

SEQUENCE LISTING

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

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

<130> CX2-151USP1

<140> Not Yet Assigned

<141> Submitted Herewith

<160> 270

<210> 1

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase from *Pseudonocardia spinosispora*

<400> 1

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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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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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ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg 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 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
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Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile
				245					250					255	
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val
			260					265					270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe
		275					280					285			
Arg	Lys	Ser	Ala												
	290														

<210> 5
 <211> 879
 <212> DNA
 <213> Artificial Sequence

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

<400> 5
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 gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
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 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
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<210> 6
 <211> 292
 <212> PRT
 <213> Artificial Sequence

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

<400> 6
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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 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 ctggccgctg ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgag gctcagggag ccacctacct ggatgggtgtg 360
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 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcac taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag catcatgtgg 540
 ggctgtgta atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600

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tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 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> 8

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 8

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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 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

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<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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gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
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tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
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ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
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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		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> 11

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 11

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gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga actgctggaa 240
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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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ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac 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 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 ggatgggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
 ggctgtctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct gggtaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagact tggccacgat tgataccag 720
 cgtgtgcaa tgacgacact ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtagctct 840
 tacgtgcac 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 cgggtgaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgcga 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 tgggatgcag caatgctgag cgtcatgtgg 540
ggcctgctga atggtttctt gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg 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

```


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

<210> 21

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 21

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atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccactggcg atgactgcc 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 ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaacag tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgtgcaa tgacgacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgttg 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

```
atgagtgatt cccccgtacc tgtgactggt 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 aggtcgcggt ctgggtcaacc tgacgagcgg tacgtcgctg 300
gaagcccgtg agaacgcaga acatactgag 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
ggcctgctga atggtttcct 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 tgacaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtagctct 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 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

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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 cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaaagg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag 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 Ala Gly Ser Leu
50 55 60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65 70 75 80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85 90 95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100 105 110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115 120 125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130 135 140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145 150 155 160
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Met Leu
165 170 175
Ser Val Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180 185 190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
195 200 205
Gln Gly Ile Glu Arg Val Thr Gly Trp Ile Ala Arg Tyr Ala Asp Gln
210 215 220
Ile Asp Ala Gly Val Tyr Pro Ala Asp Asp Ala Thr Ile Asp Thr Gln
225 230 235 240
Arg Ala Ala Met Gln His Leu Val Glu Glu Ser Arg Ala Ala Gly Ile
245 250 255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val
260 265 270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe
275 280 285
Arg Lys Ser Ala
290

<210> 27

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 27

atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt 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 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 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 aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 28

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 28

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala 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 cgggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
 ccacttggcg atgcactgtc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgag 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 atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgttg ttccgatgct ggggtcaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
 tacgctgcac 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 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	
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 Thr 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		155
Val Gly Glu Asp His Gly Leu Ala Ala Leu Tyr Asp Ala Ala Gly 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				
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 ctgcgcgcac taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgagtag cgtcatgtgg 540
ggcctgtga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgaagcgg tgaccggttg gattgcgcgc 660

```

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 tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
 gctgatgaac tggttggtcg cggtgcaacc ctggccgctg 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
 cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caggctctgag cgtcatgttg 540
 ggctgtctga atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
 cgtgctgcaa tgcagcacct ggtcagaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcggttg 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
 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 cgggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gtcagggag ccacctacct ggatggtgtg 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 gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct gggtaaggt atcgaagttg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg 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
```

<210> 37

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 37

```
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
cgcagtacct tcgatgaaca tgaaagcgca ctgctgcgcg taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatattg caatgctgag cgtcatgttg 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 aaggtcgttg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 38

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 38

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



```

cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcac taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgtgg 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 tggtagactt 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 42

