	Gly	Ala	Phe	Leu	Ala	Ala	Gly	His	Pro	Thr	Thr
			20					25					30		
Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35					40					45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
	50					55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
				85					90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	Met	Leu
				165						170				175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195					200					205			
Gln	Gly	Leu	Glu	Ala	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		

CX2_151USP1_ST25

Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
 275 280 285
 Arg Lys Ser Ala
 290

<210> 71

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 71

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atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgatcatgtg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgggtgcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 72

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 72

```
Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1 5 10 15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20 25 30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35 40 45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Gly Ser Leu
```

CX2_151USP1_ST25

```

      50              55              60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65              70              75              80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
      85              90              95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
      100             105             110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
      115             120             125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
      130             135             140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145             150             155             160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
      165             170             175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
      180             185             190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
      195             200             205
Gln Gly Ile Gly Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
      210             215             220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225             230             235             240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
      245             250             255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
      260             265             270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
      275             280             285
Arg Lys Ser Ala
      290

```

<210> 73

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 73

```

atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tgggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360

```

CX2_151USP1_ST25

```

attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgaagcga tgaccgggtg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 74

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosisporea

<400> 74

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
165         170         175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195         200         205
Gln Gly Ile Glu Ala Met Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210         215         220

```

CX2_151USP1_ST25

Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
			245						250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
		260						265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275						280					285			
Arg	Lys	Ser	Ala												
	290														

<210> 75

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 75

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgggtg gccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg gttgatcatg caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgaagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tgggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 76

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 76

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met

CX2_151USP1_ST25

1	5	10	15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr			
20	25	30	
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly			
35	40	45	
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Gly Ser Leu			
50	55	60	
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu			
65	70	75	80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser			
85	90	95	
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln			
100	105	110	
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Gly Gly Pro Ser Gly Ile			
115	120	125	
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe			
130	135	140	
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe			
145	150	155	160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Val Asp His Ala Met Leu			
165	170	175	
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu			
180	185	190	
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly			
195	200	205	
Gln Gly Ile Glu Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln			
210	215	220	
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Lys Thr Ile Asp Thr Gln			
225	230	235	240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile			
245	250	255	
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val			
260	265	270	
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe			
275	280	285	
Arg Lys Ser Ala			
290			

<210> 77

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 77

CX2_151USP1_ST25

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatattg caatgctgag cgtcagtgtg 540
ggcctgctga atggttttct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcggagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acgcgacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 78

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 78

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Gly Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ile Ala Met Leu
165         170         175

```

CX2_151USP1_ST25

Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180 185 190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195 200 205
Gln Gly Ile Gly Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210 215 220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225 230 235 240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245 250 255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260 265 270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275 280 285
Arg Lys Ser Ala
290

<210> 79

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 79

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcggtgt ttgcgtcaca gatcatcggt cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatgggtgtg 360
attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatgccg caggcctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atctgcgtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tgggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 80

<211> 292

<212> PRT

<213> Artificial Sequence

CX2_151USP1_ST25

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 80

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1      5      10      15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20      25      30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35      40      45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50      55      60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65      70      75      80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85      90      95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100     105     110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Gly Pro Ser Gly Ile
115     120     125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130     135     140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145     150     155     160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Gly Leu
165     170     175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180     185     190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195     200     205
Gln Gly Ile Cys Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210     215     220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Lys Thr Ile Asp Thr Gln
225     230     235     240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245     250     255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260     265     270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275     280     285
Arg Lys Ser Ala
290

```

<210> 81

<211> 879

<212> DNA

CX2_151USP1_ST25

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 81

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcggt cggtcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg gttgatattg caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atcggagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 82

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 82

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125

```

CX2_151USP1_ST25

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

<210> 83

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 83

atgagtgatt	cacctgtgcc	cgtgacagtt	ctgggtcttg	gtctgatggg	tcaggcctta	60
gcgggagcgt	ttctggcagc	cggtcaccct	acgacggttt	ggaatcgag	cgcagctaaa	120
gctgatgaac	tggttggtcg	cggtgcaacc	ctggccgcgt	ctcccgcggc	tgccgtcgca	180
gcgggtagtc	tgatcgttgt	ttgcgtcaca	gatcatcgtg	cggctgcgca	actgctggaa	240
ccacttggcg	atgcactgcc	aggtcgcgtt	ctggtcaacc	tgacgagcgg	tacgtcgcgt	300
gaagcccgtg	agaacgcaga	acatactgcg	gctcagggag	ccacctacct	ggatgggtgtg	360
attctgacga	ttccaagcgg	cattggcacc	ccagaagcta	ccattctgta	ttcgggaccg	420
cgcagtacct	tcgatgaaca	tgaagcgca	ctgcgcgcat	taggtccggg	ggcgaccttt	480
gtaggggaag	atcacggact	ggctaactctg	tacgatgcag	caatgctgag	cgtcatgtgg	540
ggcctgctga	atggtttcct	gcatggaacc	gcactgctgg	gaaccgcggg	cgtttcggca	600
acctctgtgg	ttccgatgct	gggtcaaggt	atcgaagcgg	tgaccggttg	gattgcgcgc	660
tacgcagatc	agattgatgc	cgggtgtctat	ccagcagacg	acaagacgat	tgatacccag	720
cgtgctgcaa	tgcagcacct	ggctgaggag	agccgtgcgg	cgggcatcaa	tggcgaactt	780
ccggcgtttg	tgaccaaact	ggccgatcgc	gcagtggcag	aaggctcgtg	tggtgactct	840
tacgtgcac	tgattgaaca	gtttcgcaag	tcagcttaa			879

CX2_151USP1_ST25

<210> 84
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 84
 Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
 1 5 10 15
 Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
 20 25 30
 Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
 35 40 45
 Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
 50 55 60
 Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
 65 70 75 80
 Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
 85 90 95
 Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
 100 105 110
 Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
 115 120 125
 Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
 130 135 140
 Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
 145 150 155 160
 Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Leu
 165 170 175
 Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
 180 185 190
 Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
 195 200 205
 Gln Gly Ile Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
 210 215 220
 Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Lys Thr Ile Asp Thr Gln
 225 230 235 240
 Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
 245 250 255
 Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
 260 265 270
 Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
 275 280 285
 Arg Lys Ser Ala

290

<210> 85

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 85

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatcatg cacacctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atcgaagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 86

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 86

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1           5           10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
          20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
          35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
          50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65           70           75           80

```

CX2_151USP1_ST25

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

<210> 87

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 87

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgccgc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcac taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatattg caatgctgag cgtcatgttg 540

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CX2_151USP1_ST25

```

ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgggaactg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct gggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 88

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 88

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20        25        30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35        40        45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50        55        60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65        70        75        80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85        90        95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100       105       110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Gly Ile Pro Ser Gly Ile
115       120       125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130       135       140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145       150       155       160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ile Ala Met Leu
165       170       175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180       185       190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195       200       205
Gln Gly Ile Gly Thr Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210       215       220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225       230       235       240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile

```

CX2_151USP1_ST25

				245					250					255					
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val				
			260						265					270					
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe				
		275					280						285						
Arg	Lys	Ser	Ala																
	290																		

<210> 89
 <211> 879
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 89
 atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
 gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
 attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
 ggctgtctga atggtttcct gcatggaacc gactgtctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atcggagtgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
 cgtgtctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcggttg tgaccaaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 90
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 90
 Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
 1 5 10 15
 Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
 20 25 30

CX2_151USP1_ST25

Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35					40					45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
		50				55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
				85					90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Gly	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	Met	Leu
				165					170					175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195					200					205			
Gln	Gly	Ile	Gly	Val	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
		210				215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Lys	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
		275					280					285			
Arg	Lys	Ser	Ala												
		290													

<210> 91

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 91

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tgggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180

CX2_151USP1_ST25

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gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tacgatcatg cacacctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcaactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggatcaagg atctgcgtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtagactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 92

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 92

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Gly Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp His Ala His Leu
165         170         175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly

```

CX2_151USP1_ST25

195	200	205
Gln Gly Ile Cys Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln		
210	215	220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Lys Thr Ile Asp Thr Gln		
225	230	235
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile		
245	250	255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val		
260	265	270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe		
275	280	285
Arg Lys Ser Ala		
290		

<210> 93
 <211> 879
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 93
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 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
 gctgatgaac tggttggctcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
 attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaactctg tacgatgccg caatgctgag cgtcatgttg 540
 ggcttctgta atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaaggt atcggagtgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
 cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 94
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

CX2_151USP1_ST25

<400> 94

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Leu
165         170         175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195         200         205
Gln Gly Ile Gly Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210         215         220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225         230         235         240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245         250         255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260         265         270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275         280         285
Arg Lys Ser Ala
290

