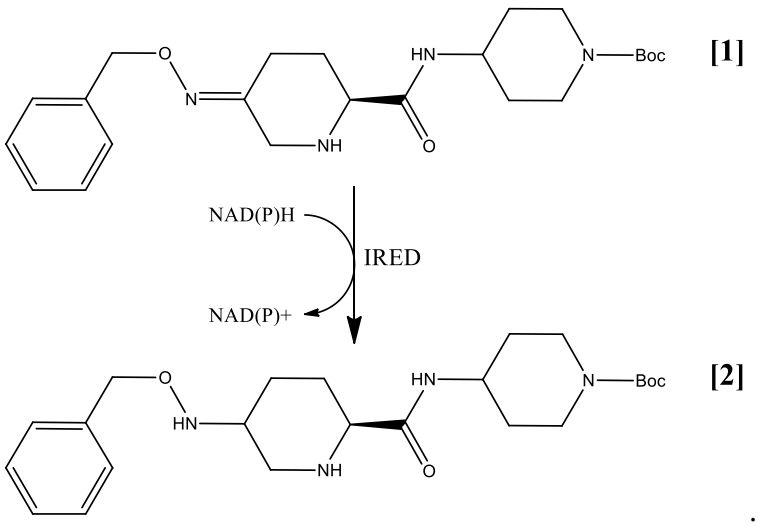
CLAIMS

What is claimed is:

1. An engineered polypeptide comprising an amino acid sequence with at least 80% sequence identity to a reference sequence of SEQ ID NO:2, comprising at least one substitution at one or more positions selected from 57/211, 87/175, 103/212, 122, 123, 124/178, 124, 132, 134, 169, 171, 173, 175, 176, 178/242, 178, 211, 212, 213, 214, 215, 217, 234, and 235, wherein said positions are numbered with reference to SEQ ID NO:2, wherein the engineered polypeptide has increased imine reductase activity compared to SEQ ID NO:2 of at least 1.5 fold, wherein imine reductase activity is measured by production of Compound [2] according to the following Scheme:



2. The engineered polypeptide of Claim 1, wherein the engineered polypeptide has increased imine reductase activity compared to SEQ ID NO:2 of at least 2 fold.

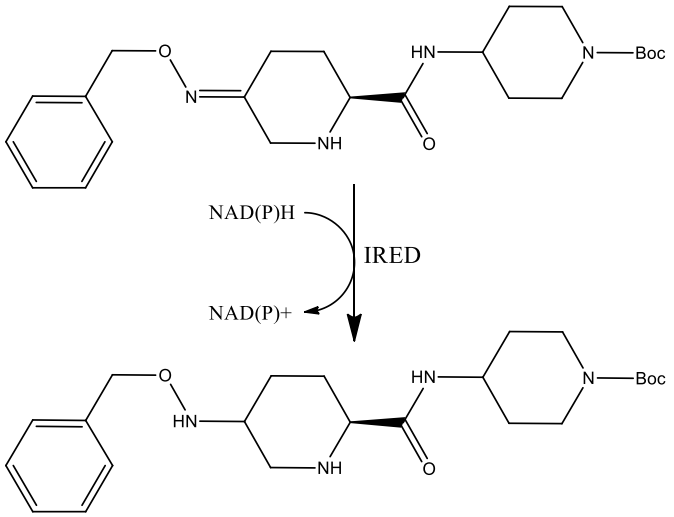
3. The engineered polypeptide of Claim 1 or Claim 2, wherein said polypeptide comprises at least one substitution selected from 57T/211L, 87S/175G, 103H/212C, 122E, 123G, 124A/178I, 124G, 132H/R, 134R, 169N/S, 171W, 173H/I, 175G/H, 176S, 178I/242Y, 178M, 211L/W, 212C/G/V, 213P/R/T/V, 214M, 215L/M, 217I/L, 234L, and 235K, wherein said positions are numbered with reference to SEQ ID NO:2.

4. The engineered polypeptide of Claim 1 or Claim 2, wherein said polypeptide comprises at least one substitution selected from A57T/I211L, P87S/M175G, R103H/E212C, L122E, T123G, I124A/V178I, I124G, E132H/R, T134R, A169N/S, Y171W, A173H/I, M175G/H, L176S, V178I/A242Y,

V178M, I211L/W, E212C/G/V, A213P/R/T/V, V214M, T215L/M, W217I/L, D234L, and A235K, wherein said positions are numbered with reference to SEQ ID NO:2.

5 The engineered polypeptide of Claim 1 or Claim 2, wherein said polypeptide comprises an amino acid sequence with at least 80% sequence identity to any even-numbered sequence set forth in SEQ ID NO:4 to SEQ ID NO:74.

