CLAIMS

What is claimed is:

1. Recombinant cells capable of producing of isoprene, wherein the cells comprise one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity and (i) one or more nucleic acids encoding one or more polypeptides of the complete MVA pathway and (ii) a heterologous nucleic acid encoding an isoprene synthase polypeptide, wherein culturing of said recombinant cells in a suitable media provides for the production of isoprene.

2. The cells of claim 1, wherein the one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity is capable of synthesizing glyceraldehyde 3-phosphate and acetyl phosphate from xylulose 5-phosphate.

3. The cells of claim 1, wherein the one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity is capable of synthesizing erythrose 4-phosphate and acetyl phosphate from fructose 6-phosphate.

4. The cells of claim 1, wherein the heterologous nucleic acid encoding a polypeptide having phosphoketolase activity is selected from the group consisting of: *Bifidobacterium longum, Enterococcus galliniarum, Clostridium acetobutilicum, Nostoc punctiforme, Rhodopseudomonas palustris, Pantoea, Mucilaginibacter paludis, Thermobifida fusca, Bifidobacterium breve, Rahnella aquatili, Bifidobacterium animalis, Gardnerella vaginalis, Streptomyces avermitilis, Lactobacillus plantarum,* and *Lactobacillus reuteri.*

5. The cells of claim 1, wherein the heterologous nucleic acid encoding a polypeptide having phosphoketolase activity is selected from the group consisting of: *Bifidobacterium longum, Enterococcus galliniarum,* and *Clostridium acetobutilicum.*

6. The cells of claim 1, the heterologous nucleic acid encoding an isoprene synthase polypeptide is a plant isoprene synthase polypeptide.

7. The cells of claim 1, the isoprene synthase polypeptide is a polypeptide from *Pueraria* or *Populus* or a hybrid, *Populus alba x Populus tremula.*

8. The cells of claim 1, the isoprene synthase polypeptide is selected from the group consisting of *Pueraria montana* or *Pueraria lobata, Populus tremuloides, Populus alba, Populus nigra*, and *Populus trichocarpa*.

9. The cells of claim 1, wherein one or more polypeptides of the complete MVA pathway is selected from (a) an enzyme that condenses two molecules of acetyl-CoA to form acetoacetyl-CoA; (b) an enzyme that condenses acetoacetyl-CoA with acetyl-CoA to form HMG-CoA (e.g., HMG synthase); (c) an enzyme that converts HMG-CoA to mevalonate; (d) an enzyme that phosphorylates mevalonate to mevalonate 5-phosphate; (e) an enzyme that converts mevalonate 5-phosphate to mevalonate 5-pyrophosphate; and (f) an enzyme that converts mevalonate 5-pyrophosphate to isopentenyl pyrophosphate.

10. The cells of claim 9, the recombinant cells further comprise one or more nucleic acids encoding one or more 1-deoxy-D-xylulose 5-phosphate (DXP) pathway polypeptides.

11. The cells of claim 1, wherein the one or more nucleic acids is placed under an inducible promoter or a constitutive promoter.

12. The cells of claim 1, wherein the one or more nucleic acids is cloned into one or more multicopy plasmids.

13. The cells of claim 1, wherein the one or more nucleic acids is integrated into a chromosome of the cells.

14. The cells of claim 1, wherein the recombinant cells are gram-positive bacterial cells, gram-negative bacterial cells, fungal cells, filamentous fungal cells, algal cells or yeast cells.

15. The cells of claim 1, wherein the recombinant cells are selected from the group consisting of *Bacillus subtilis, Streptomyces lividans, Streptomyces coelicolor, Streptomyces griseus, Escherichia coli, Pantoea citrea, Trichoderma reesei, Aspergillus oryzae and Aspergillus niger, Saccharomyces cerevisieae* and *Yarrowia lipolytica*.

16. Recombinant cells capable of producing isoprenoid precursors, wherein the cells comprise one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity and one or more nucleic acids encoding one or more polypeptides of

the complete MVA pathway, wherein culturing of said recombinant cells in a suitable media provides for the production of isoprenoid precursors.

17. The cells of claim 16, wherein the one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity is capable of synthesizing glyceraldehyde 3-phosphate and acetyl phosphate from xylulose 5-phosphate.