```

<210> 95

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

CX2_151USP1_ST25

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 95

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gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tacgatgccg cacacctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 96

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 96

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10         15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20         25         30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35         40         45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50         55         60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65         70         75         80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85         90         95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100        105        110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115        120        125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130        135        140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe

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CX2_151USP1_ST25

145		150		155		160
Val	Gly	Glu	Asp	His	Gly	Leu
		165		170		175
Ser	Val	Met	Trp	Gly	Leu	Leu
		180		185		190
Leu	Gly	Thr	Ala	Gly	Val	Ser
		195		200		205
Gln	Gly	Ile	Glu	Ala	Val	Thr
		210		215		220
Ile	Asp	Ala	Gly	Val	Tyr	Pro
		225		230		235
Arg	Ala	Ala	Met	Gln	His	Leu
		245		250		255
Asn	Gly	Glu	Leu	Pro	Ala	Phe
		260		265		270
Ala	Glu	Gly	Arg	Gly	Gly	Asp
		275		280		285
Arg	Lys	Ser	Ala			
		290				

<210> 97

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 97

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gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaaagcga ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatgccg caatgctgag cgtcagtgtg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgcgacgat tgatacccag 720
cgtgtgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 98

CX2_151USP1_ST25

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 98

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1      5      10      15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20      25      30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35      40      45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Val Ala Ala Gly Ser Leu
50      55      60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65      70      75      80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85      90      95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100     105     110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Gly Pro Ser Gly Ile
115     120     125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130     135     140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145     150     155     160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Leu
165     170     175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180     185     190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195     200     205
Gln Gly Ile Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210     215     220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225     230     235     240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245     250     255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260     265     270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275     280     285
Arg Lys Ser Ala
290

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CX2_151USP1_ST25

<210> 99

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 99

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaaagcga ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatgccg caatgctgag cgtcagtgtg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atctgcgctg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 100

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 100

```

Met Ser Asp Ser Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln

```

CX2_151USP1_ST25

	100		105		110										
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
	115						120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
	130						135					140			
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Asn	Leu	Tyr	Asp	Ala	Ala	Met	Leu
				165					170					175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
	195						200					205			
Gln	Gly	Ile	Cys	Ala	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Lys	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
		260						265				270			
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
		275					280					285			
Arg	Lys	Ser	Ala												
	290														

<210> 101

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 101

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tgggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtagggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgtgta atggttttct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcggagctg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccg 720

```

CX2_151USP1_ST25

cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtgg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 102

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 102

Met	Ser	Asp	Ser	Pro	Val	Pro	Val	Thr	Val	Leu	Gly	Leu	Gly	Leu	Met
1				5				10						15	
Gly	Gln	Ala	Leu	Ala	Gly	Ala	Phe	Leu	Ala	Ala	Gly	His	Pro	Thr	Thr
			20					25					30		
Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35					40					45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
	50					55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
				85					90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Gly	Ile	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	Met	Leu
				165						170				175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195					200					205			
Gln	Gly	Ile	Gly	Ala	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Lys	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		

CX2_151USP1_ST25

Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
 275 280 285
 Arg Lys Ser Ala
 290

<210> 103

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 103

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacgggtt ggaatcgag cgagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tacgatattg cacacctgag cgatcatgtg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgcgacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgcttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 104

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 104

```
Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1 5 10 15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20 25 30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35 40 45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Gly Ser Leu
```

CX2_151USP1_ST25

50	55	60													
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu															
65	70	75	80												
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser															
	85	90	95												
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln															
	100	105	110												
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile															
	115	120	125												
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe															
	130	135	140												
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe															
145	150	155	160												
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ile Ala His Leu															
	165	170	175												
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu															
	180	185	190												
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly															
	195	200	205												
Gln Gly Ile Glu Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln															
	210	215	220												
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln															
225	230	235	240												
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile															
	245	250	255												
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val															
	260	265	270												
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe															
	275	280	285												
Arg Lys Ser Ala															
290															

<210> 105

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 105

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatggtgtg 360

```

CX2_151USP1_ST25

```

attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcaactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaaactg tgaccgggtg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tgggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 106

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 106

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
165         170         175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195         200         205
Gln Gly Ile Glu Thr Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210         215         220

```

CX2_151USP1_ST25

Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Lys	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
			245						250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
		260						265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275						280					285			
Arg	Lys	Ser	Ala												
	290														

<210> 107

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 107

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacgggtt ggaatcgag cgagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tacgatgccg cacacctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaacctg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 108

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 108

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met

CX2_151USP1_ST25

1		5		10		15									
Gly	Gln	Ala	Leu	Ala	Gly	Ala	Phe	Leu	Ala	Ala	Gly	His	Pro	Thr	Thr
		20				25						30			
Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35				40						45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
		50				55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
			85					90					95		
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115				120						125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	His	Leu
			165					170						175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195				200						205			
Gln	Gly	Ile	Glu	Pro	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
		210				215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Lys	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
			245					250						255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
		260						265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
		275				280						285			
Arg	Lys	Ser	Ala												
		290													

<210> 109

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 109

CX2_151USP1_ST25

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgagctacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtagggggaag atcacggact ggctaactctg tacgatgccg caatgctgag cgcatgtgtg 540
ggcctgctga atggttttct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atcggagtggt tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 110

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 110

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Gly Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Leu
165         170         175

```

CX2_151USP1_ST25

Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180 185 190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195 200 205
Gln Gly Ile Gly Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210 215 220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Lys Thr Ile Asp Thr Gln
225 230 235 240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245 250 255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260 265 270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275 280 285
Arg Lys Ser Ala
290

<210> 111

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 111

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggctc cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcggt cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatgccg caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaaggt atcgtagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 112

<211> 292

<212> PRT

<213> Artificial Sequence

CX2_151USP1_ST25

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 112

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1      5      10      15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20     25     30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35     40     45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50     55     60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65     70     75     80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85     90     95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100    105    110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Gly Pro Ser Gly Ile
115    120    125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130    135    140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145    150    155    160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Leu
165    170    175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180    185    190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195    200    205
Gln Gly Ile Val Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210    215    220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Lys Thr Ile Asp Thr Gln
225    230    235    240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245    250    255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260    265    270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275    280    285
Arg Lys Ser Ala
290

```

<210> 113

<211> 879

<212> DNA

CX2_151USP1_ST25

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 113

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggctg cgggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgctgcaca gatcatcggt cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatgccg caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgagtggt tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgcgacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tgggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 114

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 114

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20        25        30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35        40        45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50        55        60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65        70        75        80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85        90        95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100       105       110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Gly Ile Pro Ser Gly Ile
115      120      125

```

CX2_151USP1_ST25

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

<210> 115

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 115

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atcgtagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

CX2_151USP1_ST25

<210> 116
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 116
 Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
 1 5 10 15
 Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
 20 25 30
 Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
 35 40 45
 Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
 50 55 60
 Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
 65 70 75 80
 Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
 85 90 95
 Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
 100 105 110
 Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
 115 120 125
 Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
 130 135 140
 Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
 145 150 155 160
 Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
 165 170 175
 Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
 180 185 190
 Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
 195 200 205
 Gln Gly Ile Val Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
 210 215 220
 Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Lys Thr Ile Asp Thr Gln
 225 230 235 240
 Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
 245 250 255
 Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
 260 265 270
 Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
 275 280 285
 Arg Lys Ser Ala

290

<210> 117

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 117

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgccgc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgccgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgag gctcagggag ccacctacct ggatggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atctgcgtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tgggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 118

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 118

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1           5           10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
          20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
          35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
          50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80

```

CX2_151USP1_ST25

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

<210> 119

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 119

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg gttgatcatg caatgctgag cgatcatgtg 540

CX2_151USP1_ST25

```

ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgaagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct gggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 120

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 120

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20        25        30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35        40        45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50        55        60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65        70        75        80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85        90        95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100       105       110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Gly Ile Pro Ser Gly Ile
115       120       125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130       135       140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145       150       155       160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Val Asp His Ala Met Leu
165       170       175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180       185       190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195       200       205
Gln Gly Ile Glu Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210       215       220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Lys Thr Ile Asp Thr Gln
225       230       235       240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile

```

CX2_151USP1_ST25

				245					250					255					
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val				
			260						265					270					
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe				
		275					280						285						
Arg	Lys	Ser	Ala																
	290																		

