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 ~~Oct family~~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; and

(2) ~~an~~ plasmid vector containing a nucleic acid encoding EBNA-1~~, wherein the plasmid vector is different from (1) and wherein the plasmid vector is devoid of a nucleic acid encoding a nuclear reprogramming factor from Oct family, a nucleic acid encoding a nuclear reprogramming factor from Klf family, a nucleic acid encoding a nuclear reprogramming factor from Sox family, a nucleic acid encoding a nuclear reprogramming factor from Myc family and a nucleic acid encoding a nuclear reprogramming factor from Lin28 family~~ and not containing a nucleic acid encoding a nuclear reprogramming factor.

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 containing the nucleic acid encoding one or more nuclear reprogramming factor contain a nucleic acid encoding EBNA-1.

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

7. The method according to any one of claims 1 to 5, wherein the ~~nuclear reprogramming factors are~~ episomal vectors contain nucleic acids encoding Oct3/4, Klf4, Sox2, L-Myc, Lin28 and Glis1.

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

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

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

19. An agent for improving iPS cell establishment efficiency, comprising a plasmid vector containing a nucleic acid encoding EBNA-1, ~~wherein the plasmid vector is devoid of a nucleic acid encoding a nuclear reprogramming factor from Oct family, a nucleic acid encoding a nuclear reprogramming factor from Klf family, a nucleic acid encoding a nuclear reprogramming factor from Sox family, a nucleic acid encoding a nuclear reprogramming factor from Myc family and a nucleic acid encoding a nuclear reprogramming factor from Lin28 family~~ and not containing a nucleic acid encoding a nuclear reprogramming factor, and wherein the plasmid vector improves iPS cell establishment efficiency when used in combination with one or more episomal vectors containing a nucleic acid encoding one or more nuclear reprogramming factor selected from ~~Oct family~~Oct3/4, Klf family, Sox family, Myc family, Lin28 family and Glis family, as compared to when the episomal vectors are used alone, 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.

20. A kit for producing an iPS 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 ~~Oct family~~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; and

(2) a plasmid vector containing a nucleic acid encoding EBNA-1~~, wherein the plasmid vector is different from (1) and wherein the plasmid vector is devoid of a nucleic acid encoding a nuclear reprogramming factor from Oct family, a nucleic acid encoding a nuclear reprogramming factor from Klf family, a nucleic acid encoding a nuclear reprogramming factor from Sox family, a nucleic acid encoding a nuclear reprogramming factor from Myc family and a nucleic acid encoding a nuclear reprogramming factor from Lin28 family~~ and not containing a nucleic acid encoding a nuclear reprogramming factor.

21. The kit according to claim 20, further comprising a nucleic acid encoding an inhibitor of p53 function, in the form of an episomal vector.

22. The kit according to claim 21, wherein the inhibitor of p53 function is p53 shRNA or a dominant-negative mutant of p53.

23. The kit according to claim 22, wherein the dominant-negative mutant of p53 is p53DD.

24. The kit according to claim 20, wherein the episomal vectors containing the nucleic acid encoding a nuclear reprogramming factor are pCEB-hSK-O and pCEB-hUL-G.

25. The kit according to claim 20, wherein the episomal vectors containing the nucleic acid encoding a nuclear reprogramming factor are pCXLE-hOCT3/4, pCXLE-hSK and pCXLE-hUL.

26. The kit according to claim 21, wherein the episomal vectors containing the nucleic acid encoding a nuclear reprogramming factor are pCXLE-hOCT3/4-shp53-F, pCXLE-hSK and pCXLE-hUL.

27. The kit according to claim 21, wherein the episomal vectors containing the nucleic acid encoding a nuclear reprogramming factor are pCE-hOCT3/4-shp53, pCE-hSK and pCE-hUL.

28. The kit according to claim 21, 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.

29. The kit according to any one of claims 24 to 26, 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.

30. The kit according to claim 27 or 28, 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.

31. A method of producing a somatic cell, comprising producing an iPS cell by the method according to any one of claims 1 to 18, and subjecting the iPS cell to a differentiation treatment to allow for differentiation into a somatic cell.