18. The cells of claim 16, wherein the one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity is capable of synthesizing erythrose 4-phosphate and acetyl phosphate from fructose 6-phosphate.

19. The cells of claim 16 wherein the heterologous nucleic acid encoding a polypeptide having phosphoketolase activity is selected from the group consisting of: *Bifidobacterium longum, Enterococcus galliniarum, Clostridium acetobutilicum, Nostoc punctiforme, Rhodopseudomonas palustris, Pantoea, Mucilaginibacter paludis, Thermobifida fusca, Bifidobacterium breve, Rahnella aquatili, Bifidobacterium animalis, Gardnerella vaginalis, Streptomyces avermitilis, Lactobacillus plantarum,* and *Lactobacillus reuteri.*

20. The cells of claim 16, wherein the heterologous nucleic acid encoding a polypeptide having phosphoketolase activity is selected from the group consisting of: *Bifidobacterium longum, Enterococcus galliniarum,* and *Clostridium acetobutilicum.*

21. The cells of claim 16, wherein one or more polypeptides of the complete MVA pathway is selected from (a) an enzyme that condenses two molecules of acetyl-CoA to form acetoacetyl-CoA; (b) an enzyme that condenses acetoacetyl-CoA with acetyl-CoA to form HMG-CoA (e.g., HMG synthase); (c) an enzyme that converts HMG-CoA to mevalonate; (d) an enzyme that phosphorylates mevalonate to mevalonate 5-phosphate; (e) an enzyme that converts mevalonate 5-phosphate to mevalonate 5-pyrophosphate; and (f) an enzyme that converts mevalonate 5-pyrophosphate to isopentenyl pyrophosphate.

22. The cells of claim 16, wherein the one or more nucleic acids is placed under an inducible promoter or a constitutive promoter.

23. The cells of claim 16, wherein the one or more nucleic acids is cloned into one or more multicopy plasmids.

24. The cells of claim 16, wherein the one or more nucleic acids is integrated into a chromosome of the cells.

25. The cells of claim 16, wherein the recombinant cells are gram-positive bacterial cells, gram-negative bacterial cells, fungal cells, filamentous fungal cells, algal cells or yeast cells.

26. The cells of claim 16, wherein the recombinant cells are selected from the group consisting of *Bacillus subtilis, Streptomyces lividans, Streptomyces coelicolor, Streptomyces griseus, Escherichia coli, Pantoea citrea, Trichoderma reesei, Aspergillus oryzae and Aspergillus niger, Saccharomyces cerevisieae* and *Yarrowia lipolytica.*

27. Recombinant cells capable of producing of isoprenoids, wherein the cells comprise one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity and (i) one or more nucleic acids encoding one or more polypeptides of the complete MVA pathway and (ii) a heterologous nucleic acid encoding an polyprenyl pyrophosphate synthase polypeptide, wherein culturing of said recombinant cells in a suitable media provides for the production of isoprenoids.

28. The cells of claim 27, wherein the one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity is capable of synthesizing glyceraldehyde 3-phosphate and acetyl phosphate from xylulose 5-phosphate.

29. The cells of claim 27, wherein the one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity is capable of synthesizing erythrose 4-phosphate and acetyl phosphate from fructose 6-phosphate.

30. The cells of claim 27, wherein the heterologous nucleic acid encoding a polypeptide having phosphoketolase activity is selected from the group consisting of: *Bifidobacterium longum, Enterococcus galliniarum, Clostridium acetobutilicum, Nostoc punctiforme, Rhodopseudomonas palustris, Pantoea, Mucilaginibacter paludis, Thermobifida fusca, Bifidobacterium breve, Rahnella aquatili, Bifidobacterium animalis, Gardnerella vaginalis, Streptomyces avermitilis, Lactobacillus plantarum,* and *Lactobacillus reuteri.*

31. The cells of claim 27, wherein the heterologous nucleic acid encoding a polypeptide having phosphoketolase activity is selected from the group consisting of: *Bifidobacterium longum, Enterococcus galliniarum,* and *Clostridium acetobutilicum.*

32. The cells of claim 27, the isoprenoid is selected from group consisting of monoterpenes, diterpenes, triterpenes, tetraterpenes, sequiterpene, and polyterpene.