<210> 121
 <211> 879
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 121
 atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
 gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
 attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
 ggctgtctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atctgcgtgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
 cgtgtctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 122
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 122
 Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
 1 5 10 15
 Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
 20 25 30

CX2_151USP1_ST25

Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35					40					45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
		50				55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
				85					90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Gly	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	Met	Leu
				165					170					175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195					200					205			
Gln	Gly	Ile	Cys	Val	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
		210				215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Lys	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
		275					280					285			
Arg	Lys	Ser	Ala												
		290													

<210> 123

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 123

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
 gctgatgaac tgggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180

CX2_151USP1_ST25

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gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatggtgtg 360
attctgacgg gcccgaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatattg caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggatcaagg atcgtagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggatcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tgggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 124

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 124

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Gly Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ile Ala Met Leu
165         170         175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly

```

CX2_151USP1_ST25

195	200	205
Gln Gly Ile Val Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln		
210	215	220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Lys Thr Ile Asp Thr Gln		
225	230	235
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile		
245	250	255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val		
260	265	270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe		
275	280	285
Arg Lys Ser Ala		
290		

<210> 125
 <211> 879
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 125
 atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
 gctgatgaac tggttggctcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
 attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaactctg tacgatattg caatgctgag cgtcatgttg 540
 ggcttctgta atggtttcct gcatggaacc gactgtctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgcgacgat tgatacccag 720
 cgtgttgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tgggtgactct 840
 tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 126
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

CX2_151USP1_ST25

<400> 126

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
          20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
          35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
          50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
          85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
          100          105          110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Gly Ile Pro Ser Gly Ile
          115          120          125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
          130          135          140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145          150          155          160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ile Ala Met Leu
          165          170          175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
          180          185          190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
          195          200          205
Gln Gly Ile Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
          210          215          220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225          230          235          240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
          245          250          255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
          260          265          270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
          275          280          285
Arg Lys Ser Ala
          290

```

<210> 127

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

CX2_151USP1_ST25

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 127

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatgccg caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atctgcgtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 128

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 128

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10         15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20         25         30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35         40         45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50         55         60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65         70         75         80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85         90         95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100        105        110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115        120        125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130        135        140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe

```

CX_151USP1_ST25

```

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

```

<210> 129

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<220>

<221> Misc_Feature

<222> (634)..(634)

<223> n = a, c, g or t

<220>

<221> Misc_Feature

<222> (636)..(636)

<223> n = a, c, g or t

<400> 129

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttgggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtcgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgggta ttccaagcgg catttggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480

```

CX2_151USP1_ST25

```

gtaggggaag atcacggact ggctaattctg gttgatcatg cacacctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcngngtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtgg tgggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 130

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<220>

<221> Misc_Feature

<222> (212)..(212)

<223> Xaa = Cys, Ter, Ser, Trp, Arg, Gly

<400> 130

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Gly Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Val Asp His Ala His Leu
165         170         175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly

```

CX2_151USP1_ST25

195	200	205
Gln Gly Ile Xaa Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln		
210	215	220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln		
225	230	235
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile		
245	250	255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val		
260	265	270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe		
275	280	285
Arg Lys Ser Ala		
290		

<210> 131
 <211> 879
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 131
 atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
 gctgatgaac tggttggctcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
 attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
 ggcttctgta atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atcgaaactg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
 cgtgttgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tgggtgactct 840
 tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 132
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

CX2_151USP1_ST25

<400> 132

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Gly Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
165         170         175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195         200         205
Gln Gly Ile Glu Thr Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210         215         220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225         230         235         240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245         250         255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260         265         270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275         280         285
Arg Lys Ser Ala
290

```

<210> 133

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

CX2_151USP1_ST25

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 133

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatgccg caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcggagtgg tgaccggtt gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 134

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 134

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Gly Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe

```

CX2_151USP1_ST25

```

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

```

<210> 135

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 135

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggcgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgggtg gcccagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaaagcga ctgcgcgcac taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatgccg caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggcgaaggt atcgtagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgtgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 136

CX2_151USP1_ST25

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 136

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1      5      10      15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20      25      30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35      40      45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50      55      60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65      70      75      80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85      90      95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100     105     110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Gly Gly Pro Ser Gly Ile
115     120     125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130     135     140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145     150     155     160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Leu
165     170     175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180     185     190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195     200     205
Gln Gly Ile Val Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210     215     220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Lys Thr Ile Asp Thr Gln
225     230     235     240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245     250     255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260     265     270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275     280     285
Arg Lys Ser Ala
290

```

CX2_151USP1_ST25

<210> 137

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosisporea

<400> 137

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct gggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 138

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosisporea

<400> 138

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln

```

CX2_151USP1_ST25

	100		105		110										
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
	115					120					125				
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
	130					135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	Met	Leu
			165						170					175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
		180						185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
	195					200						205			
Gln	Gly	Ile	Glu	Val	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Lys	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
			245						250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
	260							265				270			
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275					280					285				
Arg	Lys	Ser	Ala												
	290														

<210> 139

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 139

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gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatggtgtg 360
attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtagggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcggagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccg 720

```

CX2_151USP1_ST25

cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtgg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 140

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 140

Met	Ser	Asp	Ser	Pro	Val	Pro	Val	Thr	Val	Leu	Gly	Leu	Gly	Leu	Met
1				5				10						15	
Gly	Gln	Ala	Leu	Ala	Gly	Ala	Phe	Leu	Ala	Ala	Gly	His	Pro	Thr	Thr
			20					25					30		
Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35					40					45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
	50					55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
				85					90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	Met	Leu
				165						170				175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195					200					205			
Gln	Gly	Ile	Gly	Val	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Lys	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		

CX2_151USP1_ST25

Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
 275 280 285
 Arg Lys Ser Ala
 290

<210> 141

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 141

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacgggtt ggaatcgag cgagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg tacgatattg caatgctgag cgatcatgtg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atctgcgtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 142

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 142

```
Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1 5 10 15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20 25 30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35 40 45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Gly Ser Leu
```

CX2_151USP1_ST25

50	55	60													
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
			85						90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Gly	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
	130					135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Asn	Leu	Tyr	Asp	Ile	Ala	Met	Leu
			165						170					175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
	195						200					205			
Gln	Gly	Ile	Cys	Val	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
			245					250						255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
		260					265					270			
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275					280						285			
Arg	Lys	Ser	Ala												
	290														

<210> 143

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 143

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360

```

CX2_151USP1_ST25

```

attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg gttgatattg caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atctgcgtgg tgaccgggtg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 144

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 144

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Gly Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Val Asp Ile Ala Met Leu
165         170         175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195         200         205
Gln Gly Ile Cys Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210         215         220

```

CX2_151USP1_ST25

Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Lys	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
			245						250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
		260						265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275						280					285			
Arg	Lys	Ser	Ala												
	290														

<210> 145

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 145

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacgg cccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg tacgatattg cacacctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgagtggt tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgcgacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tgggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 146

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 146

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met

CX2_151USP1_ST25

1	5	10	15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr			
	20	25	30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly			
	35	40	45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Gly Ser Leu			
	50	55	60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu			
65	70	75	80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser			
	85	90	95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln			
	100	105	110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ala Pro Ser Gly Ile			
	115	120	125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe			
	130	135	140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe			
145	150	155	160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ile Ala His Leu			
	165	170	175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu			
	180	185	190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly			
	195	200	205
Gln Gly Ile Gly Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln			
	210	215	220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln			
225	230	235	240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile			
	245	250	255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val			
	260	265	270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe			
	275	280	285
Arg Lys Ser Ala			
290			

<210> 147

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 147

CX2_151USP1_ST25

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatgccg cacacctgag cgcatgtgtg 540
ggcctgctga atggttttct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atcggagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 148

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 148

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala His Leu
165         170         175

```

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Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180 185 190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195 200 205
Gln Gly Ile Gly Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210 215 220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Lys Thr Ile Asp Thr Gln
225 230 235 240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245 250 255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260 265 270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275 280 285
Arg Lys Ser Ala
290

<210> 149

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 149

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcggt cggtgctgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcggt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatgccg caggcctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaaggt atcgaagctg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tgggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 150

<211> 292

<212> PRT

<213> Artificial Sequence

CX2_151USP1_ST25

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 150

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1      5      10      15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20      25      30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35      40      45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50      55      60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65      70      75      80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85      90      95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100     105     110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Gly Ile Pro Ser Gly Ile
115     120     125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130     135     140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145     150     155     160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Gly Leu
165     170     175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180     185     190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195     200     205
Gln Gly Ile Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210     215     220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225     230     235     240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245     250     255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260     265     270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275     280     285
Arg Lys Ser Ala
290

