

SEQUENCE LISTING

<110> Codexis, Inc.
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<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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gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcgga actgctggaa 240
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tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
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ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
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<210> 2

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase from Pseudonocardia spinosispora

<400> 2

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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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<210> 3

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 3

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gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga actgctggaa 240
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ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag 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 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 Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210         215         220

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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

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 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
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 ggctgtgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgttttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gatttcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
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 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 6
 <211> 292
 <212> PRT
 <213> Artificial Sequence

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

<400> 6
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 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
 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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 gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgag gctcaggagg ccacctacct ggatgggtgtg 360
 attctgaccg caccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag catcatgtgg 540
 ggctgtgcta atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600

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cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac 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	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	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												

<210> 9

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 9

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gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcgga actgctggaa 240
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tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
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ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtctcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 10

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<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

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	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
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu					
	165			170	
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu					
	180			185	
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly					
	195			200	
Gln Gly Ile Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln					
	210			215	
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	
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val					
	260			265	
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe					
	275			280	
Arg Lys Ser Ala				285	
290					

<210> 11

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 11

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tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 12

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 12

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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 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
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<210> 13

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 13

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gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga actgctggaa 240
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gaagcccgtg agaacgcaga acatactgcg gtcaggagg ccacctacct ggatgggtgtg 360
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cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
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acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879
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<210> 14

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<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
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 ggaatcgcag cgcagctaaa 120
 gctgatgaac tggttgggtcg cgggtgcaacc 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
 cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
 ggcttgctga atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagact tggccacgat tgatacccag 720
 cgtgtgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtagctct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 16

<211> 292

<212> PRT

<213> Artificial Sequence

<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

<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 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 gctcaggag ccacctacct ggatggtgtg 360

```

```

attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tgggatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtcaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg 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
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
 atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
 gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
 ccacttggcg atgcaactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag catcatgttg 540
 ggcttgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
 cgttatgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<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 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
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaacag tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcagaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgtgg 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
 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 spinosispora*

<400> 23

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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 cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctgggtcaacc tgacgagcgg tacgtcgcg 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggtct tattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac 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
			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

```

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 cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgag gctcagggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaaaggg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg 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
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 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 tgtgactggt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120

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gctgatgaac tggttggtcg cgggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccaagggcta 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 ggggtcaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 28

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 28

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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 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
          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> 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 ggaatcgag cgagcctaaa 120
 gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgctgca actgctggaa 240
 ccacttggcg atgcactgtc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgctg gctcagggag ccacctacct ggatgggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caggtctgag cgtcatgttg 540
 ggctgtgctga atggtttctt gcatggaacc gcaactgttg gaaccgcggg cgtttcggca 600
 acctctgttg ttccgatgct ggggtcaaggt atcgaagcgg tgaccggttg gattgctgctg 660
 tacgcagatc agattgatgc cggtgtctat ccagcagacg acgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgcttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
 tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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

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

<400> 30
 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
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
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
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> 31

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<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 tggttggtcg 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
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtagggggaag atcacggact ggctgcactg tatgatgcag caatgagtag cgtcatgtgg 540
ggcctgtgta atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgaagcgg tgaccggttg gattgcgcgc 660

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tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 32

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 32

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	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> 33
 <211> 879
 <212> DNA
 <213> Artificial Sequence

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

<400> 33
 atgagtgatt cccccgtacc tgtgactggt 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 ctgggtcaacc 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 ggctgcactg tatgatgcag caggcttgag cgtcatgttg 540
 ggcctgctga atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 34
 <211> 292
 <212> PRT
 <213> Artificial Sequence

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

<400> 34
 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															

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

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

<400> 35
 atgagtgtatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag 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 gtcagggag ccacctacct ggatgggtgtg 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 gcaactgctg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaaggt atcgaagttg tgaccggttg gattgctgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 36
 <211> 292
 <212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 36

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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 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
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<210> 37

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 37

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atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcatgtact tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatattg caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
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<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
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cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgc taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgaaccag tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tgggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<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
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 acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cgggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
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 ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccgggat tattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg 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
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 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

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 cggtgcgaga actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gtcagggag ccacctacct ggatgggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctagtctg tatgatgcag caatgctgag cgtcatgttg 540
 ggctgtgta atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cggtgtctat ccagcagacg acgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtagactct 840
 tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 46
 <211> 292
 <212> PRT
 <213> Artificial Sequence

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

<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 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
 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

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atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagcctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga 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 ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag cacatctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
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<210> 48

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 48

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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 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
 <213> Artificial Sequence

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

<400> 49
 atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
 gctgatgaac tggttggtcg 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
 attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
 ggctgtctga atggtttccat gcatggaacc gactgcttg gaaccgcggg cgtttcggca 600
 acctctgttg ttccgatgct ggggtcaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg aaaaaacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
 tacgctgcac 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 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 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

atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180

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gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccatg agaacgcaga acatactgcg gctcaggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgctcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atctgtgcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcagaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
tacgtctcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 52

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 52

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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 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

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atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgag 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 ggggtcaaggt atcgaagcgg tgttgggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<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
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 spinosispora*

<400> 55

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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 cggtgcgcga 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 ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag catgatgtgg 540
ggcctgctga atggtttctt gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acgccacgat tgataccag 720