33. The cells of claim 27, the isoprenoid is a sesquiterpene.

34. The cells of claim 27, the isoprenoid is selected from the group consisting of abietadiene, amorphadiene, carene, α-famesene, β-farnesene, farnesol, geraniol, geranylgeraniol, linalool, limonene, myrcene, nerolidol, ocimene, patchoulol, β-pinene, sabinene, γ-terpinene, terpindene and valencene.

35. The cells of claim 27, wherein one or more polypeptides of the complete MVA pathway is selected from (a) an enzyme that condenses two molecules of acetyl-CoA to form acetoacetyl-CoA; (b) an enzyme that condenses acetoacetyl-CoA with acetyl-CoA to form HMG-CoA (e.g., HMG synthase); (c) an enzyme that converts HMG-CoA to mevalonate; (d) an enzyme that phosphorylates mevalonate to mevalonate 5-phosphate; (e) an enzyme that converts mevalonate 5-phosphate to mevalonate 5-pyrophosphate; and (f) an enzyme that converts mevalonate 5-pyrophosphate to isopentenyl pyrophosphate.

36. The cells of claim 27, wherein the one or more nucleic acids is placed under an inducible promoter or a constitutive promoter.

37. The cells of claim 27, wherein the one or more nucleic acids is cloned into one or more multicopy plasmids.

38. The cells of claim 27, wherein the one or more nucleic acids is integrated into a chromosome of the cells.

39. The cells of claim 1, wherein the recombinant host cells are gram-positive bacterial cells, gram-negative bacterial cells, fungal cells, filamentous fungal cells, algal cells or yeast cells.

40. The cells of claim 1, wherein the recombinant host cells are selected from the group consisting of *Bacillus subtilis, Streptomyces lividans, Streptomyces coelicolor, Streptomyces*

griseus, Escherichia coli, Pantoea citrea, Trichoderma reesei, Aspergillus oryzae and Aspergillus niger, Saccharomyces cerevisieae and *Yarrowia lipolytica.*

41. A method of producing isoprene comprising: (a) culturing the recombinant cell of claim 1 under conditions suitable for producing isoprene and (b) producing isoprene.

42. A methods of producing an isoprenoid precursor comprising: (a) culturing the recombinant cell of claim 16 under conditions suitable for producing an isoprenoid precursor and (b) producing an isoprenoid precursor.

43. A methods of producing an isoprenoid comprising: (a) culturing the recombinant cell of claim 27 under conditions suitable for producing an isoprenoid and (b) producing an isoprenoid.

Claims:

1. Recombinant microbial cells capable of producing isoprene from a carbon source, wherein the cells comprise one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity and (i) one or more nucleic acids encoding one or more polypeptides of the complete MVA pathway and (ii) a heterologous nucleic acid encoding a polypeptide having isoprene synthase activity, wherein culturing of said recombinant cells in a suitable media provides for the production of isoprene, wherein the production of isoprene occurs without an increase in intracellular acetyl-CoA, and wherein the production of isoprene is increased relative to cells that do not comprise the one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity.

2. The cells of claim 1, wherein the one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity is capable of synthesizing glyceraldehyde 3-phosphate and acetyl phosphate from xylulose 5-phosphate.

3. The cells of claim 1, wherein the one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity is capable of synthesizing erythrose 4-phosphate and acetyl phosphate from fructose 6-phosphate.

4. The cells of claim 1, wherein the heterologous nucleic acid encoding a polypeptide having phosphoketolase activity is a phosphoketolase polypeptide from an organism selected from the group consisting of: *Bifidobacterium longum, Enterococcus galliniarum, Clostridium acetobutylicum, Nostoc punctiforme, Rhodopseudomonas palustris, Pantoea, Mucilaginibacter paludis, Thermobifida fusca, Bifidobacterium breve, Rahnella aquatili, Bifidobacterium animalis, Gardnerella vaginalis, Streptomyces avermitilis, Lactobacillus plantarum,* and *Lactobacillus reuteri.*

5. The cells of claim 1, wherein the heterologous nucleic acid encoding a polypeptide having phosphoketolase activity is a phosphoketolase polypeptide from an organism selected from the group consisting of: *Bifidobacterium longum, Enterococcus galliniarum,* and *Clostridium acetobutylicum.*

6. The cells of claim 1, wherein the polypeptide having isoprene synthase activity is a plant isoprene synthase polypeptide.