```

<210> 151

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 151

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcggt cggtcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtagggaag atcacggact ggctaactctg tacgatgccg caggcctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atctgcgtg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 152

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 152

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Gly Ile Pro Ser Gly Ile
115         120         125

```

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

<210> 153

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 153

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatgccg caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atcgtagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

CX2_151USP1_ST25

<210> 154
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 154
 Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
 1 5 10 15
 Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
 20 25 30
 Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
 35 40 45
 Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
 50 55 60
 Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
 65 70 75 80
 Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
 85 90 95
 Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
 100 105 110
 Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
 115 120 125
 Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
 130 135 140
 Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
 145 150 155 160
 Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Leu
 165 170 175
 Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
 180 185 190
 Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
 195 200 205
 Gln Gly Ile Val Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
 210 215 220
 Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Lys Thr Ile Asp Thr Gln
 225 230 235 240
 Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
 245 250 255
 Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
 260 265 270
 Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
 275 280 285
 Arg Lys Ser Ala

290

<210> 155

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 155

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgccgc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtcgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatgccg caggcctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atctgcgtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac  tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 156

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 156

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1           5           10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80

```

CX2_151USP1_ST25

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

<210> 157

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 157

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg gttgatattg caatgctgag cgcatgtgtg 540

```

CX2_151USP1_ST25

```

ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgaagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct gggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 158

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 158

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20        25        30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35        40        45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50        55        60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65        70        75        80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85        90        95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100       105       110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115       120       125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130       135       140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145       150       155       160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Val Asp Ile Ala Met Leu
165       170       175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180       185       190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195       200       205
Gln Gly Ile Glu Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210       215       220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Lys Thr Ile Asp Thr Gln
225       230       235       240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile

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[illegible]

<210> 159
<211> 879
<212> DNA
<213> Artificial Sequence

<220>
<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400>	159						
atgagtgatt	cacctgtgcc	cgtagacagtt	ctgggtccttg	gtctgatggg	tcaggcctta	60	
gcgggagcgt	ttctggcagc	cggtcaccct	acgacggttt	ggaatcgag	cgcagctaaa	120	
gctgatgaac	tggttggtcg	cggtgcaacc	ctggccgcgt	ctcccgcggc	tgccgtcgca	180	
gcgggtagtc	tgatcgttgt	ttgcgtcaca	gatcatcgtg	cggtgcgcga	actgctggaa	240	
ccacttggcg	atgactgcc	aggtcgcgtt	ctggtaacc	tgacgagcgg	tacgtcgcgt	300	
gaagcccgtg	agaacgcaga	acatactgcg	gctcagggag	ccacctacct	ggatgggtgtg	360	
attctgacgg	gcccaagcgg	cattggcacc	ccagaagcta	ccatttctgta	ttcgggaccg	420	
cgcagtacct	tcgatgaaca	tgaaagcgca	ctgcgcgcat	taggtccggg	ggcgaccttt	480	
gtaggggaag	atcacggact	ggctaattctg	tacgatgccg	caatgctgag	cgtcatgttg	540	
ggcctgctga	atggtttcct	gcatggaacc	gcactgctgg	gaaccgcggg	cgtttcggca	600	
acctctgtgg	ttccgatgct	gggtcaaggt	atcgaagtgg	tgaccggttg	gattgcgcgc	660	
tacgcagatc	agattgatgc	cggtgtctat	ccagcagacg	acaagacgat	tgatacccag	720	
cgtgctgcaa	tgcagcacct	ggtcgaggag	agccgtgcgg	cgggcacaa	tggcgaactt	780	
ccggcgtttg	tgaccaaact	ggccgatcgc	gcagtggcag	aaggctctgg	tggtgactct	840	
tacgctgcac	tgattgaaca	gtttcgcaag	tcagcttaa			879	

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<210> 160
<211> 292
<212> PRT
<213> Artificial Sequence
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<220>
<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 160
Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1 5 10 15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20 25 30

CX2_151USP1_ST25

Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35					40					45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
		50				55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
				85					90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Gly	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Asn	Leu	Tyr	Asp	Ala	Ala	Met	Leu
				165					170					175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195					200					205			
Gln	Gly	Ile	Glu	Val	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
		210				215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Lys	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
		275					280					285			
Arg	Lys	Ser	Ala												
		290													

<210> 161

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 161

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
 gctgatgaac tgggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180

CX2_151USP1_ST25

```
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggcgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatggtgtg 360
attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tacgatgccg caggcctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggatcaagg atcgtagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tgggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 162

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 162

```
Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Gly Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Gly Leu
165         170         175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
```

CX2_151USP1_ST25

195	200	205
Gln Gly Ile Val Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln		
210	215	220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Lys Thr Ile Asp Thr Gln		
225	230	235
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile		
245	250	255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val		
260	265	270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe		
275	280	285
Arg Lys Ser Ala		
290		

<210> 163
 <211> 879
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 163
 atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
 gctgatgaac tggttggctcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
 attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtagct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaactctg tacgatattg cacacctgag cgtcatgttg 540
 ggctgtctga atggtttcct gcatggaacc gactgtctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atcgaagtgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
 cgtgttgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tgggtgactct 840
 tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 164
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

CX2_151USP1_ST25

<400> 164

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ile Ala His Leu
165         170         175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195         200         205
Gln Gly Ile Glu Val Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210         215         220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Lys Thr Ile Asp Thr Gln
225         230         235         240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245         250         255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260         265         270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275         280         285
Arg Lys Ser Ala
290

```

<210> 165

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

CX2_151USP1_ST25

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 165

```
atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cgtgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcgg tgactggtct aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 166

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 166

```
Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
```

CX2_151USP1_ST25

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

<210> 167

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 167

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttgggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggatgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaaagcga ctgcgcgat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgttgag cgtgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgactggtct aattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgtgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 168

CX2_151USP1_ST25

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 168

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1      5      10      15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20      25      30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35      40      45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50      55      60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65      70      75      80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85      90      95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100     105     110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115     120     125
Gly Thr Pro Glu Ala Arg Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130     135     140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145     150     155     160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Leu
165     170     175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180     185     190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195     200     205
Gln Gly Trp Glu Ala Met Thr Gly Leu Ile Ala Arg Tyr Ala Asp Gln
210     215     220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225     230     235     240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245     250     255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260     265     270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275     280     285
Arg Lys Ser Ala
290

```

CX2_151USP1_ST25

<210> 169

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 169

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcttg cggtcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtagggggaag atcacggact ggctaacctg tatgatgcag caatgttgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt tgggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 170

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 170

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln

```

CX2_151USP1_ST25

	100		105		110										
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
	115		120		125										
Gly	Thr	Pro	Glu	Ala	Arg	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
	130		135		140										
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145			150		155				160						
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Asn	Leu	Tyr	Asp	Ala	Ala	Met	Leu
	165		170		175										
Ser	Met	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
	180		185		190										
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
	195		200		205										
Gln	Gly	Trp	Glu	Ala	Met	Thr	Gly	Ile	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210		215		220										
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225			230		235				240						
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
	245		250		255										
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
	260		265		270										
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275		280		285										
Arg	Lys	Ser	Ala												
	290														

<210> 171

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 171

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaagcgca ctgcgcgat taggtccggg ggcgaccttt 480
gtagggggaag atcacggact ggctgccctg tatgatgcag caatgttgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt tgggaagcgg tgactggtct aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccg 720

```

CX2_151USP1_ST25

cgtgctgcaa tgcagcacct ggctgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 172

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 172

Met	Ser	Asp	Ser	Pro	Val	Pro	Val	Thr	Val	Leu	Gly	Leu	Gly	Leu	Met
1				5				10						15	
Gly	Gln	Ala	Leu	Ala	Gly	Ala	Phe	Leu	Ala	Ala	Gly	His	Pro	Thr	Thr
			20					25					30		
Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35					40					45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
	50					55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
				85					90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	Met	Leu
				165						170				175	
Ser	Met	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195					200					205			
Gln	Gly	Trp	Glu	Ala	Val	Thr	Gly	Leu	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		

CX2_151USP1_ST25

Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
 275 280 285
 Arg Lys Ser Ala
 290

<210> 173

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 173

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tatgatgcag caatgtcgag cgtgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcgg tgatgggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 174

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 174

```
Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1 5 10 15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20 25 30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35 40 45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Gly Ser Leu
```