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 42

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20         25         30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35         40         45
Ala Thr Leu Ala Ala Ser Pro Ala Ala 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 cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaaggt atcgaagcgg tgaccggtat tattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgcttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtagactct 840
tacgctgcac 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	ccccgtacc	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	tacgtcgcgt	300
gaagcccgtg	agaacgcaga	acatactgcg	gctcaggagg	ccacctacct	ggatgggtgtg	360
attctgacca	ttccaagcgg	cattggcacc	ccagaagcta	ccattctgta	ttcgggaccg	420
cgcagtacct	tcgatgaaca	tgaagcgca	ctgcgcgcgt	taggtccggg	ggcgaccttt	480
gtaggggaag	atcacggact	ggctagtctg	tatgatgcag	caatgctgag	cgtcatgttg	540
ggcctgctga	atggtttcct	gcatggaacc	gactgctgg	gaaccgcggg	cgtttcggca	600
acctctgtgg	ttccgatgct	gggtcaaggt	atcgaagcgg	tgaccggttg	gattgcgcgc	660
tacgcagatc	agattgatgc	cggtgtctat	ccagcagacg	acgccacgat	tgataccag	720
cgtgctgcaa	tgcagcacct	ggtcgaggag	agccgtgcgg	cgggcatcaa	tggcgaactt	780
ccggcgtttg	tgaccaaact	ggccgatcgc	gcagtggcag	aaggtcgtgg	tggtgactct	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

```
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 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 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 aaggtcgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 48

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 48

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

				165				170					175				
Ser	Val	Met	Trp	Gly	Leu	Leu	Asn	Gly	Phe	Leu	His	Gly	Thr	Ala	Leu		
				180				185					190				
Leu	Gly	Thr	Ala	Gly	Val	Ser	Ala	Thr	Ser	Val	Val	Pro	Met	Leu	Gly		
				195				200					205				
Gln	Gly	Ile	Glu	Ala	Val	Thr	Gly	Trp	Ile	Ala	Arg	Tyr	Ala	Asp	Gln		
				210				215					220				
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr	Gln		
				225				230					235				
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile		
				245													
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														
				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 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
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
 ggctgtgta atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct gggtaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cggtgtctat 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 ctccgcggc tgccgtcgca 180
```

```

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
cgcagtagct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgctcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atctgtgcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcagagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 52

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 52

```

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

```

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

<210> 53

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 53

atgagtgatt cccccgtacc tgtgactgtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc 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 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 cggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 54

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 54

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

Ile	Val	Val	Cys	Val	Thr	Asp	His	Arg	Ala	Val	Arg	Glu	Leu	Leu	Glu	65	70	75	80
Pro	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 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 catgatgtgg 540
ggcctgtga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtcaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acgccacgat tgataccag 720

```

cgtgctgcaa tgcagcacct ggtcaggag 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 ggaatcgag 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 gctcaggag 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
 cgtgtgcaa tgacgacac ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 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 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 ggattctgta 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 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
tacgctgcac 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 atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcg 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 ccagcagac acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 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 cgggtgcaacc 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 tgacaaaact 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 atggtttcct 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 aaggctcgtg 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 ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcgac 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
cgcagtagct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggc cttgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg 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

```

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 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 cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgttg ttccgatgct ggggtcaagg atcgggtcgg 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> 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

```

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 gctcaggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgtga 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 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 gctcaggag ccacctacct ggatggtgtg 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 ggggtcaaggt atcgaagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcaggag 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

```


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

```

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
attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatgccg caggcctgag cgtcatgttg 540
ggcctgtgta atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtcaaggt 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
 tacgtgcac 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 aggtcgcgtt 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
cgtgtctgaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtagactt 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

```

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 atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 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

```

<210> 84

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 84

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

<210> 85

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 85

```

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 cggtgcgcgga 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 tgacaaaact 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 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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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 gctcagggag ccacctacct ggatgggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg tacgatattg caatgctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcggaaactg 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

```

<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 ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<210> 90

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 90

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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 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
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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 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 cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcagagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac 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

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	ctgggtcaacc	tgacgagcgg	tacgtcgcgt	300
gaagcccgtg	agaacgcaga	acatactgcg	gctcagggag	ccacctacct	ggatgggtgtg	360
attctgacga	ttccaagcgg	cattggcacc	ccagaagcta	ccattctgta	ttcgggaccg	420
cgcagtacct	tcgatgaaca	tgaagcgca	ctgcgcgcgt	taggtccggg	ggcgaccttt	480
gtaggggaag	atcacggact	ggctaattctg	tacgatgccg	caatgctgag	cgatcatgttg	540
ggcctgctga	atggtttcct	gcatggaacc	gcactgctgg	gaaccgcggg	cgtttcggca	600
acctctgtgg	ttccgatgct	gggtcaaggt	atcggagtgg	tgaccggttg	gattgcgcgc	660
tacgcagatc	agattgatgc	cggtgtctat	ccagcagacg	acgccacgat	tgataccag	720
cgtgctgcaa	tgcagcacct	ggctcaggag	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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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 ggatgggtgtg 360
attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tacgatgccg cacacctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat 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> 96