7. The cells of claim 1, wherein the polypeptide having isoprene synthase activity is a polypeptide from *Pueraria* or *Populus* or a hybrid of *Populus alba x Populus tremula*.

8. The cells of claim 1, wherein the polypeptide having isoprene synthase activity is from an organism selected from the group consisting of *Pueraria montana*, *Pueraria lobata*, *Populus tremuloides*, *Populus alba*, *Populus nigra*, and *Populus trichocarpa*.

9. The cells of claim 1, wherein one or more polypeptides of the complete MVA pathway is selected from (a) (i) an acetyl-CoA acetyltransferase polypeptide that condenses two molecules of acetyl-CoA to form acetoacetyl-CoA or (ii) an acetoacetyl-CoA synthase polypeptide that utilizes acetyl-CoA and malonyl-CoA to form acetoacetyl-CoA; (b) a 3-hydroxy-3-methylglutaryl-CoA synthase polypeptide that condenses acetoacetyl-CoA with acetyl-CoA to form HMG-CoA; (c) a 3-hydroxy-3-methylglutaryl-CoA reductase polypeptide that converts HMG-CoA to mevalonate; (d) a mevalonate kinase polypeptide that phosphorylates mevalonate to mevalonate 5-phosphate; (e) a phosphomevalonate kinase polypeptide that converts mevalonate 5-phosphate to mevalonate 5-pyrophosphate; and (f) a diphosphomevalonte decarboxylase polypeptide that converts mevalonate 5-pyrophosphate to isopentenyl pyrophosphate.

10. The cells of claim 9, wherein the recombinant cells further comprise one or more nucleic acids encoding one or more 1-deoxy-D-xylulose 5-phosphate (DXP) pathway polypeptides.

11. The cells of claim 1, wherein the one or more nucleic acids is placed under control of an inducible promoter or a constitutive promoter.

12. The cells of claim 1, wherein the one or more nucleic acids is cloned into one or more multicopy plasmids.

13. The cells of claim 1, wherein the one or more nucleic acids is integrated into a chromosome of the cells.

14. The cells of claim 1, wherein the recombinant cells are gram-positive bacterial cells, gram-negative bacterial cells, fungal cells, filamentous fungal cells, algal cells or yeast cells.

15. The cells of claim 1, wherein the recombinant cells are selected from the group consisting of *Bacillus subtilis, Streptomyces lividans, Streptomyces coelicolor, Streptomyces griseus, Escherichia coli, Pantoea citrea, Trichoderma reesei, Aspergillus oryzae, Aspergillus niger, Saccharomyces cerevisieae* and *Yarrowia lipolytica.*

16. Recombinant microbial cells capable of producing isoprenoid precursors from a carbon source, wherein the cells comprise one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity and one or more nucleic acids encoding one or more polypeptides of the complete MVA pathway, wherein culturing of said recombinant cells in a suitable media provides for the production of isoprenoid precursors, wherein the production of isoprenoid precursors occurs without an increase in intracellular acetyl-CoA, and wherein the production of isoprenoid precursors is increased relative to cells that do not comprise the one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity.

17. The cells of claim 16, wherein the polypeptide having phosphoketolase activity is capable of synthesizing glyceraldehyde 3-phosphate and acetyl phosphate from xylulose 5-phosphate.

18. The cells of claim 16, wherein the polypeptide having phosphoketolase activity is capable of synthesizing erythrose 4-phosphate and acetyl phosphate from fructose 6-phosphate.