CX2_151USP1_ST25

50	55	60													
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
				85					90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Arg	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
	130					135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	Met	Ser
				165						170					175
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
	195						200						205		
Gln	Gly	Trp	Glu	Ala	Val	Met	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275						280					285			
Arg	Lys	Ser	Ala												
	290														

<210> 175

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 175

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360

```

CX2_151USP1_ST25

```

attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cgtgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt tgggaagcga tgactggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 176

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosisporea

<400> 176

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser
165         170         175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195         200         205
Gln Gly Trp Glu Ala Met Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210         215         220

```

CX2_151USP1_ST25

Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
			245						250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
		260						265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275						280					285			
Arg	Lys	Ser	Ala												
	290														

<210> 177

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 177

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cgttatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcgg tgactggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 178

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 178

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met

CX2_151USP1_ST25

1		5		10		15									
Gly	Gln	Ala	Leu	Ala	Gly	Ala	Phe	Leu	Ala	Ala	Gly	His	Pro	Thr	Thr
		20				25						30			
Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35				40						45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
		50				55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
			85					90					95		
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115				120						125			
Gly	Thr	Pro	Glu	Ala	Arg	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Asn	Leu	Tyr	Asp	Ala	Ala	Met	Ser
			165					170						175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195				200						205			
Gln	Gly	Trp	Glu	Ala	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
		210				215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
			245					250						255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
		260						265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
		275				280						285			
Arg	Lys	Ser	Ala												
		290													

<210> 179

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 179

CX2_151USP1_ST25

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cgttatgtgg 540
ggcctgctga atggttttct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atagaagcga tgatgggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 180

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 180

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser
165         170         175

```

CX2_151USP1_ST25

Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180 185 190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195 200 205
Gln Gly Ile Glu Ala Met Met Gly Ile Ile Ala Arg Tyr Ala Asp Gln
210 215 220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225 230 235 240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245 250 255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260 265 270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275 280 285
Arg Lys Ser Ala
290

<210> 181

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 181

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcggtgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgttgag cgtgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt tgggaagcgg tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 182

<211> 292

<212> PRT

<213> Artificial Sequence

CX2_151USP1_ST25

<220>

<223> Imine reductase variant from Pseudonocardia spinosissima

<400> 182

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1      5      10      15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20     25     30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35     40     45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50     55     60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65     70     75     80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85     90     95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100    105    110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115    120    125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130    135    140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145    150    155    160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Leu
165    170    175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180    185    190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195    200    205
Gln Gly Trp Glu Ala Val Thr Gly Ile Ile Ala Arg Tyr Ala Asp Gln
210    215    220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225    230    235    240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245    250    255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260    265    270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275    280    285
Arg Lys Ser Ala
290

```

<210> 183

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 183

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcggt cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcaact tatgatgcag caatgttgag cgtgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt tgggaagcga tgactggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgtgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 184

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 184

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125

```

CX2_151USP1_ST25

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

<210> 185

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 185

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tatgatgcag caatgtcgag cgtgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt tgggaagcga tgactggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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CX2_151USP1_ST25

<210> 186
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 186
 Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
 1 5 10 15
 Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
 20 25 30
 Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
 35 40 45
 Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
 50 55 60
 Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
 65 70 75 80
 Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
 85 90 95
 Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
 100 105 110
 Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
 115 120 125
 Gly Thr Pro Glu Ala Arg Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
 130 135 140
 Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
 145 150 155 160
 Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Ser
 165 170 175
 Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
 180 185 190
 Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
 195 200 205
 Gln Gly Trp Glu Ala Met Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
 210 215 220
 Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
 225 230 235 240
 Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
 245 250 255
 Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
 260 265 270
 Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
 275 280 285
 Arg Lys Ser Ala

290

<210> 187

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 187

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cgtgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt ctagaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 188

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 188

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1           5           10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80

```

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

<210> 189

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 189

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gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tgggtgggtcg cggtgcaacc ctggccgcgt ctcccgccgc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgttgag catgatgtgg 540

CX2_151USP1_ST25

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ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atagaagcgg tgactgggtg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacc tcgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct gggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 190

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 190

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20        25        30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35        40        45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50        55        60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65        70        75        80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85        90        95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100       105       110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115       120       125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130       135       140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145       150       155       160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Leu
165       170       175
Ser Met Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180       185       190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195       200       205
Gln Gly Ile Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210       215       220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Leu Ala Thr Ile Asp Thr Gln
225       230       235       240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile

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[illegible]

<210> 191
<211> 879
<212> DNA
<213> Artificial Sequence

<220>
<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400>	191					
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gctgatgaac	tggttggtcg	cggtgcaacc	ctggccgcgt	ctcccgcggc	tgccgtcgca	180
gcgggtagtc	tgatcgttgt	ttgcgtcaca	gatcatcgtg	cggtgcgcga	actgctggaa	240
ccacttggcg	atgactgcc	aggtcgcgtt	ctgggtcaacc	tgacgagcgg	tacgtcgcgt	300
gaagcccgtg	agaacgcaga	acatactgcg	gctcagggag	ccacctacct	ggatggtgtg	360
attctgacca	ttccaagcgg	cattggcacc	ccagaagcta	ccatttctgta	ttcggggaccg	420
cgcagtacct	tcgatgaaca	tgaaagcgca	ctgcgcgcac	taggtccggg	ggcgaccttt	480
gtaggggaag	atcacggact	ggctaacctg	tatgatgcag	caatgtcgag	cattatgtgg	540
ggcctgctga	atggtttcct	gcatggaacc	gcactgctgg	gaaccgcggg	cgtttcggca	600
acctctgtgg	ttccgatgct	gggtcaaggt	tgggaagcgg	tgactggtct	aattgcgcgc	660
tacgcagatc	agattgatgc	cggtgtctat	ccagcagacg	atgccacgat	tgatacccag	720
cgtgctgcaa	tgcagcacct	ggtcgcaggag	agccgtgcgg	cgggcaccaa	tggcgaactt	780
ccggcgtttg	tgaccaaact	ggccgatcgc	gcagtggcag	aaggtcgtgg	tggtgactct	840
tacgctgcac	tgattgaaca	gtttcgcaag	tcagcttaa			879

<210>	192
<211>	292
<212>	PRT
<213>	Artificial Sequence

<220>
<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 192
Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1 5 10 15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20 25 30

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Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35					40					45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
		50				55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
				85					90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Asn	Leu	Tyr	Asp	Ala	Ala	Met	Ser
				165					170					175	
Ser	Ile	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195					200					205			
Gln	Gly	Trp	Glu	Ala	Val	Thr	Gly	Leu	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
		210				215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
		275					280					285			
Arg	Lys	Ser	Ala												
		290													

<210> 193

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 193

atgagtgtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
 gctgatgaac tgggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180

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gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cattatgtgg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaaggt tgggaagcga tgactggtct aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtagactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 194

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 194

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser
165         170         175
Ser Ile Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly

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CX2_151USP1_ST25

195	200	205
Gln Gly Trp Glu Ala Met Thr Gly Leu Ile Ala Arg Tyr Ala Asp Gln		
210	215	220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln		
225	230	235
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile		
245	250	255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val		
260	265	270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe		
275	280	285
Arg Lys Ser Ala		
290		

<210> 195
 <211> 879
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 195
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 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
 gctgatgaac tggttggctcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtagct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
 ggcttctgta atggtttcct gcatggaacc gactgtctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg tgggaagcgg tgactggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacc tcgccacgat tgatacccag 720
 cgtgttgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggctcgtg tgggtgactct 840
 tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 196
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

CX2_151USP1_ST25

<400> 196

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
165         170         175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195         200         205
Gln Gly Trp Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210         215         220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Leu Ala Thr Ile Asp Thr Gln
225         230         235         240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245         250         255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260         265         270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275         280         285
Arg Lys Ser Ala
290

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<210> 197

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

CX2_151USP1_ST25

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 197

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gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tatgatgcag caatgtcgag cgtgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atagaagcga tgactggtct aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 198

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 198

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe

```

CX2_151USP1_ST25

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

<210> 199

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 199

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gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttgggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgctgcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaaagcga ctgcgcgat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tatgatgcag caatgtcgag cattatgttg 540
ggcctgctga atggttttct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaaggt tgggaagcgg tgttgggtct aattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgtgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 200

