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NEW CLAIMS

1. A method for producing isoprenol, characterized in that it comprises the conversion of mevalonate into isoprenol by
   (i) a first enzyme having an activity of converting mevalonate into mevalonate 3-phosphate; and
   (ii) a second enzyme being different from the first enzyme and having an activity of converting said mevalonate 3-phosphate into isoprenol,
   wherein the production of isoprenol by use of the combination of enzymes as defined in (i) and (ii) is higher than the production of isoprenol achieved by either enzyme alone or the addition of the production which either enzyme achieves in isolation.

2. The method of claim 1 wherein
   (i) the first enzyme having an activity of converting mevalonate into mevalonate 3-phosphate is selected from the group consisting of
      (A) a protein comprising the amino acid sequence as shown in SEQ ID NO: 1 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 1 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 1;
      (B) a protein comprising the amino acid sequence as shown in SEQ ID NO: 2 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 2 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 2;
      (C) a protein comprising the amino acid sequence as shown in SEQ ID NO: 3 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in

SEQ ID NO: 3 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 3;

(D) a protein comprising the amino acid sequence as shown in SEQ ID NO: 4 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 4 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 4; and

(E) a protein comprising the amino acid sequence as shown in SEQ ID NO: 16 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 16 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 16.

3. The method of claim 1 or 2, wherein

(ii) the second enzyme having an activity of converting mevalonate 3-phosphate into isoprenol selected from the group consisting of

(a) a protein comprising the amino acid sequence as shown in SEQ ID NO: 5 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 5 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 5;

(b) a protein comprising the amino acid sequence as shown in SEQ ID NO: 6 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 6 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 6;

(c) a protein comprising the amino acid sequence as shown in SEQ ID NO: 7 or a protein comprising an amino acid sequence which

is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 7 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 7;

(d) a protein comprising the amino acid sequence as shown in SEQ ID NO: 8 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 8 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 8;

(e) a protein comprising the amino acid sequence as shown in SEQ ID NO: 9 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 9 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 9

(f) a protein comprising the amino acid sequence as shown in SEQ ID NO: 10 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 10 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 10;

(g) a protein comprising the amino acid sequence as shown in SEQ ID NO: 11 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 11 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 11;

(h) a protein comprising the amino acid sequence as shown in SEQ ID NO: 12 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 12 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the

corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 12;

(i) a protein comprising the amino acid sequence as shown in SEQ ID NO: 13 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 13 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 13;

(j) a protein comprising the amino acid sequence as shown in SEQ ID NO: 14 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 14 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 14;

(k) a protein comprising the amino acid sequence as shown in SEQ ID NO: 15 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 15 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 15;

(l) a protein comprising the amino acid sequence as shown in SEQ ID NO: 17 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 17 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 17;

(m) a protein comprising the amino acid sequence as shown in SEQ ID NO: 18 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 18 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 18;

(n) a protein comprising the amino acid sequence as shown in SEQ

ID NO: 19 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 19 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 19;

(o) a protein comprising the amino acid sequence as shown in SEQ ID NO: 20 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 20 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 20;

(p) a protein comprising the amino acid sequence as shown in SEQ ID NO: 21 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 21 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 21; and

(q) a protein comprising the amino acid sequence as shown in SEQ ID NO: 22 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 22 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 22.

4. The method of any one of claims 1 to 3 characterized in that the conversion step is carried out in vitro, in a cell-free system.

5. The method of any one of claims 1 to 3 characterized in that the method is carried out in the presence of a microorganism producing said enzymes as defined in (i) and (ii) of claim 1.

6. The method of claim 4 characterized by the use of a multicellular organism producing said enzymes as defined in (i) and (ii) of claim 1.