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 96

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
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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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
attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg tacgatgccg caatgctgag cgctcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtcaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgcgacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

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<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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atgagtgtgatt cacctgtgcc cgtgacagtt 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 ctggtcaacc tgacgagcgg tacgtcgcgt 300

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gaagcccgtagaagaacgcagacatactgcggctcagggagccacctacctggatgggtgtg360
attctgacgattccaagcgcattggcaccccagaagctaccattctgtattcgggaccg420
cgagtagctatcgatgaacatgaaagcgcatctgcgcgcattaggtccggggcgacaccttt480
gtaggggaagatcacggactggctaattctgtacgatgccgcaatgctgagcgtcatgtgg540
ggcctgctgatggttttctgcatggaaccgactgctgggaaccgcgggcgtttcggca600
acctctgtggttccgatgctgggtcaaggtatctgcgctgtgaccggttgattgcgcgc660
tacgcagatcagattgatgcggtgtctatccagcagacgacaagacgatgatacccag720
cgtgctgcaatgcagcacctggtcaggagagccgtgcggcgggcatcaatggcgaactt780
ccggcggtttgtaccaaactggccgatcgcgcagtggcagaaggtcgtgtggtgactct840
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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 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 ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcggagctg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
tacgtgcac 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 gctcaggagg ccacctacct ggatggtgtg 360
 attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat 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 tgatacccag 720
 cgtgctgcaa tgacgacact ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 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

```

<210> 105

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

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

<400> 105
 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 gctcaggag ccacctacct ggatggtgtg 360
 attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
 ggctgtctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaaggt atcgaaactg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
 cgtgtgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgttg tggtagactct 840
 tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 106
 <211> 292
 <212> PRT
 <213> Artificial Sequence

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

<400> 106
 Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
 1 5 10 15
 Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
 20 25 30
 Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
 35 40 45
 Ala Thr Leu Ala Ala Ser Pro Ala Ala 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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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 ggctgccctg tacgatgccg cacacctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctggg 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

```

<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 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
attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg tacgatgccg caatgctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atcggagtgg 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

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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 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
 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 ggggtcaagg atcgtagtgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgacaaact ggccgatcgc gcagtggcag aaggctgtgg tggtagactt 840
 tacgtgcac 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

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 gctcagggag ccacctacct ggatgggtgtg 360
 attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcatgtacc tcgatgaaca tgaaagcgca ctgcgcgcac taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaattctg tacgatgccg caatgctgag cgtcatgtgg 540
 ggctgtctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600

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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

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<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 cgctcatgttg 540
 ggctgtctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atcgtagtgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
 tacgtctgcac 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

<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 gctcaggag ccacctacct ggatggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaactctg gttgatcatg caatgctgag cgtcatgttg 540
ggcctgctga atggtttctt 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
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

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 ggatgggtgtg 360
 attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
 ggctgtgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct gggtaaggt atctgcgtgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
 cgtgtgcaa tgacgacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg 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		
						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 cgggtgaacc 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

```

```

attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg tacgatattg caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcaactgctg 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

```

<210> 124

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 124

```

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

```


				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 ggaatcgag cgcagctaaa 120
gctgatgaac tggttggtcg cgggtgaacc ctggccgctg ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccactggcg atgactgcc aggtcgcgtt ctgggtcaacc 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 tacgatgccg caatgctgag cgtcatgttg 540
ggcctgctga atggttttct gcatggaacc gactgctgg gaaccgcggg cgttttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atctgcgtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgtgcaa tgacgacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaaact 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 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 gttgatcatg cacacctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg 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 ggggtcaaggt atcgaaactg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat 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> 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

```

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 acatactgag gctcaggagg ccacctacct ggatgggtgtg 360
attctgggta ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaattctg tacgatgccg caatgctgag cgtcatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcggagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 134
<211> 292
<212> PRT
<213> Artificial Sequence