```

cgtgctgcaa tgcagcacct ggctcaggag 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 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
 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> 57
 <211> 879
 <212> DNA
 <213> Artificial Sequence

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

<400> 57
 atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
 gctgatgaac tggttgggtcg cgggtgcaacc 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
 cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
 ggcttgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaaggt atctgtgcgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
 cgtgctgcaa tgcagcacct ggtcagaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtagctct 840
 tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 58
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<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
 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
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
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

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atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 60

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 60

```
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
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> 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 ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcaactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgttgctg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgttg tggtagctct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 62

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<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 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>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 63

```

atgagtgatt cccccgtacc tgtgactgtt 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 aggtcgcggt ctgggtcaacc 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 atggtttctt gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgatgggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg 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		


```

gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgtgg 540
ggcctgctga atggtttctt gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt tgggaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 66

<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 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
Arg Lys Ser Ala
290

280

285

<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 ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcgac tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgag gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcatgtacc tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg cttgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag 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

<210> 70
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 70

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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 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

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<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 cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgag gctcagggag 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 atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgggtcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg 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 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 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

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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 cggtgcgcga 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 ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgatcatgtg 540
ggcctgtgta atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgaagcga tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 74

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<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				
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 cgcagctaaa 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 ggatgggtgtg 360
attctgggtg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg gttgatcatg caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcaactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagtgg 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> 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
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 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
 atgagtgtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag 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 ggatgggtgtg 360
 attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaactctg tacgatattg caatgctgag cgtcatgtgg 540
 ggcttgctga atggtttctt gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atcggagtgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgcgacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
 tacgctgcac 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
				85					90				95	
Gly	Thr	Ser	Arg	Glu	Ala	Arg	Glu	Asn	Ala	Glu	His	Thr	Ala	Gln
			100					105					110	
Gly	Ala	Thr	Tyr	Leu	Asp	Gly	Val	Ile	Leu	Thr	Gly	Pro	Ser	Ile
		115					120					125		
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Phe
	130					135					140			
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Phe
145					150					155				160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Asn	Leu	Tyr	Asp	Ile	Ala	Leu
				165					170				175	
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala
			180					185					190	
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Gly
	195						200					205		
Gln	Gly	Ile	Gly	Val	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Gln
	210					215					220			
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Gln
225					230					235				240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Ile
				245					250					255
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Val
		260						265				270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	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

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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 cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatgccg caggcctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atctgcgtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780

```

ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tgggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 80
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<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
 <213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 81

```

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 aggtcgcggt ctgggtcaacc 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 cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcggagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tgggtgactct 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
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

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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 cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gtcagggag ccacctacct ggatggtgtg 360
attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg tacgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgttttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 84

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 84

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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 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 ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc 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 ggctaattctg tacgatcatg cacacctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgaagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg 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 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 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		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 spinosispora

<400> 87

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gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatattg caatgctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcggaaact tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtagactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<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			