6. An engineered polypeptide comprising an amino acid sequence with at least 80% sequence identity to a reference sequence of SEQ ID NO:270, comprising at least two substitutions selected from the substitution sets: 123/124/169/171/173/213/235, 123/124/169/212/213/235, 123/169/171/173/212/213/235, 123/169/171/173/213/235, 123/169/173/175/213/235, 123/169/173/212/213, 123/169/175, 123/169/175/212/235, 123/169/212/213, 123/173/175/212/213/235, 123/212/213/235, 123/212/235, 123/169/171/173/175/212/213, 123/169/173, 123/169/212/213/235, 123/213, 124/169, 124/169/173/175/212/213, 124/169/173/212/213, 124/169/173/212/213/235, 124/169/175/212/213/235, 124/169/212/213/235, 124/169/213/235, 124/175/212/213/235, 124/212/213/235, 134/169/176/178/211/214, 134/169/176/178/211, 134/169/176/178/211/217, 134/169/176/211/215/217/234, 134/169/176/211, 134/169/178/211/214/217, 134/169/211/214/217, 134/169/211/217, 134/176/211/214, 134/176/211/215, 134/211/214, 169/171/173/213/235, 169/173/175/213/235, 169/175/212/213/235, 169/176/178/211/214, 169/176/178/211/214/217, 169/176/178/211/217, 169/176/178, 169/176/178/211/214/217, 169/176/211/214, 169/176/211/214/215/234, 169/176/211/214/217, 169/176/211/217, 169/176/214/215/217, 169/178/217, 169/178/234, 169/211/214/215, 169/211/217, 169/212/213, 169/212/235, 169/212/213/235, 169/235, 171/173/212/213/235, 173/175/213, 175/213/235, 175/235, 176/178/211/215/217, 176/178/211/217, 176/211/214, 176/214/217, 178/211/214, 178/211/217, 178/215, 211/234, 212/213/235, and 213/235, wherein said positions are numbered with reference to SEQ ID NO:270 , wherein the engineered polypeptide has increased imine reductase activity compared to SEQ ID NO:2 of at least 1.5 fold, wherein imine reductase activity is measured by production of Compound [2] according to the following Scheme:



7. The engineered polypeptide of Claim 6, wherein the engineered polypeptide has increased imine reductase activity compared to SEQ ID NO:2 of at least 2 fold.

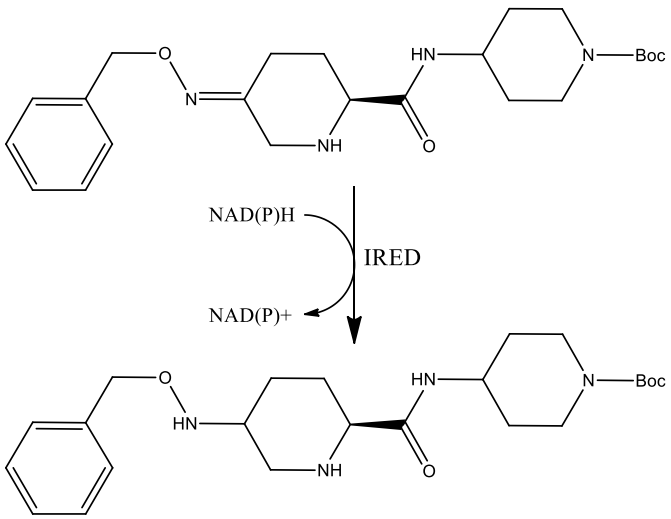
8. The engineered polypeptide of Claim 6 or Claim 7, wherein said polypeptide comprises at least one substitution set selected from 123G/124G/169N/171V/173H/213V/235K, 123G/124G/169N/212V/213V/235K, 123G/169N/171V/173H/213V/235K, 123G/169N/171V/173I/212C/213V/235K, 123G/169N/173H/175H/213V/235K, 123G/169N/173I/212G/213T, 123G/169N/175G, 123G/169N/175G/212C/235K, 123G/169N/212G/213V, 123G/173H/175H/212C/213V/235K, 123G/212C/213V/235K, 123G/212G/235K, 123G/169N/171V/173H/175H/212X/213V, 123G/169N/173I, 123G/169N/212G/213V/235K, 123G/213T, 124G/169N, 124A/169N/173I/175H/212G/213V, 124G/169N/173I/212C/213V, 124G/169N/173I/212G/213V, 124G/169N/173I/212V/213V/235K, 124G/169N/175G/212C/213V/235K, 124G/169N/212G/213V/235K, 124G/169N/212V/213V/235K, 124G/175G/212V/213V/235K, 124G/169N/213V/235K, 124G/212C/213V/235K, 124G/212G/213V/235K, 134R/169N/176S/178I/211L/214M, 134R/169N/176S/178I/211W, 134R/169N/176S/178M/211L/217L, 134R/169N/176S/211L/215M/217I/234L, 134R/169N/176S/211W, 134R/169N/178M/211W/214M/217I, 134R/169N/211W/214M/217L, 134R/169N/211W/217L, 134R/176S/211W/214M, 134R/176S/211W/215M, 134R/211W/214M, 169N/171V/173I/213V/235K, 169N/173I/175H/213V/235K, 169N/175G/212C/213V/235K, 169N/M175H/E212G/A213V/A235K 169N/176S/178I/211L/214M, 169N/176S/178I/211W/214M/217L, 169N/176S/178I/211W/217L 169N/176S/178M, 169N/176S/178M/211W/214M/217I, 169N/176S/211W/214M, 169N/176S/211W/214M/215L/234L, 169N/176S/211W/217I, 169N/176S/211W/217L, 169N/176S/214M/215M/217I, 169N/176S/211L/214M/217I, 169N/178I/217I, 169N/178M/234L, 169N/211W/214M/215L, 169N/211W/217I, 169N/212C/235K, 169N/212C/213V/235K, 169N/212G/213V, 169N/212V/213V/235K, 169N/235K, 171V/173I/212G/213V/235K, 173I/175H/213V, 175H/213P/235K, 175H/235K, 176S/178I/211W/215L/217L, 176S/178I/211W/217I, 176S/211L/214M,

