CLAIMS

1. A variant of a DNA polymerase of the polX family capable of synthesizing a nucleic acid molecule without a template strand, or of a functional fragment of such a polymerase, said variant comprising a combination of at least two substitutions at positions selected from the group consisting of E457, R336, and R454, or a functionally equivalent residue, the positions indicated being determined by alignment with SEQ ID No. 1.

2. The variant of a DNA polymerase of the polX family according to claim 1, wherein the substitutions are selected from the group consisting of R336K/H/G/N/D, R454F/Y/W/A and E457N/D/G/S/T, preferentially from the group consisting of R336N/G, R454A and E457G/N/S/T.

3. The variant of a DNA polymerase of the polX family according to claim 1 or 2, said variant comprising a combination of substitutions selected from R336N-E457N; R336N-R454A-E457N; R336N-R454A-E457G; R336N-E457G; R336G-R454A-E457N; R336G-E457N, or a functionally equivalent residue, the positions indicated being determined by alignment with SEQ ID No. 1.

4. The variant of a DNA polymerase of the polX family according to any one of the preceding claims, said variant being capable of synthesizing a DNA strand and/or an RNA strand.

5. The variant of a DNA polymerase of the polX family according to any one of the preceding claims, said variant being a variant of Pol IV, Pol μ, or of the terminal deoxyribonucleotidyl transferase (TdT).

6. The variant of a DNA polymerase of the polX family according to any one of the preceding claims, and having at least 60% identity with the sequence according to SEQ ID No. 1, preferably at least 70%, 80%, 85%, 90%, 95%, 96%, 97%, 98%, 99% identity with the sequence according to SEQ ID No. 1.

7. The variant of a DNA polymerase of the polX family according to any one of the preceding claims, said variant being a variant of the TdT of sequence SEQ ID No. 1 and comprising moreover a substitution of the residues between the positions C378 to L406, or the functionally equivalent residues, with the residues H363 to C390 of the polymerase Polμ of sequence SEQ ID No. 2, or the functionally equivalent residues.

8. A nucleic acid coding for a variant of a DNA polymerase of the polX family according to any one of claims 1 to 7.

9. An expression cassette of a nucleic acid according to claim 8.

10. A vector comprising a nucleic acid according to claim 8 or an expression cassette according to claim 9.

11. A host cell comprising a nucleic acid according to claim 8 or an expression cassette according to claim 9 or a vector according to claim 10.

12. Use of a nucleic acid according to claim 8, of an expression cassette according to claim 9, of a vector according to claim 10 or of a cell according to claim 11, for producing a variant of a DNA polymerase of the polX family according to any one of claims 1-7.

13. A method for producing a variant of a DNA polymerase of the polX family according to any one of claims 1-7, according to which a host cell according to claim 11 is cultured under culture conditions enabling the expression of the nucleic acid coding for said variant, and

optionally said variant thus expressed is recovered from the culture medium or from said host cells.

14. Use of a variant of a DNA polymerase of the polX family according to any one of claims 1-7, for synthesizing a nucleic acid molecule without a template strand, from 3’-OH modified nucleotides.

15. The use according to claim 14, for synthesizing a DNA strand or an RNA strand.

16. A method for the enzymatic synthesis of a nucleic acid molecule without a template strand, according to which a primer strand is brought in contact with at least one nucleotide, preferably a 3'-OH modified nucleotide, in the presence of a variant of a DNA polymerase of the polX family according to any one of claims 1-7.

17. A kit for the enzymatic synthesis of a nucleic acid molecule without a template strand, comprising at least one variant of a DNA polymerase of the polX family according to any one of claims 1-7, nucleotides, preferably 3’-OH modified nucleotides, and optionally at least one nucleotide primer.