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

<400> 134
Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1 5 10 15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20 25 30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35 40 45
Ala Thr Leu Ala Ala Ser Pro Ala Ala 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

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	ctgggtcaacc	tgacgagcgg	tacgtcgcgt	300
gaagcccgtg	agaacgcaga	acatactgcg	gctcaggagg	ccacctacct	ggatgggtgtg	360
attctgggtg	gccaagcgg	cattggcacc	ccagaagcta	ccattctgta	ttcgggaccg	420
cgagtagcct	tcgatgaaca	tgaaagcgca	ctgcgcgcat	taggtccggg	ggcgaccttt	480
gtaggggaag	atcacggact	ggctaattct	tacgatgccg	caatgctgag	cgatcatgttg	540
ggcctgctga	atggtttcct	gcatggaacc	gcactgctgg	gaaccgcggg	cgttttcggca	600
acctctgttg	ttccgatgct	gggtcaaggt	atcgtagtgg	tgaccggttg	gattgcgcgc	660
tacgcagatc	agattgatgc	cggtgtctat	ccagcagacg	acaagacgat	tgataccag	720
cgtgctgcaa	tgcagcacct	ggtcgaggag	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 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

```

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

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 137

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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
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 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
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<210> 138

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 138

```
Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
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 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
 attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgatcatgtg 540
 ggctgtctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct gggtcaaggt atcggagtgg 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> 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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atgagtgtgatt cacctgtgcc cgtgacagtt 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 ctggtcaacc tgacgagcgg tacgtcgcgt 300

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gaagcccgtagaagcgcagaacatactgcggctcagggagccacctacctggatgggtgtg360
attctgacgggcccaagcggcattggcacc ccagaagcta ccattctgta ttcgggaccg420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt480
gtaggggaag atcacggact ggctaattctg tacgatattg caatgctgag cgtcatgtgg540
ggcctgctga atggtttcct gcatggaacc gcaactgctgg gaaccgcggg cgtttcggca600
acctctgtgg ttccgatgct ggggtcaaggt atctgcgtgg tgaccggttg gattgcgcgc660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtagactct840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa879

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<210> 142

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 142

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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 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 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 gttgatattg caatgctgag cgtcatgttg 540
ggcctgctga atggtttctt gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg 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
tacgtgcac 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 gctcaggagg ccacctacct ggatggtgtg 360
 attctgacgg cccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaattctg tacgatattg cacacctgag cgtcatgttg 540
 ggcttgctga atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atcggagtgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgcgacgat tgatacccag 720
 cgtgctgcaa tgacgacact ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcggttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840

tacgctgcac tgattgaaca gtttcgcaag tcagcttaa

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
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<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 cgggtgcgca actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt 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 ggctaattctg tacgatgccg cacacctgag cgtcatgttg 540
 ggctgtctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaaggt atcggagtgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
 cgtgtctgaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgtgg tgggtgactct 840
 tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<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 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 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
ggcctgctga atggtttcct gcatggaacc gactgctggg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg atcgaagctg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgttg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<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 ctggtcaacc 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 gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaaggt 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

```

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

```

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
 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 tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgag gctcagggag ccacctacct ggatgggtgtg 360
 attctgacga ttccaagcgg 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 ggggtcaagg atcgtagtgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgacaaact 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
 290

<210> 155

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 155

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt 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 gctcagggag ccacctacct ggatgggtgtg 360
 attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcac 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 ggtcaggagg 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

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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 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

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

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

<400> 157
 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 ggatgggtgtg 360
 attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaattctg gttgatattg caatgctgag cgctcatgttg 540
 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
 tacgtctcac 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 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 gtcaggggag ccacctacct ggatggtgtg 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 atcgaagtgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat 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
```

<210> 161

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 161

```
atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag 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
attctgacgg gcccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tacgatgccg caggcctgag cgtcatgttg 540
ggcctgctga atggtttcct 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
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 162

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 162

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

Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
 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

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
 attctgacga ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaattctg tacgatattg cacacctgag cgtcatgttg 540
 ggcttgctga atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct gggtaaggt atcgaagtgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acaagacgat tgataccag 720
 cgtgtgcaa tgacgacct 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 cgggtgaacc 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