176S/214M/217L, 178M/211L/214M, 178M/211W/217L, 178I/215M, 211W/234L, 212G/213V/235K, 212V/213V/235K, 213T/235K, and 213V/235K, wherein said positions are numbered with reference to SEQ ID NO:270.

9. The engineered polypeptide of Claim 6 of Claim 7, wherein said polypeptide comprises at least one substitution set selected from T123G/I124G/A169N/Y171V/A173H/A213V/A235K, T123G/I124G/A169N/E212V/A213V/A235K, T123G/A169N/Y171V/A173H/A213V/A235K, T123G/A169N/Y171V/A173I/E212C/A213V/A235K, T123G/A169N/A173H/M175H/A213V/A235K, T123G/A169N/A173I/E212G/A213T, T123G/A169N/M175G, T123G/A169N/M175G/E212C/A235K, T123G/A169N/E212G/A213V, T123G/A173H/M175H/E212C/A213V/A235K, T123G/E212C/A213V/A235K, T123G/E212G/A235K, T123G/A169N/Y171V/A173H/M175H/E212X/A213V, T123G/A169N/A173I, T123G/A169N/E212G/A213V/A235K, T123G/A213T, I124G/A169N, I124A/A169N/A173I/M175H/E212G/A213V, I124G/A169N/A173I/E212C/A213V, I124G/A169N/A173I/E212G/A213V, I124G/A169N/A173I/E212V/A213V/A235K, I124G/A169N/M175G/E212C/A213V/A235K, I124G/A169N/E212G/A213V/A235K, I124G/A169N/E212V/A213V/A235K, I124G/M175G/E212V/A213V/A235K, I124G/A169N/A213V/A235K, I124G/E212C/A213V/A235K, I124G/E212G/A213V/A235K, T134R/A169N/L176S/V178I/I211L/V214M, T134R/A169N/L176S/V178I/I211W, T134R/A169N/L176S/V178M/I211L/W217L, T134R/A169N/L176S/I211L/T215M/W217I/D234L, T134R/A169N/L176S/I211W, T134R/A169N/V178M/I211W/V214M/W217I, T134R/A169N/I211W/V214M/W217L, T134R/A169N/I211W/W217L, T134R/L176S/I211W/V214M, 134R/L176S/I211W/T215M, T134R/I211W/V214M, A169N/Y171V/A173I/A213V/A235K, A169N/A173I/M175H/A213V/A235K, A169N/M175G/E212C/A213V/A235K, A169N/M175H/E212G/A213V/A235K, A169N/L176S/V178I/I211L/V214M, A169N/L176S/V178I/I211W/V214M/W217L, A169N/L176S/V178I/I211W/W217L, A169N/L176S/V178M, A169N/L176S/V178M/I211W/V214M/W217I, A169N/L176S/I211W/V214M, A169N/L176S/I211W/V214M/T215L/D234L, A169N/L176S/I211W/W217I, A169N/L176S/I211W/W217L, A169N/L176S/V214M/T215M/W217I, A169N/L176S/I211L/V214M/W217I, A169N/V178I/W217I, A169N/V178M/D234L, A169N/I211W/V214M/T215L, A169N/I211W/W217I, A169N/E212C/A235K, A169N/E212C/A213V/A235K, A169N/E212G/A213V, A169N/E212V/A213V/A235K, A169N/A235K, Y171V/A173I/E212G/A213V/A235K, A173I/M175H/A213V, M175H/A213P/A235K, M175H/A235K, L176S/V178I/I211W/T215L/W217L, L176S/V178I/I211W/W217I, L176S/I211L/V214M, L176S/V214M/W217L, V178M/I211L/V214M, V178M/I211W/W217L, V178I/T215M, I211W/D234L, E212G/A213V/A235K, E212V/A213V/A235K, A213T/A235K, and A213V/A235K, wherein said positions are numbered with reference to SEQ ID NO:270.