CX2_151USP1_ST25

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 200

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1      5      10      15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20      25      30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35      40      45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50      55      60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65      70      75      80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85      90      95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100     105     110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115     120     125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130     135     140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145     150     155     160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Ser
165     170     175
Ser Ile Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180     185     190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195     200     205
Gln Gly Trp Glu Ala Val Leu Gly Leu Ile Ala Arg Tyr Ala Asp Gln
210     215     220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225     230     235     240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245     250     255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260     265     270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275     280     285
Arg Lys Ser Ala
290

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CX2_151USP1_ST25

<210> 201
<211> 879
<212> DNA
<213> Artificial Sequence

<220>
<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 201
atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tatgatgcag caatgtcgag cattatgtgg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcgg tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 202
<211> 292
<212> PRT
<213> Artificial Sequence

<220>
<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 202
Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1 5 10 15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20 25 30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35 40 45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Val Ala Ala Gly Ser Leu
50 55 60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65 70 75 80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85 90 95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln

CX2_151USP1_ST25

	100		105		110										
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
	115		120		125										
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
	130		135		140										
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145			150		155				160						
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	Met	Ser
	165		170		175										
Ser	Ile	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
	180		185		190										
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
	195		200		205										
Gln	Gly	Trp	Glu	Ala	Val	Thr	Gly	Ile	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210		215		220										
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225			230		235				240						
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
	245		250		255										
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
	260		265		270										
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275		280		285										
Arg	Lys	Ser	Ala												
	290														

<210> 203

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 203

atgagtgatt	cacctgtgcc	cgtgacagtt	ctgggtcttg	gtctgatggg	tcaggcctta	60
gcgggagcgt	ttctggcagc	cggtcaccct	acgacggttt	ggaatcgag	cgagctaaa	120
gctgatgaac	tggttggtcg	cggtgcaacc	ctggccgcgt	ctcccgcggc	tgccgtcgca	180
gcgggtagtc	tgatcgttgt	ttgcgtcaca	gatcatcgtg	cggtgcgcga	actgctggaa	240
ccacttggcg	atgcactgcc	aggtcgcgtt	ctggtcaacc	tgacgagcgg	tacgtcgcgt	300
gaagcccgtg	agaacgcaga	acatactgcg	gctcaggag	ccacctacct	ggatggtgtg	360
attctgacca	ttccaagcgg	cattggcacc	ccagaagcta	cgattctgta	ttcgggaccg	420
cgcagtacct	tcgatgaaca	tgaaagcgca	ctgcgcgcgt	taggtccggg	ggcgaccttt	480
gtagggggaag	atcacggact	ggctaacctg	tatgatgcag	caatgtcgag	catgatgtgg	540
ggcctgctga	atggtttcct	gcattggaacc	gcactgctgg	gaaccgcggg	cgtttcggca	600
acctctgtgg	ttccgatgct	gggtcaaggt	atcgaagcgg	tgaccggttg	gattgcgcgc	660
tacgcagatc	agattgatgc	cgggtgtctat	ccagcagacg	atgccacgat	tgatacccg	720

CX2_151USP1_ST25

cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtgg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 204

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 204

Met	Ser	Asp	Ser	Pro	Val	Pro	Val	Thr	Val	Leu	Gly	Leu	Gly	Leu	Met
1				5				10						15	
Gly	Gln	Ala	Leu	Ala	Gly	Ala	Phe	Leu	Ala	Ala	Gly	His	Pro	Thr	Thr
			20					25					30		
Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35					40					45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
	50					55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
				85					90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Asn	Leu	Tyr	Asp	Ala	Ala	Met	Ser
				165					170					175	
Ser	Met	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195					200					205			
Gln	Gly	Ile	Glu	Ala	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		

CX2_151USP1_ST25

Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
 275 280 285
 Arg Lys Ser Ala
 290

<210> 205

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 205

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gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaaagcga ctgcgcgat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgttgag cattatgtgg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 206

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 206

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1 5 10 15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20 25 30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35 40 45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Gly Ser Leu
```

CX2_151USP1_ST25

50		55		60	
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu					
65		70		75	80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser					
	85		90		95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln					
	100		105		110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile					
	115		120		125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe					
	130		135		140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe					
145		150		155	160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Leu					
	165		170		175
Ser Ile Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu					
	180		185		190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly					
	195		200		205
Gln Gly Ile Glu Ala Val Thr Gly Ile Ile Ala Arg Tyr Ala Asp Gln					
	210		215		220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln					
225		230		235	240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile					
	245		250		255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val					
	260		265		270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe					
	275		280		285
Arg Lys Ser Ala					
290					

<210> 207

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 207

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gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgag gctcagggag ccacctacct ggatggtgtg 360

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CX2_151USP1_ST25

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attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
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gtagggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cattatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt tgggaagcgg tgactggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 208

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 208

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Arg Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser
165         170         175
Ser Ile Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195         200         205
Gln Gly Trp Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210         215         220

```

CX2_151USP1_ST25

Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
			245						250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
		260						265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275						280					285			
Arg	Lys	Ser	Ala												
	290														

<210> 209

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 209

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gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgttgag cgtgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgttgggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 210

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 210

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met

CX2_151USP1_ST25

1		5		10		15									
Gly	Gln	Ala	Leu	Ala	Gly	Ala	Phe	Leu	Ala	Ala	Gly	His	Pro	Thr	Thr
		20				25						30			
Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35				40						45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
		50				55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
			85					90						95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115				120						125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Asn	Leu	Tyr	Asp	Ala	Ala	Met	Leu
			165					170						175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195				200						205			
Gln	Gly	Trp	Glu	Ala	Met	Leu	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
		210				215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
			245					250						255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
		260						265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
		275				280						285			
Arg	Lys	Ser	Ala												
		290													

<210> 211

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 211

CX2_151USP1_ST25

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tatgatgcag caatgttgag cattatgtgg 540
ggcctgctga atggttttct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt atcgaagcgg tgatgggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 212

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 212

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
165         170         175

```

CX2_151USP1_ST25

Ser Ile Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180 185 190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195 200 205
Gln Gly Ile Glu Ala Val Met Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210 215 220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225 230 235 240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245 250 255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260 265 270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275 280 285
Arg Lys Ser Ala
290

<210> 213

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 213

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cgtgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt ctagaagcgg tgatgggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacc tcgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 214

<211> 292

<212> PRT

<213> Artificial Sequence

CX2_151USP1_ST25

<220>

<223> Imine reductase variant from Pseudonocardia spinosissima

<400> 214

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1      5      10      15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20      25      30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35      40      45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50      55      60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65      70      75      80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85      90      95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100      105      110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115      120      125
Gly Thr Pro Glu Ala Arg Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130      135      140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145      150      155      160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser
165      170      175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180      185      190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195      200      205
Gln Gly Leu Glu Ala Val Met Gly Ile Ile Ala Arg Tyr Ala Asp Gln
210      215      220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Leu Ala Thr Ile Asp Thr Gln
225      230      235      240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245      250      255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260      265      270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275      280      285
Arg Lys Ser Ala
290

```

<210> 215

<211> 879

<212> DNA

CX2_151USP1_ST25

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 215

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcggt cggtcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cgtgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt tgggaagcga tgttgggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacc tcgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 216

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 216

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125

```

CX2_151USP1_ST25

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

<210> 217

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 217

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tatgatgcag caatgttgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt ctagaagcga tgactggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

CX2_151USP1_ST25

<210> 218
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 218
 Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
 1 5 10 15
 Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
 20 25 30
 Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
 35 40 45
 Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
 50 55 60
 Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
 65 70 75 80
 Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
 85 90 95
 Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
 100 105 110
 Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
 115 120 125
 Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
 130 135 140
 Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
 145 150 155 160
 Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
 165 170 175
 Ser Met Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
 180 185 190
 Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
 195 200 205
 Gln Gly Leu Glu Ala Met Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
 210 215 220
 Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
 225 230 235 240
 Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
 245 250 255
 Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
 260 265 270
 Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
 275 280 285
 Arg Lys Ser Ala

290

<210> 219

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 219

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgtcgag cgttatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt ctagaagcga tgactggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 220

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 220

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1           5           10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80

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

<210> 221

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 221

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540

CX2_151USP1_ST25

```

ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt ctagaagcgg tgactgggtct aattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct gggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 222