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```

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 ggggtcaagg tgggaagcgg tgactgggtct 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

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<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
	275		280		
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 cgggtgaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
 ccacttggcg atgcaactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
 cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgttgag cgtgatgtgg 540
 ggctgtctga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg 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 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
ccactggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gtcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgttgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgtgcaa tgacgacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 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 cggtgcgaga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt 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 ggctgccctg tatgatgcag caatgttgag catgatgtgg 540
ggcctgctga atggtttcct 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 tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 172

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 172

```
Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala 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 gctcaggagg ccacctacct ggatgggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
 cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgccctg tatgatgcag caatgtcgag cgtgatgtgg 540
 ggctgtctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg tgggaagcgg tgatgggttg gattgcgcgc 660
 tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcaggagg agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 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

```
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 gactgctgg 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
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 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 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 ggatgggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cgttatgttg 540
 ggctgtctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgttg ttccgatgct gggtaaggt tgggaagcgg tgactggttg gattgcgcgc 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

<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 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		155
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser				
	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 Trp 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> 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 acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cgttatgtgg 540
ggcctgtga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt atagaagcga tgatgggtat aattgcgcgc 660

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tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg 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 cggtcgcga 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
 ggctgtctga atggtttcct gcatggaacc gcaactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct gggcaaggt 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
 tacgtctgcac 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 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 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 gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaaggt tgggaagcga tgactggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 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 ctggtcaacc 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 ggggtcaaggt tgggaagcga tgactggttg 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
```

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

<210> 187

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 187

```

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 gctcaggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cgtgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg ctagaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 188

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 188

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


```

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 ggctcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tgggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<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 atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgagtgacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cattatgtgg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg 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 tgacaaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgctgcac tgattgaaca gtttcgcaag tcagcttaa 879

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

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

<400> 192
Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1 5 10 15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20 25 30
Val Trp Asn Arg 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	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	ggatgggtgtg	360
attctgacca	ttccaagcgg	cattggcacc	ccagaagcta	cgattctgta	ttcgggaccg	420
cgcagtacct	tcgatgaaca	tgaagcgca	ctgcgcgcat	taggtccggg	ggcgaccttt	480
gtaggggaag	atcacggact	ggctaacctg	tatgatgcag	caatgtcgag	cattatgtgg	540
ggcctgctga	atggtttcct	gcatggaacc	gactgctgg	gaaccgcggg	cgtttcggca	600
acctctgtgg	ttccgatgct	gggtcaaggt	tgggaagcga	tgactgggtct	aattgcgcgc	660
tacgcagatc	agattgatgc	cggtgtctat	ccagcagacg	atgccacgat	tgataccag	720
cgtgctgcaa	tgcagcacct	ggtcgaggag	agccgtgcgg	cgggcatcaa	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 cgcagctaaa 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 aaggctcgtg 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
 cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgccctg tatgatgcag caatgtcgag cgtgatgtgg 540
 ggctgtctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg atagaagcga tgactggtct aattgcgcgc 660
 tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg 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
```

```

gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgcga actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccggtg 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 cattatgtgg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt tgggaagcgg tgttgggtct aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac 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

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 acatactgag gctcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgccctg tatgatgcag caatgtcgag cattatgtgg 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

<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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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 ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgtga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtcaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgataccag 720

```

cgtgctgcaa tgcagcacct ggtcaggag 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	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 ggaatcgag 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 gctcaggag 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 atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaaggt atcgaagcgg tgactggtat aattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgatacccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
 tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

<210> 206
 <211> 292
 <212> PRT
 <213> Artificial Sequence

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

<400> 206
 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 gctcaggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cattatgttg 540
ggcctgctga atggtttcct gcatggaacc gcaactgttg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcgg tgactggttg 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

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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
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<210> 209