```

ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcggagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg 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
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 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 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 gctcaggagg ccacctacct ggatgggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tacgatcatg cacacctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atctgcgtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 92
<211> 292
<212> PRT
<213> Artificial Sequence

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

<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 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
	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> 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 ggaatcgag cgagcctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
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cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg tacgatgccg caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgttg ttccgatgct ggggtcaagg atcggagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 94

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

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<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>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 95

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgag gctcagggag ccacctacct ggatggtgtg 360
attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttctgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
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ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgctgcac 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

```
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	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> 97

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 97

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gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga 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 ggctaactctg tacgatgccg caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtcaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acgcgacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 98

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 98

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	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> 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 ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cgggtgaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300

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gaagcccgtagaagaacgcagacatactgcggctcagggagccacctacctggatgggtgtg 360
attctgacgattccaagcggcattggcacc ccagaagcta ccattctgtattcgggaccg 420
cgcagtagctcgatgaacatgaaagcgcatctgcgcgcattaggtccgggggcgaccttt 480
gtaggggaagatcacggactggctaattctgtacgatgccgcaatgctgagcgatcatgtgg 540
ggcctgctgatggttttctgcatggaaccgcactgctgggaaccgcggcggtttcggca 600
acctctgtggttccgatgctgggtcaaggtatctgcgctgtgaccgggttgattgcgcgc 660
tacgcagatcagattgatgcgggtgtctatccagcagacgacaagacgat tgatacccag 720
cgtgctgcaatgcagcacctggtcgaggagagccgtgcggcgggcatcaa tggcgaactt 780
ccggcggtttgtaccaactggccgatcgcgcagtggcagaaggtcgtgtggtgactct 840
tacgtgcacgtattgaacgtttcgcaagtcagcttaa 879

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<210> 100

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 100

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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 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
 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 atgactgcc 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 ggctgcactg tatgatgcag caatgctgag cgtcatgtgg 540
 ggcttgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atcggagctg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg 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
 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

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 cgggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gtcaggagg ccacctacct ggatggtgtg 360
 attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgccctg tacgatattg cacacctgag cgtcatgttg 540
 ggcttgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atcgaagtgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgcgacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtagctct 840

tacgctgcac tgattgaaca gtttcgcaag tcagcttaa

879

<210> 104

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 104

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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 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
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<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 ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcgga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctgggtcaacc 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 ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaactg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtagactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
  
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<210> 106

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 106

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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	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	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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gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cgggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca 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 cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcatgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaacctg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 108

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 108

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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 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
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<210> 109

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 109

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60

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gcgggagcgt ttctggcagc cggtcacctt acgacggttt ggaatcgcag cgcagctaaa 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 gtcagggag ccacctacct ggatggtgtg 360
attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg tacgatgccg caatgctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gcatgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcggagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 110

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<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
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 tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcggt 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 ggctaattctg tacgatgccg caatgctgag cgtcatgttg 540
 ggctgtgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaaggt atcgtagtgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 112
 <211> 292
 <212> PRT
 <213> Artificial Sequence

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

<400> 112
 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

<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 cggtcacctt acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcac taggtccggg ggcgaccttt 480
gtagggggaa atcacggact ggctaattctg tacgatgccg caatgctgag cgtcatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600

```

```

acctctgtgg ttccgatgct ggggtcaaggt atcggagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgcgacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac 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			
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												

<210> 115
 <211> 879
 <212> DNA
 <213> Artificial Sequence

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

<400> 115
 atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
 gctgatgaac tggttggtcg cggtgcaacc ctggccgctg 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 ggctgcactg tatgatgcag caatgctgag cgctcatgtg 540
 ggctgtctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaaggt atcgtagtgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
 tacgtctcac tgattgaaca gtttcgcaag tcagcttaa 879

<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 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 ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gtcagggag ccacctacct ggatggtgtg 360
attctgggta 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 ggggtcaaggt atctgcgtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 118

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 118

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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 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 spinosispora

<400> 119

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg gttgatcatg caatgctgag cgtcatgtgg 540
ggcctgctga atggtttctt gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgaagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 120

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 120

