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 substitutions selected from R336N-E457N; R336N-R454A-E457N; R336N-R454A-E457G; R336N-E457G; R336G-R454A-E457N; R336G-E457N, 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, said variant being capable of synthesizing a DNA strand and/or an RNA strand.

3. 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).

4. 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.

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 the TdT of sequence SEQ ID No. 1 and comprising moreover a substitution of the residues between the positions C378 to L406, with the residues H363 to C390 of the polymerase Polμ of sequence SEQ ID No. 2.

6. A nucleic acid coding for a variant of a DNA polymerase of the polX family according to any one of claims 1 to 5.

7. An expression cassette of a nucleic acid according to claim 6.

8. A vector comprising a nucleic acid according to claim 8 or an expression cassette according to claim 7.

9. A host cell comprising a nucleic acid according to claim 6 or an expression cassette according to claim 7 or a vector according to claim 8.

10. Use of a nucleic acid according to claim 6, of an expression cassette according to claim 7, of a vector according to claim 8 or of a cell according to claim 9, for producing a variant of a DNA polymerase of the polX family according to any one of claims 1-5.

11. A method for producing a variant of a DNA polymerase of the polX family according to any one of claims 1-5, according to which a host cell according to claim 9 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.

12. Use of a variant of a DNA polymerase of the polX family according to any one of claims 1-5, for synthesizing a nucleic acid molecule without a template strand, from 3’-OH modified nucleotides.

13. The use according to claim 12, for synthesizing a DNA strand or an RNA strand.

14. 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 1-5.

15. 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 1-5, nucleotides, preferably 3’-OH modified nucleotides, and optionally at least one nucleotide primer.