19. The cells of claim 16 wherein the heterologous nucleic acid encoding a polypeptide having phosphoketolase activity is a phosphoketolase polypeptide from an organism selected from the group consisting of: *Bifidobacterium longum, Enterococcus galliniarum, Clostridium acetobutylicum, Nostoc punctiforme, Rhodopseudomonas palustris, Pantoea, Mucilaginibacter paludis, Thermobifida fusca, Bifidobacterium breve, Rahnella aquatili, Bifidobacterium animalis, Gardnerella vaginalis, Streptomyces avermitilis, Lactobacillus plantarum,* and *Lactobacillus reuteri.*

20. The cells of claim 16, wherein the heterologous nucleic acid encoding a polypeptide having phosphoketolase activity is a phosphoketolase polypeptide from an organism selected from the group consisting of: *Bifidobacterium longum, Enterococcus galliniarum,* and *Clostridium acetobutylicum.*

21. The cells of claim 16, wherein one or more polypeptides of the complete MVA pathway is selected from (a) (i) an acetyl-CoA acetyltransferase polypeptide that condenses two molecules of acetyl-CoA to form acetoacetyl-CoA or (ii) an acetoacetyl-CoA synthase polypeptide that utilizes acetyl-CoA and malonyl-CoA to form acetoacetyl-CoA; (b) a 3-hydroxy-3-methylglutaryl-CoA synthase polypeptide that condenses acetoacetyl-CoA with acetyl-CoA to form HMG-CoA; (c) a 3-hydroxy-3-methylglutaryl-CoA reductase polypeptide that converts HMG-CoA to mevalonate; (d) a mevalonate kinase polypeptide that phosphorylates mevalonate to mevalonate 5-phosphate; (e) a phosphomevalonate kinase polypeptide that converts mevalonate 5-phosphate to mevalonate 5-pyrophosphate; and (f) a diphosphomevalonte decarboxylase polypeptide that converts mevalonate 5-pyrophosphate to isopentenyl pyrophosphate.

22. The cells of claim 16, wherein the one or more nucleic acids is placed under control of an inducible promoter or a constitutive promoter.

23. The cells of claim 16, wherein the one or more nucleic acids is cloned into one or more multicopy plasmids.

24. The cells of claim 16, wherein the one or more nucleic acids is integrated into a chromosome of the cells.

25. The cells of claim 16, wherein the recombinant cells are gram-positive bacterial cells, gram-negative bacterial cells, fungal cells, filamentous fungal cells, algal cells or yeast cells.

26. The cells of claim 16, wherein the recombinant cells are selected from the group consisting of *Bacillus subtilis, Streptomyces lividans, Streptomyces coelicolor, Streptomyces griseus, Escherichia coli, Pantoea citrea, Trichoderma reesei, Aspergillus oryzae, Aspergillus niger, Saccharomyces cerevisieae* and *Yarrowia lipolytica.*

27. Recombinant microbial cells capable of producing of an isoprenoid from a carbon source, wherein the cells comprise one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity and (i) one or more nucleic acids encoding one or more polypeptides of the complete MVA pathway and (ii) a heterologous nucleic acid encoding a polyprenyl pyrophosphate synthase polypeptide, wherein culturing of said recombinant cells in a suitable media provides for the production of the isoprenoid, wherein the production the isoprenoid occurs without an increase in intracellular acetyl-CoA, and wherein the production of the isoprenoid is increased relative to cells that do not comprise the one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity.

28. The cells of claim 27, wherein the polypeptide having phosphoketolase activity is capable of synthesizing glyceraldehyde 3-phosphate and acetyl phosphate from xylulose 5-phosphate.

29. The cells of claim 27, wherein the polypeptide having phosphoketolase activity is capable of synthesizing erythrose 4-phosphate and acetyl phosphate from fructose 6-phosphate.

30. The cells of claim 27, wherein the polypeptide having phosphoketolase activity is a phosphoketolase polypeptide from an organism selected from the group consisting of: *Bifidobacterium longum, Enterococcus galliniarum, Clostridium acetobutylicum, Nostoc punctiforme, Rhodopseudomonas palustris, Pantoea, Mucilaginibacter paludis, Thermobifida fusca, Bifidobacterium breve, Rahnella aquatili, Bifidobacterium animalis, Gardnerella vaginalis, Streptomyces avermitilis, Lactobacillus plantarum,* and *Lactobacillus reuteri.*

31. The cells of claim 27, wherein the polypeptide having phosphoketolase activity is a phosphoketolase polypeptide from an organism selected from the group consisting of: *Bifidobacterium longum, Enterococcus galliniarum,* and *Clostridium acetobutylicum.*

32. The cells of claim 27, wherein the isoprenoid is selected from the group consisting of a monoterpene, diterpene, triterpene, tetraterpene, sequiterpene, and polyterpene.