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 222

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20        25        30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35        40        45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50        55        60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65        70        75        80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85        90        95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100       105       110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115       120       125
Gly Thr Pro Glu Ala Arg Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130       135       140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145       150       155       160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser
165       170       175
Ser Met Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180       185       190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195       200       205
Gln Gly Leu Glu Ala Val Thr Gly Leu Ile Ala Arg Tyr Ala Asp Gln
210       215       220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225       230       235       240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile

```

CX2_151USP1_ST25

				245					250					255					
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val				
			260						265					270					
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe				
		275					280						285						
Arg	Lys	Ser	Ala																
	290																		

<210> 223
 <211> 879
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 223
 atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
 gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgttgag cgttatgtgg 540
 ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg tgggaagcgg tgactggtct aattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
 cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtgg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 224
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 224
 Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
 1 5 10 15
 Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
 20 25 30

CX2_151USP1_ST25

Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35					40					45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
	50					55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
			85						90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Arg	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
	130					135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Asn	Leu	Tyr	Asp	Ala	Ala	Met	Leu
				165					170					175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
	195						200					205			
Gln	Gly	Trp	Glu	Ala	Val	Thr	Gly	Leu	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
		260						265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
		275					280					285			
Arg	Lys	Ser	Ala												
	290														

<210> 225

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 225

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacgggtt ggaatcgcag cgagcctaaa 120
 gctgatgaac tgggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180

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```
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cgttatgtgg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggatcaagg tgggaagcgg tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tgggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 226

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 226

```
Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser
165         170         175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
```

CX2_151USP1_ST25

195	200	205
Gln Gly Trp Glu Ala Val Thr Gly Ile Ile Ala Arg Tyr Ala Asp Gln		
210	215	220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln		
225	230	235
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile		
245	250	255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val		
260	265	270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe		
275	280	285
Arg Lys Ser Ala		
290		

<210> 227

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 227

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggctc cggtgcaacc ctggccgcgt ctcccgccgc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgccgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtagct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cattatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg ctagaagcga tgactggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcggttg tgacaaaact ggccgatcgc gcagtggcag aaggctcgtg tgggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 228

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

CX2_151USP1_ST25

<400> 228

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser
165         170         175
Ser Ile Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195         200         205
Gln Gly Leu Glu Ala Met Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210         215         220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225         230         235         240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245         250         255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260         265         270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275         280         285
Arg Lys Ser Ala
290

```

<210> 229

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

CX2_151USP1_ST25

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 229

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt tgggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 230

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 230

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe

```

CX2_151USP1_ST25

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

<210> 231

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 231

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggcgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaaagcga ctgcgcgcac taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cattatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggcgaaggt ctagaagcga tgactgggtg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgtgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 232

CX2_151USP1_ST25

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 232

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1      5      10      15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20      25      30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35      40      45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50      55      60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65      70      75      80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85      90      95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100     105     110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115     120     125
Gly Thr Pro Glu Ala Arg Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130     135     140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145     150     155     160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser
165     170     175
Ser Ile Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180     185     190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195     200     205
Gln Gly Leu Glu Ala Met Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210     215     220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225     230     235     240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245     250     255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260     265     270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275     280     285
Arg Lys Ser Ala
290

```

CX2_151USP1_ST25

<210> 233
 <211> 879
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 233
 atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
 gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaaagcga ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
 ggcttgcgtga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgactggtat aattgcgcgc 660
 tacgcaaatac agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
 cgtgctgcaa tgcagcacct gggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcggttg tgacaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
 tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 234
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 234
 Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
 1 5 10 15
 Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
 20 25 30
 Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
 35 40 45
 Ala Thr Leu Ala Ala Ser Pro Ala Ala Val Ala Ala Gly Ser Leu
 50 55 60
 Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
 65 70 75 80
 Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
 85 90 95
 Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln

CX2_151USP1_ST25

	100		105		110										
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
	115		120		125										
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
	130		135		140										
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145			150		155				160						
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Asn	Leu	Tyr	Asp	Ala	Ala	Met	Ser
	165		170		175										
Ser	Met	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
	180		185		190										
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
	195		200		205										
Gln	Gly	Trp	Glu	Ala	Met	Thr	Gly	Ile	Ile	Ala	Arg	Tyr	Ala	Asn	Gln
	210		215		220										
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225			230		235				240						
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
	245		250		255										
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
	260		265		270										
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275		280		285										
Arg	Lys	Ser	Ala												
	290														

<210> 235

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 235

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtagggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggttttct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt tgggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccg 720

```

CX2_151USP1_ST25

cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtgg tgggttttct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 236

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 236

Met	Ser	Asp	Ser	Pro	Val	Pro	Val	Thr	Val	Leu	Gly	Leu	Gly	Leu	Met
1				5				10						15	
Gly	Gln	Ala	Leu	Ala	Gly	Ala	Phe	Leu	Ala	Ala	Gly	His	Pro	Thr	Thr
			20					25					30		
Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35					40					45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
	50					55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
				85					90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Asn	Leu	Tyr	Asp	Ala	Ala	Met	Ser
				165					170					175	
Ser	Met	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195					200					205			
Gln	Gly	Trp	Glu	Ala	Met	Thr	Gly	Ile	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		

CX2_151USP1_ST25

Ala Glu Gly Arg Gly Gly Val Ser Tyr Ala Ala Leu Ile Glu Gln Phe
 275 280 285
 Arg Lys Ser Ala
 290

<210> 237

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 237

```
atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt tgggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgt tgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 238

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 238

```
Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1 5 10 15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20 25 30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35 40 45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Gly Ser Leu
```

CX2_151USP1_ST25

50	55	60													
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
			85						90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
	130					135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Asn	Leu	Tyr	Asp	Ala	Ala	Met	Ser
				165					170						175
Ser	Met	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
	195						200					205			
Gln	Gly	Trp	Glu	Ala	Met	Thr	Gly	Ile	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Val	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
			245					250						255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
		260					265					270			
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275					280						285			
Arg	Lys	Ser	Ala												
	290														

<210> 239

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 239

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatggtgtg 360

```

CX2_151USP1_ST25

```

attctgacca ttccaagcag gattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt tgggaagcga tgactgggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 240

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 240

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Arg Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser
165         170         175
Ser Met Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195         200         205
Gln Gly Trp Glu Ala Met Thr Gly Ile Ile Ala Arg Tyr Ala Asp Gln
210         215         220

```

CX2_151USP1_ST25

Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
			245						250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
		260						265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275						280					285			
Arg	Lys	Ser	Ala												
	290														

<210> 241

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 241

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggatgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgactagtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 242

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 242

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met

CX2_151USP1_ST25

1	5	10	15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr			
	20	25	30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly			
	35	40	45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Gly Ser Leu			
	50	55	60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu			
65	70	75	80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser			
	85	90	95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln			
	100	105	110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile			
	115	120	125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe			
	130	135	140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe			
145	150	155	160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser			
	165	170	175
Ser Met Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu			
	180	185	190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly			
	195	200	205
Gln Gly Trp Glu Ala Met Thr Ser Ile Ile Ala Arg Tyr Ala Asp Gln			
	210	215	220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln			
225	230	235	240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile			
	245	250	255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val			
	260	265	270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe			
	275	280	285
Arg Lys Ser Ala			
290			

<210> 243

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 243

CX2_151USP1_ST25

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcaa tgatgtcgag catgatgtgg 540
ggcctgctga atggttttct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt tgggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 244

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinospora

<400> 244

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Met Met Ser
165         170         175

```

CX2_151USP1_ST25

Ser Met Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180 185 190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195 200 205
Gln Gly Trp Glu Ala Met Thr Gly Ile Ile Ala Arg Tyr Ala Asp Gln
210 215 220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225 230 235 240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245 250 255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260 265 270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275 280 285
Arg Lys Ser Ala
290

<210> 245

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 245

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt tggcatgcga tgactggat aattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 246

<211> 292

<212> PRT

<213> Artificial Sequence

CX2_151USP1_ST25

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 246

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1      5      10      15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20      25      30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35      40      45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50      55      60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65      70      75      80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85      90      95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100     105     110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115     120     125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130     135     140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145     150     155     160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser
165     170     175
Ser Met Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180     185     190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195     200     205
Gln Gly Trp His Ala Met Thr Gly Ile Ile Ala Arg Tyr Ala Asp Gln
210     215     220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225     230     235     240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245     250     255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260     265     270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275     280     285
Arg Lys Ser Ala
290

```

<210> 247

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 247

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcggt cggtcgcgga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcggt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt tggaggcgga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgtgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 248

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 248

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20        25        30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35        40        45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50        55        60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65        70        75        80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85        90        95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100       105       110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115      120      125

```

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

<210> 249

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 249

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt tggaaaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