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 209

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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 atgcactgcc aggtcgcgtt ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcaggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcg taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgttgag cgtgatgtgg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgttgggttg gattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagac acgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<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	tggttgggtcg	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	ccattctgta	ttcgggaccg	420
cgcagtacct	tcgatgaaca	tgaaagcgca	ctgcgcgcat	taggtccggg	ggcgaccttt	480
gtaggggaag	atcacggact	ggctgccctg	tatgatgcag	caatgttgag	cattatgttg	540
ggcctgctga	atggtttctt	gcatggaacc	gcactgctgg	gaaccgcggg	cgttttcggca	600
acctctgtgg	ttccgatgct	gggtcaaggt	atcgaagcgg	tgatgggttg	gattgcgcgc	660
tacgcagatc	agattgatgc	cgggtgtctat	ccagcagacg	atgccacgat	tgataccag	720
cgtgctgcaa	tgacgcacct	ggtcgaggag	agccgtgcgg	cgggcatcaa	tggcgaactt	780
ccggcgtttg	tgacaaaact	ggccgatcgc	gcagtggcag	aaggtcgtgg	tggtgactct	840
tacgtgcac	tgattgaaca	gtttcgcaag	tcagcttaa			879

<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 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 ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcgt taggtccggg ggcgaccttt 480

```

```

gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cgtgatgtgg 540
ggcctgctga atggtttcct 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 aaggctcgtgg 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

```

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 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 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 cgggtgtctat ccagcagacc tcgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggagg 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

```

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 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 cgattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctgcactg tatgatgcag caatgtcgag cgttatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt ctagaagcga tgactggttg gattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat 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> 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 cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcgtt ctgggtcaacc 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 caatgtcgag catgatgtgg 540
ggcctgtga atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt ctagaagcgg tgactggtct 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

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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 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 gctcaggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgttgag cgttatgtgg 540
ggcctgctga atggtttcct gcatggaacc gcaactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcgg tgactggtct aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg 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 atgactgcc 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
gtagggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag cgttatgttg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg 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 aaggtcgtgg 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
				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	Ile	Pro	Ser	Gly
		115					120					125		
Gly	Thr	Pro	Glu	Ala	Thr	Ile	Leu	Tyr	Ser	Gly	Pro	Arg	Ser	Thr
	130					135					140			
Asp	Glu	His	Glu	Ser	Ala	Leu	Arg	Ala	Leu	Gly	Pro	Gly	Ala	Thr
145					150					155				160
Val	Gly	Glu	Asp	His	Gly	Leu	Ala	Asn	Leu	Tyr	Asp	Ala	Ala	Met
				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	Leu
	195						200					205		
Gln	Gly	Trp	Glu	Ala	Val	Thr	Gly	Ile	Ile	Ala	Arg	Tyr	Ala	Asp
	210					215					220			
Ile	Asp	Ala	Gly	Val	Tyr	Pro	Ala	Asp	Asp	Ala	Thr	Ile	Asp	Thr
225					230					235				240
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly
				245					250					255
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala
	260							265				270		
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln
	275						280					285		
Arg	Lys	Ser	Ala											
	290													

<210> 227

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 227

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
gctgatgaac 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 cattatgtgg 540
ggcctgtgta atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtcaaggt 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
 tacgtgtcac 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

```

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 cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc 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
gtagggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgtgcaa tgagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtagctct 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

```

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
attctgacca ttccaagcgg cattggcacc ccagaagcta ggattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat 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 cggtgtctat 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 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 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 catgatgttg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgactggtat aattgcgcgc 660
tacgcaaata 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 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	255
Asn Gly Glu Leu Pro Ala Phe Val Thr Lys Leu Ala Asp Arg Ala Val				
	260		265	270
Ala Glu Gly Arg Gly Gly Asp Ser Tyr Ala Ala Leu Ile Glu Gln Phe				
	275		280	285
Arg Lys Ser Ala				
290				