7. A composition comprising
   (a) mevalonate; and
   (b) at least two enzymes, wherein one enzyme is selected from (i) and the other enzyme is selected from (ii), wherein (i) and (ii) are as follows:
      (i) a first enzyme having an activity of converting mevalonate into mevalonate 3-phosphate; and
      (ii) a second enzyme being different from the first enzyme and having an activity of converting said mevalonate 3-phosphate into isoprenol,

   wherein the production of isoprenol by use of the combination of enzymes as defined in (i) and (ii) is higher than the production of isoprenol achieved by either enzyme alone or the addition of the production which either enzyme achieves in isolation.

8. A composition comprising
   (a) mevalonate; and
   (b) a multicellular organism or a microorganism which produces at least two enzymes, wherein one enzyme is selected from (i) and the other enzyme is selected from (ii), wherein (i) and (ii) are as follows:
      (i) a first enzyme having an activity of converting mevalonate into mevalonate 3-phosphate; and
      (ii) a second enzyme being different from the first enzyme and having an activity of converting said mevalonate 3-phosphate into isoprenol.

   wherein the production of isoprenol by use of the combination of enzymes as defined in (i) and (ii) is higher than the production of isoprenol achieved by either enzyme alone or the addition of the production which either enzyme achieves in isolation.

9. Use of a combination of at least two enzymes, wherein one enzyme is selected from the following (i) and the other enzyme is selected from the following (ii) or of a composition of claim 7 or 8 or of a microorganism as defined in claim 8, for producing isoprenol from mevalonate,
   wherein (i) and (ii) are as follows:
   (i) a first enzyme having an activity of converting mevalonate into mevalonate 3-phosphate; and
   (ii) a second enzyme being different from the first enzyme and having an activity of converting said mevalonate 3-phosphate into isoprenol,

wherein the production of isoprenol by use of the combination of enzymes as defined in (i) and (ii) is higher than the production of isoprenol achieved by either enzyme alone or the addition of the production which either enzyme achieves in isolation.

10. The composition of claim 7 or 8 or the use of claim 9, wherein

(i) the first enzyme having an activity of converting mevalonate into mevalonate 3-phosphate is selected from the group consisting of

(A) a protein comprising the amino acid sequence as shown in SEQ ID NO: 1 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 1 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 1;

(B) a protein comprising the amino acid sequence as shown in SEQ ID NO: 2 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 2 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 2;

(C) a protein comprising the amino acid sequence as shown in SEQ ID NO: 3 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 3 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 3;

(D) a protein comprising the amino acid sequence as shown in SEQ ID NO: 4 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 4 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 4; and

(E) a protein comprising the amino acid sequence as shown in SEQ ID NO: 16 or a protein comprising an amino acid sequence which

is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 16 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 16.

11. The composition of claim 7, 8 or 10 or the use of claim 9 or 10, wherein

(ii) the second enzyme having an activity of converting mevalonate 3-phosphate into isoprenol selected from the group consisting of

(a) a protein comprising the amino acid sequence as shown in SEQ ID NO: 5 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 5 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 5;

(b) a protein comprising the amino acid sequence as shown in SEQ ID NO: 6 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 6 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 6;

(c) a protein comprising the amino acid sequence as shown in SEQ ID NO: 7 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 7 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 7;

(d) a protein comprising the amino acid sequence as shown in SEQ ID NO: 8 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 8 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 8;

(e) a protein comprising the amino acid sequence as shown in SEQ

ID NO: 9 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 9 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 9

(f) a protein comprising the amino acid sequence as shown in SEQ ID NO: 10 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 10 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 10;

(g) a protein comprising the amino acid sequence as shown in SEQ ID NO: 11 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 11 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 11;

(h) a protein comprising the amino acid sequence as shown in SEQ ID NO: 12 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 12 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 12;

(i) a protein comprising the amino acid sequence as shown in SEQ ID NO: 13 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 13 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 13;

(j) a protein comprising the amino acid sequence as shown in SEQ ID NO: 14 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 14 and showing an activity of converting mevalonate

3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 14;

(k) a protein comprising the amino acid sequence as shown in SEQ ID NO: 15 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 15 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 15;