CX2_151USP1_ST25

<210> 250
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 250
 Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
 1 5 10 15
 Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
 20 25 30
 Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
 35 40 45
 Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
 50 55 60
 Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
 65 70 75 80
 Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
 85 90 95
 Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
 100 105 110
 Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
 115 120 125
 Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
 130 135 140
 Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
 145 150 155 160
 Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser
 165 170 175
 Ser Met Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
 180 185 190
 Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
 195 200 205
 Gln Gly Trp Lys Ala Met Thr Gly Ile Ile Ala Arg Tyr Ala Asp Gln
 210 215 220
 Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
 225 230 235 240
 Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
 245 250 255
 Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
 260 265 270
 Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
 275 280 285
 Arg Lys Ser Ala

290

<210> 251

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 251

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggcgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtagtggg tgggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac  tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 252

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 252

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1           5           10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80

```

CX2_151USP1_ST25

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

<210> 253

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 253

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttgggtcg cggtgcaacc ctggccgcgt ctccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540

```

CX2_151USP1_ST25

```

ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt tgggaagcga tgactcgtat aattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct gggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 254

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 254

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20        25        30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35        40        45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50        55        60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65        70        75        80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85        90        95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100       105       110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115       120       125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130       135       140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145       150       155       160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser
165       170       175
Ser Met Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180       185       190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195       200       205
Gln Gly Trp Glu Ala Met Thr Arg Ile Ile Ala Arg Tyr Ala Asp Gln
210       215       220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225       230       235       240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile

```

CX2_151USP1_ST25

				245					250					255					
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val				
			260						265					270					
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe				
		275					280						285						
Arg	Lys	Ser	Ala																
	290																		

<210> 255

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 255

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgcttct gggtaagggt tgggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 256

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 256

Met	Ser	Asp	Ser	Pro	Val	Pro	Val	Thr	Val	Leu	Gly	Leu	Gly	Leu	Met				
1				5				10						15					
Gly	Gln	Ala	Leu	Ala	Gly	Ala	Phe	Leu	Ala	Ala	Gly	His	Pro	Thr	Thr				
		20						25					30						

CX2_151USP1_ST25

Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35					40					45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
		50				55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
				85					90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
			115				120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
			130			135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Asn	Leu	Tyr	Asp	Ala	Ala	Met	Ser
				165					170					175	
Ser	Met	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Leu	Leu	Gly
		195					200					205			
Gln	Gly	Trp	Glu	Ala	Met	Thr	Gly	Ile	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
		210				215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245						250				255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
		275					280					285			
Arg	Lys	Ser	Ala												
		290													

<210> 257

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 257

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
 gctgatgaac tgggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180

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gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagctc ttattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggatcaagg tgggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tgggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 258

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 258

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Leu Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser
165         170         175
Ser Met Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly

```

CX2_151USP1_ST25

195	200	205
Gln Gly Trp Glu Ala Met Thr Gly Ile Ile Ala Arg Tyr Ala Asp Gln		
210	215	220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln		
225	230	235
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile		
245	250	255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val		
260	265	270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe		
275	280	285
Arg Lys Ser Ala		
290		

<210> 259
 <211> 879
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 259
 atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
 gctgatgaac tggttggctc cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtagcgga actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatggtgtg 360
 attctgacca ttccaagcgg catttggccgt ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtagct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
 ggcttctgta atggtttcct gcatggaacc gactgtctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgactggtat aattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
 cgtgttgcaa tgcagcacct ggtagcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcggttg tgacaaaact ggccgatcgc gcagtggcag aaggctcgtg tggtagactt 840
 tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 260
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

CX2_151USP1_ST25

<400> 260

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Arg Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser
165         170         175
Ser Met Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195         200         205
Gln Gly Trp Glu Ala Met Thr Gly Ile Ile Ala Arg Tyr Ala Asp Gln
210         215         220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225         230         235         240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245         250         255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260         265         270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275         280         285
Arg Lys Ser Ala
290

```

<210> 261

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

CX2_151USP1_ST25

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 261

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaagggt tgggaagcga tgactaatat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 262

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 262

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe

```

CX2_151USP1_ST25

145		150		155		160
Val	Gly	Glu	Asp	His	Gly	Leu
		165		170		175
Ser	Met	Met	Trp	Gly	Leu	Leu
		180		185		190
Leu	Gly	Thr	Ala	Gly	Val	Ser
		195		200		205
Gln	Gly	Trp	Glu	Ala	Met	Thr
		210		215		220
Ile	Asp	Ala	Gly	Val	Tyr	Pro
		225		230		235
Arg	Ala	Ala	Met	Gln	His	Leu
		245		250		255
Asn	Gly	Glu	Leu	Pro	Ala	Phe
		260		265		270
Ala	Glu	Gly	Arg	Gly	Gly	Asp
		275		280		285
Arg	Lys	Ser	Ala			
		290				

<210> 263

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 263

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tgattggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgctgcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaaagcga ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgactggat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgtgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 264

CX2_151USP1_ST25

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 264

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1      5      10      15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20      25      30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Ile Gly Arg Gly
35      40      45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50      55      60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65      70      75      80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85      90      95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100     105     110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115     120     125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130     135     140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145     150     155     160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser
165     170     175
Ser Met Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180     185     190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195     200     205
Gln Gly Trp Glu Ala Met Thr Gly Ile Ile Ala Arg Tyr Ala Asp Gln
210     215     220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225     230     235     240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245     250     255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260     265     270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275     280     285
Arg Lys Ser Ala
290

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CX2_151USP1_ST25

<210> 265
 <211> 879
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 265
 atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
 gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtagct tcgatgaaca tgaaaagcga ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
 ggctgtctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct gggtaaaggt tgggaagcga tgactggtat aattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
 cgtgctgcaa tgcagcacct gggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
 tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 266
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Imine reductase variant from Pseudonocardia spinosispora

<400> 266
 Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
 1 5 10 15
 Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
 20 25 30
 Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
 35 40 45
 Ala Thr Leu Ala Ala Ser Pro Ala Ala Val Ala Ala Gly Ser Leu
 50 55 60
 Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
 65 70 75 80
 Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
 85 90 95
 Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln

CX2_151USP1_ST25

	100		105		110										
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
	115						120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
	130						135					140			
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Asn	Leu	Tyr	Asp	Ala	Ala	Met	Ser
			165					170						175	
Ser	Met	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
	195						200					205			
Lys	Gly	Trp	Glu	Ala	Met	Thr	Gly	Ile	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
			245						250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
	260							265				270			
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275						280					285			
Arg	Lys	Ser	Ala												
	290														

<210> 267

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 267

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtagggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaaggt tgggaagcga tgactggat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccg 720

```

CX2_151USP1_ST25

cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtgg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 268

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 268

Met	Ser	Asp	Ser	Pro	Val	Pro	Val	Thr	Val	Leu	Gly	Leu	Gly	Leu	Met
1				5				10						15	
Gly	Gln	Ala	Leu	Ala	Gly	Ala	Phe	Leu	Ala	Ala	Gly	His	Pro	Thr	Thr
			20					25					30		
Val	Trp	Asn	Arg	Ser	Ala	Ala	Lys	Ala	Asp	Glu	Leu	Val	Gly	Arg	Gly
		35					40					45			
Ala	Thr	Leu	Ala	Ala	Ser	Pro	Ala	Ala	Ala	Val	Ala	Ala	Gly	Ser	Leu
	50					55					60				
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
				85					90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Arg	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
		130				135					140				
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Asn	Leu	Tyr	Asp	Ala	Ala	Met	Ser
				165					170					175	
Ser	Met	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
		195					200					205			
Gln	Gly	Trp	Glu	Ala	Met	Thr	Gly	Ile	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		

CX2_151USP1_ST25

Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
 275 280 285
 Arg Lys Ser Ala
 290

<210> 269

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 269

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgatcatgtg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 270

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 270

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1 5 10 15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20 25 30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35 40 45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Gly Ser Leu
```

CX2_151USP1_ST25

50		55		60											
Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu
65					70					75					80
Pro	Leu	Gly	Asp	Ala	Leu	Pro	Gly	Arg	Val	Leu	Val	Asn	Leu	Thr	Ser
				85					90					95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Ala	Gln
			100					105					110		
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Ile	Pro	Ser	Gly	Ile
		115					120					125			
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr	Phe
	130					135				140					
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr	Phe
145					150					155					160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Ala	Leu	Tyr	Asp	Ala	Ala	Met	Leu
				165						170				175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu
			180					185					190		
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly
	195						200					205			
Gln	Gly	Ile	Glu	Ala	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln
	210					215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln
225					230					235					240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245				250						255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
	275						280					285			
Arg	Lys	Ser	Ala												
	290														