CLAIMS

1. Method for dedifferentiating or reprogramming a feeder-free and integration-free mammalian somatic cell comprising:

a) transfecting the isolated somatic cell with culture medium supplemented with a composition comprising 1) an effective amount of a fusion product between a synthetic mRNA encoding Oct-4 and a N-terminal-linked MyoD transactivation domain, and 2) synthetic mRNA reprogramming factors Sox2, Klf4, cMyc, Nanog, and Lin28; and

b) culturing said somatic cell for a sufficient time, under feeder-free and xeno-free culture conditions, whereby the somatic cell is reprogrammed or de-differentiated, producing an induced pluripotent stem cell, that is feeder-free, xeno-free and integration-free, wherein the synthetic mRNAs are purified by chromatography.

2. A method of claim 1, wherein the synthetic mRNAs are purified to remove any contaminating non-mRNA species from transcription.

3. A method of claim 1, wherein the cells are seeded in density gradient from within a well, and cells grow at varying local densities.

4. A method of claim 1, wherein the cells are non-human primate cells.

5. A method of claim 1, wherein the cells are cynomolgus monkey cells.

6. A method of claim 1, wherein the cells are rhesus monkey cells.

7. A method of claim 1, wherein the cells are baboon cells.

8. A method of claim 1, wherein the cells are canine cells.

9. A method of claim 1, wherein the cells are equine cells.

10. A method of claim1, wherein the cells are bovine cells.

11. A method of claim1, wherein the cells are swine cells.

12. A method of claim 1, wherein the cells are ovine cells.

13. A method of claim 2, wherein the Oct4 is fused to the N-terminal MyoD transactivation domain in tandem triplicates.

14. A method for reprogramming mammalian cells, wherein the method comprising:

growing target cells at a density of 25 k to 250 k cells/well in a standard 6- well plate on a feeder-free surface; and

transfecting the cells with any one or more of the synthetic mRNA of reprogramming factor of claim 1 in doses ranging from about 50 ng to about 800 ng/ml.

15. A method of claim 4, wherein the method comprising:

growing target cells at a density of 50 k, 75 k, 100 k, or 150 k cells/well in a standard 6-well plate on a feeder-free surface; and

transfecting the cells with any one or more of the synthetic mRNA of reprogramming factor of claim 1 in doses ranging from about 50 ng to about 800 ng/ml of mRNA, wherein lower doses are used at earlier time points than later time points; and attaining iPSCs without passaging.

16. A method of claim 4, wherein the method comprising:

growing target cells at a density selected any one of the following: 15K, 30K, 50 k, 75 k, 100 k, 150 k, 250 K, 500 K cells/well in a standard 6-well plate in a feeder-free surface; wherein the volume of each well is adjusted to be between 0.5 ml to 5 ml of appropriate medium; and

transfecting cells with any one or more of the synthetic mRNA of reprogramming factor of claim 1 in doses ranging from about 50 ng to 800 ng/ml of mRNA wherein lower doses are used at earlier time points than later time points; and

attaining iPSCs without passaging the cells.

17. A method of claim 1, wherein the mammalian cells are human cells.

18. A method of claim 17, wherein the method is Xeno-free.

19. The method of claim 1 wherein the somatic cells are selected from the group consisting of unipotent, multipotent, pluripotent, and differentiated cells.

20. The method of claim 1 wherein the transfected cells are maintained in culture as induced pluripotent stem (iPS) cells.

21. The method of claim 1, where in wherein the transfected cells form induced pluripotent stem cells further comprising inducing the iPS cells to form differentiated cells.

22. A composition comprising de-differentiated cells that have been transfected by an effective amount of a fusion product in vitro wherein one or more of the compound in the composition is selected from one or more of a synthetic mRNA reprogramming factor Oct4, Sox2, Klf4, cMyc, Nanog, and/or Lin28 and a transactivation domains for use in the treatment of disease and/or disorder.

23. The use of a composition comprising de-differentiated cells that have been transfected by an effective amount of a fusion product in vitro wherein one or more of the compound in the composition is selected from one or more of a synthetic mRNA reprogramming factor Oct4, Sox2, Klf4, cMyc, Nanog, and/or Lin28 and a transactivation domains in the manufacture of a medicament for the treatment of disease and/or disorder, wherein the disease and/or disorder is arthritis, Lupus or autoimmune disease.

24. The method of claim 1, wherein the synthetic mRNAs contain more than 10% 2-thio-uracil of the total uracil.