Claims

1. A method of producing an iPS cell, comprising a step of introducing the following (1) and (2) into a somatic cell:
(1) one or more episomal vectors containing a nucleic acid encoding one or more nuclear reprogramming factor selected from Oct3/4, Klf family, Sox family, Myc family, Lin28 family and Glis family, wherein the episomal vectors at least contain:

(a) nucleic acids encoding Oct3/4, Klf4 and Sox2; or

(b) a nucleic acid encoding Oct3/4, a nucleic acid encoding a member of the Klf family selected from Klf1, Klf2, Klf4 and Klf5, a nucleic acid encoding a member of the Sox family selected from Sox1, Sox2, Sox3, Sox15 and Sox17, and a nucleic acid encoding a member of the Myc family selected from c-Myc, L-Myc and N-Myc, wherein the episomal vectors contain oriP and a nucleic acid encoding EBNA-1; and

(2) a plasmid vector containing a nucleic acid encoding EBNA-1 and not containing a nucleic acid encoding a nuclear reprogramming factor, wherein the plasmid vector is adapted to transiently express the EBNA-1 in a mammalian cell.

2. The method according to claim 1, further comprising introducing a nucleic acid, encoding an inhibitor of p53 function, in the form of an episomal vector.

3. The method according to claim 2, wherein the inhibitor of p53 function is p53 shRNA or a dominant negative mutant of p53.

4. The method according to claim 3, wherein the dominant negative mutant of p53 is p53DD.

5. The method according to any one of claims 1 to 4, wherein the episomal vectors contain nucleic acids encoding Oct3/4, Klf4, Sox2, L-Myc and Lin28.

6. The method according to any one of claims 1 to 4, wherein the episomal vectors contain nucleic acids encoding Oct3/4, Klf4, Sox2, L-Myc, Lin28 and Glis1.

7. The method according to any one of claims 1 to 6, wherein the nucleic acid encoding a nuclear reprogramming factor is divided and contained in 2 or 3 episomal vectors.

8. The method according to claim 1, wherein the episomal vectors containing the nucleic acid encoding a nuclear reprogramming factor are pCEB-hSK-O and pCEB-hUL-G.

9. The method according to claim 1, wherein the episomal vectors containing the nucleic acid encoding a nuclear reprogramming factor are pCXLE-hOCT3/4, pCXLE-hSK and pCXLE-hUL.

10. The method according to claim 2, wherein the episomal vectors containing the nucleic acid encoding a nuclear reprogramming factor are pCXLE-hOCT3/4-shp53-F, pCXLE-hSK and pCXLE-hUL.

11. The method according to claim 2, wherein the episomal vectors containing the nucleic acid encoding a nuclear reprogramming factor are pCE-hOCT3/4-shp53, pCE-hSK and pCE-hUL.

12. The method according to claim 2, wherein the episomal plasmid vectors containing the nucleic acid encoding a nuclear reprogramming factor are pCE-hOCT3/4, pCE-hSK and pCE-hUL, and the episomal vector containing the nucleic acid encoding an inhibitor of p53 function is pCE-mp53DD.

13. The method according to any one of claims 8 to 10, wherein the plasmid vector containing the nucleic acid encoding EBNA-1 is pCXWB-EBNA1.

14. The method according to claim 11 or 12, wherein the plasmid vector containing the nucleic acid encoding EBNA-1 is pCXB-EBNA1.

15. The method according to any one of claims 1 to 14, wherein the somatic cell is selected from human fibroblast (HDF) and blood cell.

16. The method according to claim 15, wherein the blood cell is a peripheral blood mononuclear cell (PMNC).

17. The method according to claim 16, wherein the peripheral blood mononuclear cell (PMNC) is a T cell.

18. A mammalian somatic cell comprising the following (1) and (2):
(1) one or more episomal vectors containing a nucleic acid encoding one or more nuclear reprogramming factor selected from Oct3/4, Klf family, Sox family, Myc family, Lin28 family and Glis family, wherein the episomal vectors at least contain:

(a) nucleic acids encoding Oct3/4, Klf4 and Sox2; or

(b) a nucleic acid encoding Oct3/4, a nucleic acid encoding a member of the Klf family selected from Klf1, Klf2, Klf4 and Klf5, a nucleic acid encoding a member of the Sox family selected from Sox1, Sox2, Sox3, Sox15 and Sox17, and a nucleic acid encoding a member of the Myc family selected from c-Myc, L-Myc and N-Myc, wherein the episomal vectors contain oriP and a nucleic acid encoding EBNA-1; and

(2) a plasmid vector containing a nucleic acid encoding EBNA-1 and not containing a nucleic acid encoding a nuclear reprogramming factor, wherein the plasmid vector is adapted to transiently express the EBNA-1 in a mammalian cell.

19. The mammalian somatic cell according to claim 18, further comprising a nucleic acid encoding an inhibitor of p53 function, in the form of an episomal vector.

20. The mammalian somatic cell according to claim 19, wherein the inhibitor of p53 function is p53 shRNA or a dominant-negative mutant of p53.

21. The mammalian somatic cell according to claim 20, wherein the dominant-negative mutant of p53 is p53DD.

22. The mammalian somatic cell according to claim 18, wherein the episomal vectors containing the nucleic acid encoding a nuclear reprogramming factor are pCEB-hSK-O and pCEB-hUL-G.

23. The mammalian somatic cell according to claim 18, wherein the episomal vectors containing the nucleic acid encoding a nuclear reprogramming factor are pCXLE-hOCT3/4, pCXLE-hSK and pCXLE-hUL.

24. The mammalian somatic cell according to claim 19, wherein the episomal vectors containing the nucleic acid encoding a nuclear reprogramming factor are pCXLE-hOCT3/4-shp53-F, pCXLE-hSK and pCXLE-hUL.

25. The mammalian somatic cell according to claim 19, wherein the episomal vectors containing the nucleic acid encoding a nuclear reprogramming factor are pCE-hOCT3/4-shp53, pCE-hSK and pCE-hUL.

26. The mammalian somatic cell according to claim 19, wherein the episomal plasmid vectors containing the nucleic acid encoding a nuclear reprogramming factor are pCE-hOCT3/4, pCE-hSK and pCE-hUL, and the episomal vector containing the nucleic acid encoding an inhibitor of p53 function is pCE-mp53DD.

27. The mammalian somatic cell according to any one of claims 22 to 24, wherein the plasmid vector containing the nucleic acid encoding EBNA-1 and not containing a nucleic acid encoding a nuclear reprogramming factor is pCXWB-EBNA1.

28. The mammalian somatic cell according to claim 25 or 26, wherein the plasmid vector containing the nucleic acid encoding EBNA-1 and not containing a nucleic acid encoding a nuclear reprogramming factor is pCXB-EBNA1.

29. A method of producing a somatic cell, comprising producing an iPS cell by the method according to any one of claims 1 to 17, and subjecting the iPS cell to a differentiation treatment to allow for differentiation into a somatic cell.