(l) a protein comprising the amino acid sequence as shown in SEQ ID NO: 17 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 17 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 17;

(m) a protein comprising the amino acid sequence as shown in SEQ ID NO: 18 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 18 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 18;

(n) a protein comprising the amino acid sequence as shown in SEQ ID NO: 19 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 19 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 19;

(o) a protein comprising the amino acid sequence as shown in SEQ ID NO: 20 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 20 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 20;

(p) a protein comprising the amino acid sequence as shown in SEQ ID NO: 21 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 21 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 21; and

(q) a protein comprising the amino acid sequence as shown in SEQ ID NO: 22 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 22 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 22.

12. A method for producing isoprenol comprising the step of enzymatically converting mevalonate 3-phosphate into isoprenol by use of an enzyme which can catalyze the conversion via decarboxylation and dephosphorylation and wherein said mevalonate-3-phosphate has been produced by a different enzyme.

13. The method of any one of claims 1 to 6 or the method of claim 12, characterized in that the method is carried out with ATP, dATP, ADP, AMP, an NTP other than ATP or a dNTP as co-substrate.

14. A method for producing isoprene from mevalonate comprising the method of any one of claims 1 to 6, 12 or 13 and further comprising the step of converting the produced isoprenol into isoprene.

15. A method for producing isoamyl alcohol from mevalonate comprising the method of any one of claims 1 to 6, 12 or 13 and further comprising the step of converting the produced isoprenol into isoamyl alcohol.

CLAIMS

1. A method for producing isoprenol, characterized in that it comprises the conversion of mevalonate into isoprenol by
   (i) a first enzyme having an activity of converting mevalonate into mevalonate 3-phosphate, wherein said first enzyme is a Mevalonate Diphosphate Decarboxylase; and
   (ii) a second enzyme being different from the first enzyme and having an activity of converting said mevalonate 3-phosphate into isoprenol, wherein said second enzyme is a Mevalonate Diphosphate Decarboxylase,

   wherein the production of isoprenol by use of the combination of enzymes as defined in (i) and (ii) is higher than the production of isoprenol achieved by either enzyme alone or the addition of the production which either enzyme achieves in isolation.

2. The method of claim 1 wherein
   (i) the first enzyme having an activity of converting mevalonate into mevalonate 3-phosphate is selected from the group consisting of
      (A) a protein comprising the amino acid sequence as shown in SEQ ID NO: 1 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 1 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 1;
      (B) a protein comprising the amino acid sequence as shown in SEQ ID NO: 2 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 2 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 2;
      (C) a protein comprising the amino acid sequence as shown in SEQ ID NO: 3 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in

SEQ ID NO: 3 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 3;

(D) a protein comprising the amino acid sequence as shown in SEQ ID NO: 4 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 4 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 4; and

(E) a protein comprising the amino acid sequence as shown in SEQ ID NO: 16 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 16 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 16.

3. The method of claim 1 or 2, wherein

(ii) the second enzyme having an activity of converting mevalonate 3-phosphate into isoprenol selected from the group consisting of

(a) a protein comprising the amino acid sequence as shown in SEQ ID NO: 5 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 5 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 5;

(b) a protein comprising the amino acid sequence as shown in SEQ ID NO: 6 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 6 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 6;

(c) a protein comprising the amino acid sequence as shown in SEQ

ID NO: 7 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 7 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 7;

(d) a protein comprising the amino acid sequence as shown in SEQ ID NO: 8 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 8 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 8;

(e) a protein comprising the amino acid sequence as shown in SEQ ID NO: 9 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 9 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 9

(f) a protein comprising the amino acid sequence as shown in SEQ ID NO: 10 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 10 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 10;

(g) a protein comprising the amino acid sequence as shown in SEQ ID NO: 11 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 11 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 11;

(h) a protein comprising the amino acid sequence as shown in SEQ ID NO: 12 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in

SEQ ID NO: 12 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 12;