10. The engineered polypeptide of Claim 6 or Claim 7, wherein said polypeptide comprises an amino acid sequence with at least 80% sequence identity to any even-numbered sequence set forth in SEQ ID NO:76 to SEQ ID NO:232.

11. An engineered polypeptide comprising an amino acid sequence with at least 80% sequence identity to a reference sequence of SEQ ID NO:230, comprising at least one substitution at one or more positions selected from 45, 127, 130, 134, 174, 206, 209, 212, 216, 223, 227, and 279, wherein said positions are numbered with reference to SEQ ID NO:230 , wherein the engineered polypeptide has increased imine reductase activity compared to SEQ ID NO:2 of at least 1.5 fold, wherein imine reductase activity is measured by production of Compound [2] according to the following Scheme:



12. The engineered polypeptide of Claim 11, wherein the engineered polypeptide has increased imine reductase activity compared to SEQ ID NO:2 of at least 2 fold.

13. The engineered polypeptide of Claim 11 or Claim 12, wherein said polypeptide comprises at least one substitution selected from 45I, 127R, 130R, 134L/R, 174M, 206L, 209K/S, 212H/K/R, 216N/R/S, 223N, 227V, and 279V, wherein said positions are numbered with reference to SEQ ID NO:230.

14. The engineered polypeptide of Claim 11 or Claim 12, wherein said polypeptide comprises at least one substitution selected from V45I, G127R, T130R, T134L/R, A174M, M206L, Q209K/S, E212H/K/R, G216N/R/S, D223N, A227V, and D279V, wherein said positions are numbered with

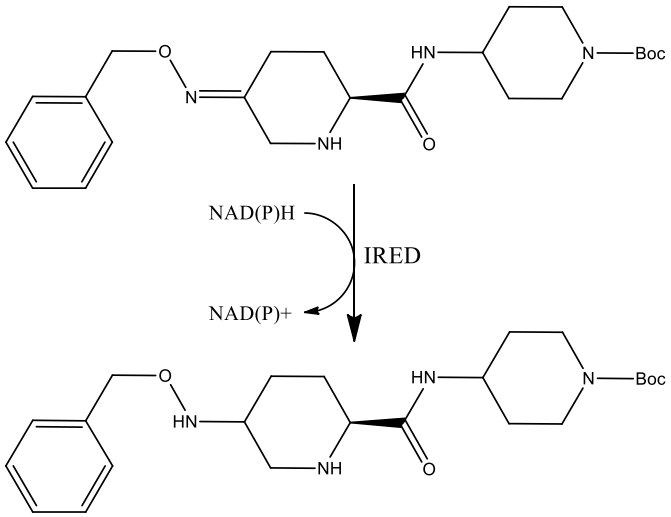
reference to SEQ ID NO:230.

15. The engineered polypeptide of Claim 11 or Claim 12, wherein said polypeptide comprises an amino acid sequence with at least 80% sequence identity to any even-numbered sequence set forth in SEQ ID NO:234 to SEQ ID NO:270.

16. An engineered polynucleotide encoding at least one engineered polypeptide of any of Claims 1 to 15.

17. The engineered polynucleotide of Claim 16, wherein the polynucleotide comprises the odd-numbered sequences set forth in SEQ ID NO:3 to SEQ ID NO:267.

18. An engineered polynucleotide encoding an engineered imine or oxime reductase polypeptide, wherein the engineered polynucleotides comprise substitution(s) at positions 12/15/18/21/27, 169/631/633, 259/523/524/525, 308/634/635/636, 364/365/366, 367/368/369, 370/371, 370/371/372/532, 394/396, 394/395/396, 401/402, 505/506/507, 512/513, 517/518/519, 523/524/525, 526/527/528, 532/534, 532/724/725, 631/633, 631/632/633, 634/635/636, 635/636, 637/638, 637/639, 637/639, 638/639, 640, 643/644/645, 644/645, 649/650/651, 700/701/702, and 703/704/705, wherein the positions are numbered with reference to SEQ ID NO:1, wherein the engineered polypeptide has increased imine reductase activity compared to SEQ ID NO:2 of at least 1.5 fold, wherein imine reductase activity is measured by production of Compound [2] according to the following Scheme:



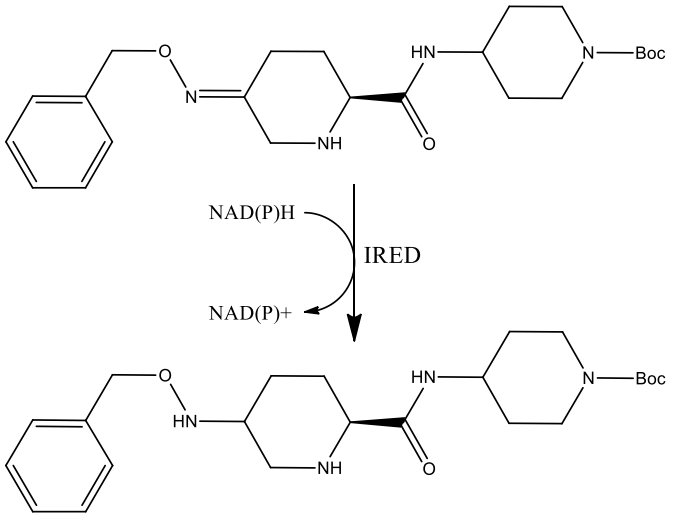
19. The engineered polypeptide of Claim 18, wherein the engineered polypeptide has increased imine reductase activity compared to SEQ ID NO:2 of at least 2 fold.

20. The engineered polynucleotide encoding the engineered imine or oxime reductase polypeptide of Claim 18 or Claim 19, wherein said engineered polynucleotide comprises at least one of the following substitution(s)/substitution sets selected from 12A/15T/18G/21C/27A, 169A/631C/633T, 259T/523G/524G/525T, 308A/634T/635G/636T, 364G/365A/366A, 367G/368G/369T, 370G/371G, 370G/371C/372A/532A, 394C/396T, 394A/395G/396G, 401G/402G, 505A/506A/507T, 505A/506G/507T, 512G/513G, 517A/518T/519T, 517C/518A/519T, 523C/524A/525T, 523G/524G/525T, 526A/527G/528T, 532A/534G, 532A/724T/725A, 631C/633T, 631T/632G/633G, 634T/635G/636T, 635G/636T, 635T/636T, 637A/638G, 637A/639A, 637C/639A, 638T/639T, 640A, 643T/644T/645G, 644T/645G, 649A/650T/651T, 649C/650T/651T, 700T/701T/702G, and 703A/704A/705A, and wherein the positions are numbered with reference to SEQ ID NO:1.

21. The engineered polynucleotide encoding the engineered imine or oxime reductase polypeptide of Claim 18 or Claim 19, wherein said engineered polynucleotide comprises at least one of the following substitution(s)/substitution sets selected from C12A/C15T/A18G/T21C/T27A, G169A/A631C/C633T, C259T/A523G/T524G/G525T, G308A/G634T/A635G/A636T, C364G/T365A/G366A, A367G/C368G/C369T, A370G/T371G, A370G/T371C/T372A/G532A, G394C/A396T, G394A/A395G/A396G, C401G/C402G, G505A/C506A/A507T, G505A/C506G/A507T, A512G/T513G, G517A/C518T/A519T, G517C/C518A/A519T, A523C/T524A/G525T, A523G/T524G/G525T, C526A/T527G/G528T, G532A/C534G, G532A/G724T/C725A, A631C/C633T, A631T/T632G/C633G, G634T/A635G/A636T, A635G/A636T, A635T/A636T, G637A/C638G, G637A/G639A, G637C/G639A, C638T/G639T, G640A, A643T/C644T/C645G, C644T/C645G, T649A/G650T/G651T, T649C/G650T/G651T, G700T/A701T/C702G, and G703A/C704A/C705A, and wherein the positions are numbered with reference to SEQ ID NO:1.

22. An engineered polynucleotide encoding an engineered imine or oxime reductase polypeptide, wherein the engineered polynucleotides comprise substitution(s) at positions
367/368/369/505/506/507/513/519/523/524/525/634/635/636/639/703/704/705,
369/370/371/372/505/506/507/513/519/638/703/704/705,
369/370/371/372/507/513/519/523/524/525/635/638/703/704/705,
369/505/506/507/511/512/517/518/519/638/703/704/705,
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401/402/505/506/507/526/527/532/534/631/632/633/645/702,
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401/402/505/506/507/526/527/534/631/633/644/645/649/650/651/700/701,
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402/505/506/507/526/534/631/632/633/645/649/650/651/702,
402/507/526/527/532/534/631/632/633/643/644/645/649/650/651/702,
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505/506/507/526/527/532/534/631/632/633/640/645/649/650/651/702,
505/506/507/526/527/532/534/631/632/633/645/649/650/651/702,
505/506/507/526/534/631/632/633/640/643/644/645, 507/526/527/534/633/640/645/649/650/651/702,
507/526/532/534/644/645/702, and 631/632/633/645/700/701, wherein the positions are numbered with reference to SEQ ID NO:269, wherein the engineered polypeptide has increased imine reductase activity compared to SEQ ID NO:2 of at least 1.5 fold, wherein imine reductase activity is measured by production of Compound [2] according to the following Scheme:



23. The engineered polypeptide of Claim 1, wherein the engineered polypeptide has increased imine reductase activity compared to SEQ ID NO:2 of at least 2 fold.