```
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
				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

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cgggtgcaacc 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 tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atctgcgtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgtgcaa tgacgacact ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
tacgtgcac 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				
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

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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 cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatggtgtg 360

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attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg tacgatattg caatgctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgtagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 124

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<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
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> 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 ggaatcgag cgcagctaaa 120
 gctgatgaac tggttggtcg cgggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
 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 ggctaattctg tacgatattg caatgctgag cgtcatgttg 540
 ggcttgctga atggttttct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgcgacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

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

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

<400> 126
 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>

<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 cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc 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 ggctaattctg tacgatgccg caatgctgag cgtcatgttg 540
ggcctgctga atggttttct gcatggaacc gcactgctgg gaaccgcggg cgttttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atctgcgtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcagaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<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
 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
atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg gttgatcatg cacacctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcngngtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 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


```

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

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<210> 132

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 132

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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 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

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Arg Lys Ser Ala
290

<210> 133
<211> 879
<212> DNA
<213> Artificial Sequence

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

<400> 133
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 cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtagggaag atcacggact ggctaattctg tacgatgccg caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcggagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgctgcac 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 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	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

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagcctaaa 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 gctcaggagg ccacctacct ggatgggtgtg 360
attctgggtg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg tacgatgccg caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgttg ttccgatgct ggggtcaaggt atcgtagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 136

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

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 136

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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 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

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<210> 137
 <211> 879
 <212> DNA
 <213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 137

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gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgag gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttctgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgaagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879
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<210> 138

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 138

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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	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

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcacctt acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg 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
attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtcaaggt atcggagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac 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							
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 acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300

```

```

gaagcccgatg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg tacgatattg caatgctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atctgcgtgg tgaccgggtg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtagctct 840
tacgctgcac 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 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
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
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 atgactgcc 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 ggctaattctg gttgatattg caatgctgag cgtcatgtgg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atctgcgtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg 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
 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 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 gtcagggag ccacctacct ggatggtgtg 360
 attctgacgg cccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaattctg tacgatattg cacacctgag cgtcatgttg 540
 ggcttgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atcggagtgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgcgacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtagctct 840

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879

<210> 146

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 146

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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 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 spinosispora

<400> 147

```
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 cggtgcgcgga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctgggtcaacc 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 ggctaattctg tacgatgccg cacacctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gactgctggg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcggagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tgggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
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<210> 148
<211> 292
<212> PRT
<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<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	
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

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cgggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctgggtcaacc tgacgagcgg tacgtcgct 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg tacgatgccg caggcctgag cgtcatgttg 540
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acctctgtgg ttccgatgct ggggtcaaggt atcgaagctg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 150

<211> 292

<212> PRT

<213> Artificial Sequence

<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
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<210> 151

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 151

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60

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gcgggagcgt ttctggcagc cggtcacctt acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gtcagggag ccacctacct ggatggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg tacgatgccg caggcctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gcatgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atctgcgctg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 152

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 152

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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 Cys Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210         215         220

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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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 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
 gctgatgaac tggttggctg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcggt ctgggtcaacc tgacgagcgg tacgtcggt 300
 gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
 attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaattctg tacgatgccg caatgctgag cgtcatgttg 540
 ggctgtgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaaggt atcgtagtgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtagtctt 840
 tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<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
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<210> 155

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 155

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 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
 gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga 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 ctgcgcgcgt taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaattctg tacgatgccg caggcctgag cgtcatgtgg 540
 ggctgtctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600

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acctctgtgg ttccgatgct ggggtcaaggt atctgcgtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<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
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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	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												

<210> 157
 <211> 879
 <212> DNA
 <213> Artificial Sequence

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

<400> 157
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 gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca 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
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 ggctgtctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaaggt atcgaagtgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg 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 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
				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> 159