(i) a protein comprising the amino acid sequence as shown in SEQ ID NO: 13 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 13 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 13;

(j) a protein comprising the amino acid sequence as shown in SEQ ID NO: 14 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 14 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 14;

(k) a protein comprising the amino acid sequence as shown in SEQ ID NO: 15 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 15 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 15;

(l) a protein comprising the amino acid sequence as shown in SEQ ID NO: 17 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 17 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 17;

(m) a protein comprising the amino acid sequence as shown in SEQ ID NO: 18 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 18 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the

corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 18;

(n) a protein comprising the amino acid sequence as shown in SEQ ID NO: 19 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 19 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 19;

(o) a protein comprising the amino acid sequence as shown in SEQ ID NO: 20 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 20 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 20;

(p) a protein comprising the amino acid sequence as shown in SEQ ID NO: 21 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 21 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 21; and

(q) a protein comprising the amino acid sequence as shown in SEQ ID NO: 22 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 22 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 22.

4. The method of any one of claims 1 to 3 characterized in that the conversion step is carried out in vitro, in a cell-free system.

5. The method of any one of claims 1 to 3 characterized in that the method is carried out in the presence of a microorganism producing said enzymes as defined in (i) and (ii) of claim 1.

6. The method of claim 4 characterized by the use of a multicellular organism producing said enzymes as defined in (i) and (ii) of claim 1.

7. A composition comprising
   (a) mevalonate; and
   (b) at least two enzymes, wherein one enzyme is selected from (i) and the other enzyme is selected from (ii), wherein (i) and (ii) are as follows:
      (i) a first enzyme having an activity of converting mevalonate into mevalonate 3-phosphate, wherein said first enzyme is a Mevalonate Diphosphate Decarboxylase; and
      (ii) a second enzyme being different from the first enzyme and having an activity of converting said mevalonate 3-phosphate into isoprenol, wherein said second enzyme is a Mevalonate Diphosphate Decarboxylase,

   wherein the production of isoprenol by use of the combination of enzymes as defined in (i) and (ii) is higher than the production of isoprenol achieved by either enzyme alone or the addition of the production which either enzyme achieves in isolation.

8. A composition comprising
   (a) mevalonate; and
   (b) a multicellular organism or a microorganism which produces at least two enzymes, wherein one enzyme is selected from (i) and the other enzyme is selected from (ii), wherein (i) and (ii) are as follows:
      (i) a first enzyme having an activity of converting mevalonate into mevalonate 3-phosphate, wherein said first enzyme is a Mevalonate Diphosphate Decarboxylase; and
      (ii) a second enzyme being different from the first enzyme and having an activity of converting said mevalonate 3-phosphate into isoprenol, wherein said second enzyme is a Mevalonate Diphosphate Decarboxylase

   wherein the production of isoprenol by use of the combination of enzymes as defined in (i) and (ii) is higher than the production of isoprenol achieved by either enzyme alone or the addition of the production which either enzyme achieves in isolation.

9. Use of a combination of at least two enzymes, wherein one enzyme is selected from the following (i) and the other enzyme is selected from the following (ii) or of a composition of claim 7 or 8 or of a microorganism as defined in claim 8, for producing isoprenol from mevalonate,

wherein (i) and (ii) are as follows:

(i) a first enzyme having an activity of converting mevalonate into mevalonate 3-phosphate, wherein said first enzyme is a Mevalonate Diphosphate Decarboxylase; and

(ii) a second enzyme being different from the first enzyme and having an activity of converting said mevalonate 3-phosphate into isoprenol, wherein said second enzyme is a Mevalonate Diphosphate Decarboxylase,

wherein the production of isoprenol by use of the combination of enzymes as defined in (i) and (ii) is higher than the production of isoprenol achieved by either enzyme alone or the addition of the production which either enzyme achieves in isolation.