24. The engineered polynucleotide encoding the engineered imine or oxime reductase polypeptide of Claim 22, wherein said engineered polynucleotide comprises at least one of the following substitution(s)/substitution sets selected from
367G/368G/369T/505A/506A/507T/513C/519C/523G/524G/525C/634T/635G/636C/639T/703A/704A/705G, 369G/370G/371G/372C/505A/506A/507T/513C/519C/638T/703A/704A/705G,
369G/370G/371G/372C/507C/513C/519C/523G/524G/525C/635T/638T/703A/704A/705G,
369G/505A/506A/507T/511G/512T/517A/518T/519T/638T/703A/704A/705G,
369G/505A/506A/507T/513C/517A/518T/519T/523C/524A/525C/638T/703A/704A/705G,
369G/505A/506A/507T/513C/519C/523G/524G/525C/634T/635G/636C/638T/703A/704A/705G,
369G/505A/506A/507T/513C/519C/635T/638T/703A/704A/705G,
401G/402G/505A/506A/507C/526T/527C/532A/534G/631C/633A/645T/649C/650T/651A/702T,
401G/402G/505A/506A/507C/526T/527C/532A/534T/631C/633A/640A/645T/702T,
401G/402G/505A/506A/507C/526T/527C/532A/534T/631T/632G/633G/645T/702T,
401G/402G/505A/506A/507C/526T/527C/534G/631C/633A/644T/645G/649A/650T/651A/700C/701T,
401G/402G/505A/506A/507C/526T/527C/534T/631T/632G/633G/645T/702T,
401G/402G/505A/506A/507C/526T/532A/534G/631T/632G/633G/640A/645T/649A/650T/651A/702T,
401G/402G/505A/506A/507C/526T/534G/631T/632G/633G/640A/645T/649C/650T/651A/702T,
401G/402G/505A/506A/507C/526T/534T/631T/632G/633G/645T/649C/650T/651A/702T,
401G/402G/507C/526T/527C/534G/631T/632G/633G/640A/645T/702T,
401G/402G/507C/526T/527C/534G/631T/632G/633G/644T/645G/702T,
401G/402G/526T/534G/631T/632G/633G/640A/645T/702T,
402G/505A/506A/507C/526T/527C/532A/534T/631T/632G/633G/640A/645T/649C/650T/651A/702T,
402G/505A/506A/507C/526T/527C/532A/534G/702T,

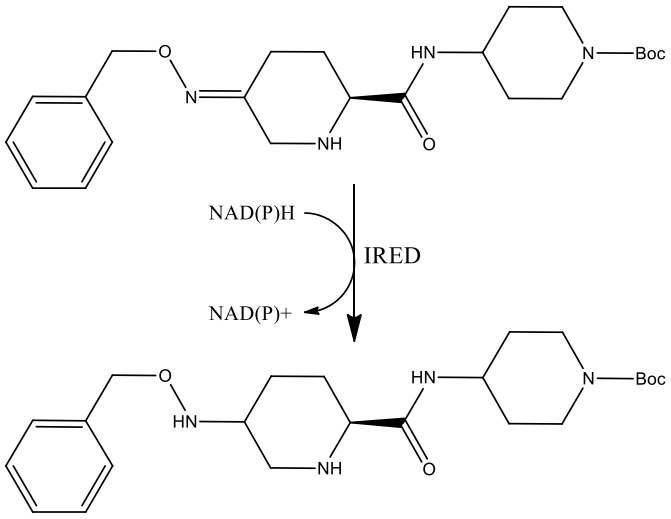
402G/505A/506A/507C/526T/527C/532A/534T/631C/633A/640A/645T/702T,
402G/505A/506A/507C/526T/527C/532A/534T/631T/632G/633G/640A/645T/649C/650T/651A/702T,
402G/505A/506A/507C/526T/527C/534G/631C/633A/640A/645T/649A/650T/651A/702T,
402G/505A/506A/507C/526T/527C/534G/631T/632G/633G/640A/643T/644T/645G/700C/701T,
402G/505A/506A/507C/526T/527C/534G/631T/632G/633G/640A/645T/702T,
402G/505A/506A/507C/526T/527C/534G/631T/632G/633G/645T/649C/650T/651A/702T,
402G/505A/506A/507C/526T/527C/534T/631T/632G/633G/645T/649A/650T/651A/702T,
402G/505A/506A/507C/526T/527C/534T/633A/640A/644T/645G/649A/650T/651A/702T,
402G/505A/506A/507C/526T/532A/534G/633A/645T/700C/701T,
402G/505A/506A/507C/526T/532A/534T/645T/649A/650T/651A,
402G/505A/506A/507C/526T/534G/631T/632G/633G/645T/649A/650T/651A/702T,
402G/507C/526T/527C/532A/534T/631T/632G/633G/643T/644T/645G/649C/650T/651A/702T,
402G/507C/526T/527C/532A/534T/631T/632G/633G/645T/649A/650T/651A/702T,
402G/507C/526T/532A/534G/631C/633A/640A/645T,
402G/507C/526T/532A/534G/631T/632G/633G/645T/649C/650T/651A/702T,
402G/526T/527C/534T/631C/633A/640A/645T/702T,
505A/506A/507C/526T/527C/532A/534G/631T/632G/633G/640A/645T/649A/650T/651A/702T,
505A/506A/507C/526T/527C/532A/534T/631T/632G/633G/645T/649C/650T/651A/702T,
505A/506A/507C/526T/534G/631T/632G/633G/640A/643T/644T/645G,
507C/526T/527C/534G/633A/640A/645T/649C/650T/651A/702T,
507C/526T/527C/534G/633A/640A/645T/649C/650T/651A/702T,
507C/526T/532A/534T/644T/645G/702T, and 631T/632G/633G/645T/700C/701T, wherein the positions are numbered with reference to SEQ ID NO:269.