33. The cells of claim 27, wherein the isoprenoid is a sesquiterpene.

34. The cells of claim 27, wherein the isoprenoid is selected from the group consisting of abietadiene, amorphadiene, carene, *α*-farnesene, f3-farnesene, farnesol, geraniol, geranylgeraniol, linalool, limonene, myrcene, nerolidol, ocimene, patchoulol, f3-pinene, sabinene, γ-terpinene, terpindene and valencene.

35. The cells of claim 27, wherein one or more polypeptides of the complete MVA pathway is selected from (a) (i) an acetyl-CoA acetyltransferase polypeptide that condenses two molecules of acetyl-CoA to form acetoacetyl-CoA or (ii) an acetoacetyl-CoA synthase polypeptide that utilizes acetyl-CoA and malonyl-CoA to form acetoacetyl-CoA; (b) a 3-hydroxy-3-methylglutaryl-CoA synthase polypeptide that condenses acetoacetyl-CoA with acetyl-CoA to form HMG-CoA; (c) a 3-hydroxy-3-methylglutaryl-CoA reductase polypeptide that converts HMG-CoA to mevalonate; (d) a mevalonate kinase polypeptide that phosphorylates mevalonate to mevalonate 5-phosphate; (e) a phosphomevalonate kinase polypeptide that converts mevalonate 5-phosphate to mevalonate 5-pyrophosphate; and (f) a diphosphomevalonte decarboxylase polypeptide that converts mevalonate 5-pyrophosphate to isopentenyl pyrophosphate.

36. The cells of claim 27, wherein the one or more nucleic acids is placed under control of an inducible promoter or a constitutive promoter.

37. The cells of claim 27, wherein the one or more nucleic acids is cloned into one or more multicopy plasmids.

38. The cells of claim 27, wherein the one or more nucleic acids is integrated into a chromosome of the cells.

39. The cells of claim 27, wherein the recombinant host cells are gram-positive bacterial cells, gram-negative bacterial cells, fungal cells, filamentous fungal cells, algal cells or yeast cells.

40. The cells of claim 27, wherein the recombinant host cells are selected from the group consisting of *Bacillus subtilis, Streptomyces lividans, Streptomyces coelicolor, Streptomyces griseus, Escherichia coli, Pantoea citrea, Trichoderma reesei, Aspergillus oryzae, Aspergillus niger, Saccharomyces cerevisieae* and *Yarrowia lipolytica.*

41. The cells of claim 1, wherein the recombinant cells are further engineered to disrupt the expression of the acetate kinase gene or delete the acetate kinase gene.

42. The cells of claim 16, wherein the recombinant cells are further engineered to disrupt the expression of the acetate kinase gene or delete the acetate kinase gene.

43. The cells of claim 27, wherein the recombinant cells are further engineered to disrupt the expression of the acetate kinase gene or delete the acetate kinase gene.

44. The cells of claim 1, wherein the recombinant cells are further engineered to overexpress the phosphate acetyltransferase gene.

45. The cells of claim 16, wherein the recombinant cells are further engineered to overexpress the phosphate acetyltransferase gene.

46. The cells of claim 27, wherein the recombinant cells are further engineered to overexpress the phosphate acetyltransferase gene.

47. The cells of claim 1, wherein the production of isoprene is increased by at least 5% relative to cells that do not comprise the one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity.

48. The cells of claim 1, wherein the production of isoprene is increased by at least 10% relative to cells that do not comprise the one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity.

49. The cells of claim 16, wherein the production of isoprenoid precursors is increased by at least 5% relative to cells that do not comprise the one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity.

50. The cells of claim 16, wherein the production of isoprenoid precursors is increased by at least 10% relative to cells that do not comprise the one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity.

51. The cells of claim 27, wherein the production of the isoprenoid is increased by at least 5% relative to cells that do not comprise the one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity.

52. The cells of claim 27, wherein the production of the isoprenoid is increased by at least 10% relative to cells that do not comprise the one or more heterologous nucleic acids encoding a polypeptide having phosphoketolase activity.