10. The composition of claim 7 or 8 or the use of claim 9, wherein

(i) the first enzyme having an activity of converting mevalonate into mevalonate 3-phosphate is selected from the group consisting of

(A) a protein comprising the amino acid sequence as shown in SEQ ID NO: 1 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 1 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 1;

(B) a protein comprising the amino acid sequence as shown in SEQ ID NO: 2 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 2 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 2;

(C) a protein comprising the amino acid sequence as shown in SEQ ID NO: 3 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in

SEQ ID NO: 3 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 3;

(D) a protein comprising the amino acid sequence as shown in SEQ ID NO: 4 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 4 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 4; and

(E) a protein comprising the amino acid sequence as shown in SEQ ID NO: 16 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 16 and showing an activity of converting mevalonate into mevalonate 3-phosphate which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 16.

11. The composition of claim 7, 8 or 10 or the use of claim 9 or 10, wherein

(ii) the second enzyme having an activity of converting mevalonate 3-phosphate into isoprenol selected from the group consisting of

(a) a protein comprising the amino acid sequence as shown in SEQ ID NO: 5 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 5 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 5;

(b) a protein comprising the amino acid sequence as shown in SEQ ID NO: 6 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 6 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 6;

(c) a protein comprising the amino acid sequence as shown in SEQ

ID NO: 7 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 7 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 7;

(d) a protein comprising the amino acid sequence as shown in SEQ ID NO: 8 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 8 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 8;

(e) a protein comprising the amino acid sequence as shown in SEQ ID NO: 9 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 9 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 9

(f) a protein comprising the amino acid sequence as shown in SEQ ID NO: 10 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 10 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 10;

(g) a protein comprising the amino acid sequence as shown in SEQ ID NO: 11 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 11 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 11;

(h) a protein comprising the amino acid sequence as shown in SEQ ID NO: 12 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in

SEQ ID NO: 12 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 12;

(i) a protein comprising the amino acid sequence as shown in SEQ ID NO: 13 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 13 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 13;

(j) a protein comprising the amino acid sequence as shown in SEQ ID NO: 14 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 14 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 14;

(k) a protein comprising the amino acid sequence as shown in SEQ ID NO: 15 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 15 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 15;

(l) a protein comprising the amino acid sequence as shown in SEQ ID NO: 17 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 17 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 17;

(m) a protein comprising the amino acid sequence as shown in SEQ ID NO: 18 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 18 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the

corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 18;

(n) a protein comprising the amino acid sequence as shown in SEQ ID NO: 19 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 19 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 19;

(o) a protein comprising the amino acid sequence as shown in SEQ ID NO: 20 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 20 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 20;

(p) a protein comprising the amino acid sequence as shown in SEQ ID NO: 21 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 21 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 21; and

(q) a protein comprising the amino acid sequence as shown in SEQ ID NO: 22 or a protein comprising an amino acid sequence which is at least 15% identical to the amino acid sequence shown in SEQ ID NO: 22 and showing an activity of converting mevalonate 3-phosphate into isoprenol which is at least as high as the corresponding activity of the protein having the amino acid sequence shown in SEQ ID NO: 22.

12. A method for producing isoprenol comprising the step of enzymatically converting mevalonate 3-phosphate into isoprenol by use of an enzyme which can catalyze the conversion via decarboxylation and dephosphorylation, said enzyme being a Mevalonate Diphosphate Decarboxylase, and wherein said mevalonate-3-phosphate has been produced by a different enzyme.

13. The method of any one of claims 1 to 6 or the method of claim 12, characterized in that the method is carried out with ATP, dATP, ADP, AMP, an NTP other than ATP or a dNTP as co-substrate.

14. A method for producing isoprene from mevalonate comprising the method of any one of claims 1 to 6, 12 or 13 and further comprising the step of converting the produced isoprenol into isoprene.

15. A method for producing isoamyl alcohol from mevalonate comprising the method of any one of claims 1 to 6, 12 or 13 and further comprising the step of converting the produced isoprenol into isoamyl alcohol.