25. The engineered polynucleotide encoding the engineered imine or oxime reductase polypeptide of Claim 22, wherein said engineered polynucleotide comprises at least one of the following substitution(s)/substitution sets selected from
A367G/C368G/C369T/G505A/C506A/A507T/T513C/A519C/A523G/T524G/G525C/G634T/A635G/A636C/G639T/G703A/C704A/C705G,
C369G/A370G/T371G/T372C/G505A/C506A/A507T/T513C/A519C/C638T/G703A/C704A/C705G,
C369G/A370G/T371G/T372C/A507C/T513C/519C/A523G/T524G/G525C/A635T/C638T/G703A/C704A/C705G,
C369G/G505A/C506A/A507T/T511G/A512T/G517A/C518T/A519T/C638T/G703A/C704A/C705G,
C369G/G505A/C506A/A507T/T513C/G517A/C518T/A519T/A523C/T524A/G525C/C638T/G703A/C704A/C705G,
C369G/G505A/C506A/A507T/T513C/A519C/A523G/T524G/G525C/G634T/A635G/A636C/C638T/G703A/C704A/C705G, C369G/G505A/C506A/A507T/T513C/A519C/A635T/C638T/G703A/C704A/C705G,

C401G/C402G/G505A/C506A/A507C/C526T/T527C/G532A/C534G/A631C/C633A/C645T/T649C/G650T/G651A/C702T,
C401G/C402G/G505A/C506A/A507C/C526T/T527C/G532A/C534T/A631C/C633A/G640A/C645T/C702T,
C401G/C402G/G505A/C506A/A507C/C526T/T527C/G532A/C534T/A631T/T632G/C633G/C645T/C702T,
C401G/C402G/G505A/C506A/A507C/C526T/T527C/C534G/A631C/C633A/C644T/C645G/T649A/G650T/G651A/G700C/A701T,
C401G/C402G/G505A/C506A/A507C/C526T/T527C/C534T/A631T/T632G/C633G/C645T/C702T,
C401G/C402G/G505A/C506A/A507C/C526T/G532A/C534G/A631T/T632G/C633G/G640A/C645T/T649A/G650T/G651A/C702T,
C401G/C402G/G505A/C506A/A507C/C526T/C534G/A631T/T632G/C633G/G640A/C645T/T649C/G650T/G651A/C702T,
C401G/C402G/G505A/C506A/A507C/C526T/C534T/A631T/T632G/C633G/C645T/T649C/G650T/G651A/C702T, C401G/C402G/A507C/C526T/T527C/C534G/A631T/T632G/C633G/G640A/C645T/C702T,
C401G/C402G/A507C/C526T/T527C/C534G/A631T/T632G/C633G/C644T/C645G/C702T,
C401G/C402G/C526T/C534G/A631T/T632G/C633G/G640A/C645T/C702T,
C402G/G505A/C506A/A507C/C526T/T527C/G532A/C534T/A631T/T632G/C633G/G640A/C645T/T649C/G650T/G651A/C702T, C402G/G505A/C506A/A507C/C526T/T527C/G532A/C534G/C702T,
C402G/G505A/C506A/A507C/C526T/T527C/G532A/C534T/A631C/C633A/G640A/C645T/C702T,
C402G/G505A/C506A/A507C/C526T/T527C/G532A/C534T/A631T/T632G/C633G/G640A/C645T/T649C/G650T/G651A/C702T,
C402G/G505A/C506A/A507C/C526T/T527C/C534G/A631C/C633A/G640A/C645T/T649A/G650T/G651A/C702T,
C402G/G505A/C506A/A507C/C526T/T527C/C534G/A631T/T632G/C633G/G640A/A643T/C644T/C645G/G700C/A701T,
C402G/G505A/C506A/A507C/C526T/T527C/C534G/A631T/T632G/C633G/G640A/C645T/C702T,
C402G/G505A/C506A/A507C/C526T/T527C/C534G/A631T/T632G/C633G/C645T/T649C/G650T/G651A/C702T,
C402G/G505A/C506A/A507C/C526T/T527C/C534T/A631T/T632G/C633G/C645T/T649A/G650T/G651A/C702T,
C402G/G505A/C506A/A507C/C526T/T527C/C534T/C633A/G640A/C644T/C645G/T649A/G650T/G651A/C702T, C402G/G505A/C506A/A507C/C526T/G532A/C534G/C633A/C645T/G700C/A701T,
C402G/G505A/C506A/A507C/C526T/G532A/C534T/C645T/T649A/G650T/G651A,
C402G/G505A/C506A/A507C/C526T/C534G/A631T/T632G/C633G/C645T/T649A/G650T/G651A/C702T,