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 159

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagcctaaa 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 gctcagggag ccacctacct ggatggtgtg 360
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tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 160

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 160

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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 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
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<210> 161

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 161

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gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatgggtgtg 360
attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tacgatgccg caggcctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgtagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
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<210> 162

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 162

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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 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	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> 163

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 163

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cgggtgaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccactggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatgggtgtg 360
attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg tacgatattg cacacctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 164

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<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	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>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 165

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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 cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc 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 atggtttctt gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtcaaggt tgggaagcgg tgactggtct aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg 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
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 ggaatcgag cgcagctaaa 120
 gctgatgaac tggttggtcg cggtgcaacc ctggccgctg 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 ggattctgta ttcgggaccg 420
 cgagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgttgag cgtgatgtgg 540
 ggcttgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct gggtaaggt tgggaagcga tgactggtct aattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 168
 <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 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															

<210> 169

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 169

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cgggtgaacc 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 ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgttgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcagaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgtgg tgggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<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
 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

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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 cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gtcagggag 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 atggtttctt gcatggaacc gcatgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt tgggaagcgg tgactggtct aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaact ggccgatcgc gcagtggcag aaggctgtgg tggtagactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
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<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		
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
 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 cggtgcgaga actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgccctg tatgatgcag caatgtcgag cgtgatgtgg 540
 ggctgtctga atggtttcct gcatggaacc gcatgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg tgggaagcgg tgatgggttg gattgcgcgc 660
 tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgtgg tgggtgactct 840
 tacgctgcac 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 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 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

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
```

```

gctgatgaac tggttggtcg cgggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cgtgatgttg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt tgggaagcga tgactggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 176

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<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 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
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 cgagcctaaa 120
 gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgag gctcagggag ccacctacct ggatgggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
 cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cgttatgttg 540
 ggctgtgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgttg ttccgatgct ggggtcaaggt tgggaagcgg tgactggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgcttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
 tacgctgcac 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
 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
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser				
	85		90	
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln				
	100		105	
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile				
	115		120	
Gly Thr Pro Glu Ala Arg Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe				
	130		135	
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe				
	145		150	
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser				
	155		160	
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu				
	165		170	
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly				
	175		180	
Gln Gly Trp Glu Ala Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln				
	185		190	
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln				
	195		200	
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile				
	205		210	
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val				
	215		220	
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe				
	225		230	
Arg Lys Ser Ala			235	
	240		245	
	250		255	
	260		265	
	270		275	
	280		285	
	290			

<210> 179

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 179

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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 cggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgag gctcagggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtagggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cgttatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtcaaggt atagaagcga tgatgggtat aattgcgcgc 660

```

tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 180

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<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	
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 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 tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgttgag cgtgatgtgg 540
 ggcctgctga atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaaggt tgggaagcgg tgactggtat aattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
 cgtgctgcaa tgcagcacct ggtcagaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 182
 <211> 292
 <212> PRT
 <213> Artificial Sequence

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

<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 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

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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 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 caatgttgag cgtgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgactggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 184

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 184

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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
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

```
atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tatgatgcag caatgtcgag cgtgatgtgg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgactgggtt gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<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
```