<210> 235

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 235

```

atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgcag cgcagctaaa 120
gctgatgaac tggttggtcg cggtgcaacc ctggccgcgt ctcccgcggc tgccgtcgca 180
gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cgggtgcgca actgctggaa 240
ccacttggcg atgcactgcc aggtcgcggt ctggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gctcagggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgacaaact 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	15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr	
20	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 tgggaagcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgt tgggtgtctat ccagcagacg atgccacgat tgataccag 720
cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctcgtg 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 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 ttccaagcag gattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaagg tgggaagcga tgactggtat 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> 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

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	ctgggtcaacc	tgacgagcgg	tacgtcgcgt	300
gaagcccgtg	agaacgcaga	acatactgcg	gctcagggag	ccacctacct	ggatgggtgtg	360
attctgacca	ttccaagcgg	cattggcacc	ccagaagcta	ccattctgta	ttcgggaccg	420
cgcagtacct	tcgatgaaca	tgaagcgca	ctgcgcgcat	taggtccggg	ggcgaccttt	480
gtaggggaag	atcacggact	ggctaacctg	tatgatgcag	caatgtcgag	catgatgtgg	540
ggcctgctga	atggtttcct	gcatggaacc	gcactgctgg	gaaccgcggg	cgtttcggca	600
acctctgtgg	ttccgatgct	gggtcaaggt	tgggaagcga	tgactagtat	aattgcgcgc	660
tacgcagatc	agattgatgc	cggtgtctat	ccagcagacg	atgccacgat	tgataccag	720
cgtgctgcaa	tgcagcacct	ggtcgaggag	agccgtgcgg	cgggcatcaa	tggcgaactt	780
ccggcgtttg	tgaccaaact	ggccgatcgc	gcagtggcag	aaggctcgtg	tggtgactct	840
tacgtgcac	tgattgaaca	gtttcgcaag	tcagcttaa			879

<210> 242

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

<220>

<223> Imine reductase variant from *Pseudonocardia spinosispora*

<400> 242

```

Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
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 atgactgcc 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 tatgatgcaa tgatgtcgag catgatgtgg 540
ggcctgctga atggtttcct 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 tgacaaact ggccgatcgc gcagtggcag aaggctgtgg tggtgactct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879
```

<210> 244

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia 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		
							230				235				240		
Arg	Ala	Ala	Met	Gln	His	Leu	Val	Glu	Glu	Ser	Arg	Ala	Ala	Gly	Ile		
				245					250					255			
Asn	Gly	Glu	Leu	Pro	Ala	Phe	Val	Thr	Lys	Leu	Ala	Asp	Arg	Ala	Val		
			260					265				270					
Ala	Glu	Gly	Arg	Gly	Gly	Asp	Ser	Tyr	Ala	Ala	Leu	Ile	Glu	Gln	Phe		
			275				280					285					
Arg	Lys	Ser	Ala														
			290														

<210> 245
 <211> 879
 <212> DNA
 <213> Artificial Sequence

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

<400> 245
 atgagtgatt cacctgtgcc cgtgacagtt ctgggtcttg gtctgatggg tcaggcctta 60
 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
 gctgatgaac 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 ccattctgta ttcgggaccg 420
 cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
 ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct gggtcaaggt tggcatgcga tgactggtat aattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcaggagg 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

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

<210> 247

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 247

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atgagtgtatt cacctgtgcc cgtgacagtt 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 ctggtcaacc tgacgagcgg tacgtcgcgt 300

```

```

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 atggtttcct gcatggaacc gcaactgctg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt tggagggcga tgactggtat aattgcgcgc 660
tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgatacccag 720
cgtgctgcaa tgcagcacct ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgtgg tggtagctct 840
tacgtgcac tgattgaaca gtttcgcaag tcagcttaa 879