C402G/A507C/C526T/T527C/G532A/C534T/A631T/T632G/C633G/A643T/C644T/C645G/T649C/G650T/G651A/C702T,
C402G/A507C/C526T/T527C/G532A/C534T/A631T/T632G/C633G/C645T/T649A/G650T/G651A/C702T, C402G/A507C/C526T/G532A/C534G/A631C/C633A/G640A/C645T,
C402G/A507C/C526T/G532A/C534G/A631T/T632G/C633G/C645T/T649C/G650T/G651A/C702T,
C402G/C526T/T527C/C534T/A631C/C633A/G640A/C645T/C702T,
G505A/C506A/A507C/C526T/T527C/G532A/C534G/A631T/T632G/C633G/G640A/C645T/T649A/G650T/G651A/C702T,
G505A/C506A/A507C/C526T/T527C/G532A/C534T/A631T/T632G/C633G/C645T/T649C/G650T/G651A/C702T, G505A/C506A/A507C/C526T/C534G/A631T/T632G/C633G/G640A/A643T/C644T/C645G,
A507C/C526T/T527C/C534G/C633A/G640A/C645T/T649C/G650T/G651A/C702T,
A507C/C526T/G532A/C534T/C644T/C645G/C702T, and A631T/T632G/C633G/C645T/G700C/A701T,
wherein the positions are numbered with reference to SEQ ID NO:269.

26. An engineered polynucleotide encoding an engineered imine or oxime reductase polypeptide, wherein the engineered polynucleotides comprise substitution(s) at positions 133, 379/381, 388/389/390, 400/401/402, 401/402, 520/521/522, 616/618, 625, 625/626/627, 634, 634/635/636, 634/636, 646, 646/647, 646, 667, 680/681, and 836/837, wherein the positions are numbered with reference to SEQ ID NO:229, wherein the engineered polypeptide has increased imine reductase activity compared to SEQ ID NO:2 of at least 1.5 fold, wherein imine reductase activity is measured by production of Compound [2] according to the following Scheme:



27. The engineered polypeptide of Claim 26, wherein the engineered polypeptide has increased imine reductase activity compared to SEQ ID NO:2 of at least 2 fold.

28. The engineered polynucleotide encoding the engineered imine or oxime reductase polypeptide of Claim 25 or Claim 26, wherein said engineered polynucleotide comprises at least one of the following substitution(s)/substitution sets selected from 133A, 379A/381G, 388C/389G/390T, 400C/401T/402T, 401G/402G, 520A/521T/522G, 616C/618T, 625A, 625A/626G/627T, 634A, 634A/635G/636G, 634C/636T, 646A, 646A/647A, 646C, 667A, 680T/681T, and 836T/837T, wherein the positions are numbered with reference to SEQ ID NO:229.

29. The engineered polynucleotide encoding the engineered imine or oxime reductase polypeptide of Claim 25 or Claim 26, wherein said engineered polynucleotide comprises at least one of the following substitution(s)/substitution sets selected from G133A, G379A/C381G, A388C/C389G/C390T, A400C/C401T/C402T, C401G/C402G, G520A/C521T/A522G, A616C/G618T, C625A, C625A/A626G/A627T, G634A, G634A/A635G/A636G, G634C/A636T, G646A, G646A/G647A, G646C, G667A, C680T/C681T, and A836T/C837T, wherein the positions are numbered with reference to SEQ ID NO:229.

30. A vector comprising the engineered polynucleotide of any of Claims 16 to 29.

31. The vector of Claim 30, further comprising at least one control sequence.

32. A host cell comprising the vector of Claim 30 and/or 31.

33. The host cell of Claim 32, wherein said host cell produces at least one engineered polypeptide of any of Claims 1 to 15.

34. A method of producing an engineered imine or oxime reductase polypeptide, comprising the steps of culturing the host cell of Claim 32 or 33, under conditions such that said engineered polynucleotide is expressed and said engineered polypeptide is produced.

35. The method of Claim 34, further comprising the step of recovering said engineered polypeptide.