```

cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgttgag catgatgtgg 540
ggcctgctga atggtttctt gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atagaagcgg tgactggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacc tcgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tgggtgactct 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

```

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

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

<400> 191
atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cgggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcaactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cattatgtgg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcgg tgactggtct aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtagactct 840
tacgtgcac 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
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	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

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	cggtgcgcgga	actgctggaa	240
ccacttggcg	atgcactgcc	aggtcgcggt	ctgggtcaacc	tgacgagcgg	tacgtcgcggt	300
gaagcccgtg	agaacgcaga	acatactgcg	gctcagggag	ccacctacct	ggatgggtgtg	360
attctgacca	ttccaagcgg	cattggcacc	ccagaagcta	cgattctgta	ttcgggaccg	420
cgcagtacct	tcgatgaaca	tgaaagcgca	ctgcgcgcat	taggtccggg	ggcgaccttt	480
gtaggggaag	atcacggact	ggctaacctg	tatgatgcag	caatgtcgag	cattatgtgg	540
ggcctgctga	atggttttct	gcatggaacc	gactgctgg	gaaccgcggg	cgttttcggca	600
acctctgtgg	ttccgatgct	gggtcaaggt	tgggaagcga	tgactgggtct	aattgcgcgc	660
tacgcagatc	agattgatgc	cggtgtctat	ccagcagacg	atgccacgat	tgataccag	720
cgtgctgcaa	tgcagcacct	ggtcaggag	agccgtgcgg	cgggcaccaa	tggcgaactt	780
ccggcgtttg	tgaccaaact	ggccgatcgc	gcagtggcag	aaggtcgtgg	tggtgactct	840
tacgtgcac	tgattgaaca	gtttcgcaag	tcagcttaa			879

<210> 194
 <211> 292
 <212> PRT
 <213> Artificial Sequence

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

<400> 194
 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 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

<210> 195
 <211> 879
 <212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 195

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagcctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctgggtcaacc 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 ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcgg tgactggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacc tcgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 196

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 196

```
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	Leu	Ala	Thr	Ile	Asp	Thr	Gln		
						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> 197
 <211> 879
 <212> DNA
 <213> Artificial Sequence

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

<400> 197
 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 aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcaggagg ccacctacct ggatgggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgccctg tatgatgcag caatgtcgag cgtgatgtgg 540
 ggctgtgta atggtttccat gcatggaacc gactgctgg gaaccgcggg cgttttcggca 600
 acctctgtgg ttccgatgct gggtaaggt atagaagcga tgactggtct aattgcgcgc 660
 tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<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 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 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

```
atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctccgcggc tgccgtcgca 180
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```

gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgatg agaacgcaga acatactgcg gctcaggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtagct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tatgatgcag caatgtcgag cattatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt tgggaagcgg tgttggtct aattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgcttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tgggtgactct 840
tacgtctcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 200

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 200

```

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

<210> 201

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 201

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgag gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tatgatgcag caatgtcgag cattatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt tgggaagcgg tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879
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<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 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	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

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gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 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 gctcaggagg ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgataccag 720

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cgtgctgcaa tgcagcacct ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg 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 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
 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
 atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
 gctgatgaac tggttgggtcg cgggtgcaacc 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 cgattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgttgag cattatgtgg 540
 ggcttgctga atggttttct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaaggt atcgaagcgg tgactggtat aattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
 cgtgctgcaa tgcagcacct ggtcagaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtagactct 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
 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
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
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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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 cgggtgcgca 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 ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cattatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcgg tgactgggtg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 208

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 208

```
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
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

```
atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cgggtgaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcaactgc aggtcgcgtt 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 caatgttgag cgtgatgtgg 540
ggcctgctga atggtttctt gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgttgggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgtgg 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
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 spinosispora*

<400> 211

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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 aggtcgcggt ctgggtcaacc 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 cattatgttg 540
ggcctgctga atggtttctt gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgatgggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 212

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<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	
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

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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 cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480

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gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cgtgatgtgg 540
ggcctgctga atggtttctt gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt ctagaagcgg tgatgggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacc tcgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 214

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<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 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

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275
Arg Lys Ser Ala
290

280

285

<210> 215
<211> 879
<212> DNA
<213> Artificial Sequence

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

<400> 215
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 ggatgggtgtg 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 tgggaagcga tgttgggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacc tcgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg 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 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

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

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 218

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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 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

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<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 ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgag gctcagggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgtcgag cgttatgttg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt ctagaagcga tgactggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
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<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 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 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 ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc 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 catgatgtgg 540
ggcctgtgta atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt ctagaagcgg tgactggtct aattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tgggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 222

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 222

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
				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 ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga actgctggaa 240