```

<210> 248

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 248

```

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

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

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<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 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
 cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
 ggctgtctga atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaaggt tgggaagcga tgactcgtat aattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
 cgtgtctgaa tgcagcacct ggtcagaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgacaaaact 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 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
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 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

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Thr Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser
165         170         175
Ser 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 ctgggtcaacc tgacgagcgg tacgtcgcgt 300
gaagcccgtg agaacgcaga acatactgcg gtcagggag ccacctacct ggatgggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagctc ttattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttctt gcatggaacc gcatgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct ggggtcaaggt tgggaagcga tgactggtat 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

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<210> 258

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 258

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Met Ser Asp Ser Pro Val Pro Val Thr Val Leu Gly Leu Gly Leu Met
1          5          10          15
Gly Gln Ala Leu Ala Gly Ala Phe Leu Ala Ala Gly His Pro Thr Thr
20          25          30
Val Trp Asn Arg Ser Ala Ala Lys Ala Asp Glu Leu Val Gly Arg Gly
35          40          45
Ala Thr Leu Ala Ala Ser Pro Ala Ala Ala Val Ala Ala Gly Ser Leu
50          55          60
Ile Val Val Cys Val Thr Asp His Arg Ala Val Arg Glu Leu Leu Glu
65          70          75          80
Pro Leu Gly Asp Ala Leu Pro Gly Arg Val Leu Val Asn Leu Thr Ser
85          90          95
Gly Thr Ser Arg Glu Ala Arg Glu Asn Ala Glu His Thr Ala Ala Gln
100         105         110
Gly Ala Thr Tyr Leu Asp Gly Val Ile Leu Thr Ile Pro Ser Gly Ile
115         120         125
Gly Thr Pro Glu Ala Leu Ile Leu Tyr Ser Gly Pro Arg Ser Thr Phe
130         135         140
Asp Glu His Glu Ser Ala Leu Arg Ala Leu Gly Pro Gly Ala Thr Phe
145         150         155         160
Val Gly Glu Asp His Gly Leu Ala Asn Leu Tyr Asp Ala Ala Met Ser
165         170         175
Ser Met Met Trp Gly Leu Leu Asn Gly Phe Leu His Gly Thr Ala Leu
180         185         190
Leu Gly Thr Ala Gly Val Ser Ala Thr Ser Val Val Pro Met Leu Gly
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 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 cattggccgt ccagaagcta ccattctgta ttcgggaccg 420
 cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
 ggctgtgta atggtttctt gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct ggggtcaagg 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

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 gcgggagcgt ttctggcagc cggtcaccct acgacggttt ggaatcgag cgcagctaaa 120
 gctgatgaac tggttggtcg cggtgcaacc ctggccgctg ctcccgcggc tgccgtcgca 180
 gcgggtagtc tgatcgttgt ttgcgtcaca gatcatcgtg cggtgcgaga actgctggaa 240
 ccacttggcg atgcactgcc aggtcgcgtt ctggtcaacc tgacgagcgg tacgtcgcgt 300
 gaagcccgtg agaacgcaga acatactgag gctcagggag ccacctacct ggatgggtgtg 360
 attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
 cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcac taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
 ggctgtgcta atggtttcct gcatggaacc gcactgctgg gaaccgcggg cgtttcggca 600

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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

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<210> 262

<211> 292

<212> PRT

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 262

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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
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

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

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

<400> 263
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 gctgatgaac tgattggtcg 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
 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 ggggtcaagg tgggaagcga tgactggtat aattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg atgccacgat tgataccag 720
 cgtgctgcaa tgcagcacct ggtcaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggctgtgg tgggtgactct 840
 tacgtctcac 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

	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> 265

<211> 879

<212> DNA

<213> Artificial Sequence

<220>

<223> Imine reductase variant from Pseudonocardia spinosispora

<400> 265

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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 acatactgcg gtcagggag ccacctacct ggatggtgtg 360
attctgacca ttccaagcgg cattggcacc ccagaagcta ccattctgta ttcgggaccg 420
cgcagtacct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
gtaggggaag atcacggact ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaaaggt tgggaagcga 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

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<210> 266

<211> 292

<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

```
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 atgactgcc aggtcgcgtt ctggtcaacc 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 ggctaacctg tatgatgcag caatgtcgag catgatgtgg 540
ggcctgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
acctctgtgg ttccgatgct gggtaaggt 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
tacgtgcac 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
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 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
 cgagtagcct tcgatgaaca tgaaagcgca ctgcgcgcat taggtccggg ggcgaccttt 480
 gtaggggaag atcacggact ggctgcactg tatgatgcag caatgctgag cgtcatgttg 540
 ggctgtgctga atggtttcct gcatggaacc gactgctgg gaaccgcggg cgtttcggca 600
 acctctgtgg ttccgatgct gggtaaggt atcgaagcgg tgaccggttg gattgcgcgc 660
 tacgcagatc agattgatgc cgggtgtctat ccagcagacg acgccacgat tgataccag 720
 cgtgtgcaa tgacgacact ggtcgaggag agccgtgcgg cgggcatcaa tggcgaactt 780
 ccggcgtttg tgaccaaact ggccgatcgc gcagtggcag aaggtcgttg tggtagctct 840
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<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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