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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
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgttgag cgttatgttg 540
ggcctgctga atggtttcct gcatggaacc gcaactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaaggt tgggaagcgg tgactggtct aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac 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
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 acgacggttt ggaatcgag 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 ggatgggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cgttatgtgg 540
 ggcttgctga atggtttctt gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg tgggaagcgg tgactggtat aattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 226
 <211> 292
 <212> PRT
 <213> Artificial Sequence

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

<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
	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> 227

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 227

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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 cgggtgcgca 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 ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cattatgttg 540
ggcctgctga atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg ctagaagcga tgactggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780

```

ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tgggtgactct 840
 tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 228
 <211> 292
 <212> PRT
 <213> Artificial Sequence

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

<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 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>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 229

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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 ctgggtcaacc 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 gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tgggtgactct 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
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

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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 cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gtcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cattatgttg 540
ggcctgctga atggtttctt gcatggaacc gcatgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg ctagaagcga tgactgggtt gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 232

<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 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
```

<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 ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcaactgcc aggtcgcgtt 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 catgatgttg 540
ggcctgctga atggtttctt gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt tgggaagcga tgactggtat aattgcgcgc 660
tacgcaaadc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgtgg 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
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
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile		240
	245	250
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val		255
	260	265
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe		270
	275	280
Arg Lys Ser Ala		285
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 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 ggatgggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
 ggctgtctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgactggtat aattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tgggtgttct 840
 tacgtgcac 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


```

ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgt tgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac 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 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 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 tggttggtcg cgggtgcaacc 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 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 ggggtcaagg tgggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcagaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg 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 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				
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

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgagcctaaa 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 gctcaggagg 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 ggggtcaagg tgggaagcga tgactagtat aattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg 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
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 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

```
atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgag gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttctgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcaa tgatgtcgag catgatgtgg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt tgggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 244

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<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
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 cggtcacctt acgacggttt ggaatcgcag cgcagctaaa 120
 gctgatgaac tggttggtcg 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
 attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
 ggcttgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct gggtcaaggt tggcatgcga tgactggtat aattgcgcgc 660
 tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 246
 <211> 292
 <212> PRT
 <213> Artificial Sequence

<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


```

gaagcccgatg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttctt gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tggagggcga tgactgggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcagaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 248

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 248

```

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 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
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
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttctt gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tggaaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<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 ggaatcgag 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 gtcagggag ccacctacct ggatggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
 ggcttgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct gggtagtggg tgggaagcga tgactggtat aattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
 cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840

tacgctgcac 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
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 tggttggtcg 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
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgactcgtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tgggtgactct 840
tacgtgcac 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
			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

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atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cgggtgcaacc 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
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcatgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgcttct ggggtcaagg tgggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac 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
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

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gcgggagcgt ttctggcagc cggtcacctt acgacggttt ggaatcgcag cgcagctaaa 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 gtcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagctc ttattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttctt gcatggaacc gcatgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaaggt tggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 258

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 258

```

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 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
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> 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 tggttggcgc cgggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcggt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
 attctgacca ttccaagcgg cattggccgt ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
 ggctgtgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgttttcggca 600
 acctctgtgg ttccgatgct ggggtcaaggt tgggaagcga tgactggtat aattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgacaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
 tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

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

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

<400> 260
 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 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>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 261

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 cggtgcgaga actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgag gctcaggagg ccacctacct ggatgggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
 ggctgtctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgttttcggca 600

acctctgtgg ttccgatgct ggggtcaaggt tgggaagcga tgactaatat aattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
 tacgctgcac 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
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	Asn	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												

<210> 263
 <211> 879
 <212> DNA
 <213> Artificial Sequence

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

<400> 263
 atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
 gctgatgaac tgattggtcg 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
 attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
 ggctgtctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaaggt tgggaagcga tgactggtat aattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcggtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 264
 <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 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

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 266

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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 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
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<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 cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt tgggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879
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<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
 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

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 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
 ggcttgctga atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
 cgtgtgcaa tgacgacact ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
 tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 270

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 270

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
 1 5 10 15

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