SUMMARY ~~OF THE INVENTION~~

[0005] In some ~~embodiments~~examples, provided herein is a method for automated production of a viral vector, comprising: introducing an engineered viral producer cell into a fully enclosed cell engineering system; transducing the engineered viral producer cell with a vector encoding a gene of interest to produce a transduced viral producer cell; expanding the transduced viral producer cell and producing the viral vector within the transduced viral producer cell; transferring the expanded producer cell to a downstream processing module; and isolating the viral vector; and purifying the viral vector, wherein (a) through (e) are performed in a closed and automated process. In one aspect, the present disclosure refers to a method for automated production of a viral vector, comprising: (a) introducing an engineered viral producer cell into a fully enclosed cell engineering system; (b) transducing the engineered viral producer cell with a vector encoding a gene of interest to produce a transduced viral producer cell; (c) expanding the transduced viral producer cell and producing the viral vector within the transduced viral producer cell; (d) transferring the expanded producer cell to a downstream processing module; and (e) isolating the viral vector; and (f) purifying the viral vector, wherein (a) through (e) are performed in a closed and automated process.

[0006] Also provided herein is a method for automated production of a viral vector, comprising: introducing a packaging cell into a fully enclosed cell engineering system; transducing the packaging cell with one or more vectors encoding a viral helper gene, a viral packing gene, and a gene of interest to produce a transduced cell; expanding the transduced cell and producing the viral vector within the transduced cell; transferring the expanded cell to a downstream processing module; and isolating the viral vector; and purifying the viral vector, wherein (a) through (e) are performed in a closed and automated process. In one aspect, the present disclosure refers to a method for automated production of a viral vector, comprising: (a) introducing a packaging cell into a fully enclosed cell engineering system; (b) transducing the packaging cell with one or more vectors encoding a viral helper gene, a viral packing gene, and a gene of interest to produce a transduced cell; (c) expanding the transduced cell and producing the viral vector within the transduced cell; (d) transferring the expanded cell to a downstream processing module; and (e) isolating the viral vector; and (f) purifying the viral vector, wherein (a) through (e) are performed in a closed and automated process.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 shows a flow diagram for the automated production of a viral vector in accordance with embodiments hereof.

[0008] FIG. 2 shows a closed and automated cell engineering system as described in embodiments herein.

[0009] FIG. 3 shows a lab space containing exemplary closed and automated cell engineering systems as described in embodiments herein.

[0010] FIG. 4 shows a diagram of a viral vector production process that can be performed in a cassette of a closed and automated system as described in embodiments herein.

[0011] FIG. 5 shows a flow diagram of a process within an automated cell engineering system as described herein.

CLAIMS

What is claimed is:

1. A method for automated production of a viral vector, comprising:

   (a) introducing an engineered viral producer cell into a fully enclosed cell engineering system;

   (b) transducing the engineered viral producer cell with a vector encoding a gene of interest to produce a transduced viral producer cell;

   (c) expanding the transduced viral producer cell and producing the viral vector within the transduced viral producer cell;

   (d) transferring the expanded producer cell to a downstream processing module; and

   (e) isolating the viral vector; and

   (f) purifying the viral vector,

   wherein (a) through (e) are performed in a closed and automated process.

2. The method of claim 1, wherein the engineered viral producer cell is a mammalian cell.

~~3. The method of claim 2, wherein the mammalian cell is a mammalian cell culture.~~

~~4. The method of claim 3, wherein the mammalian cell culture is a suspension culture.~~

~~5.~~3. The method of ~~any one of claims 1-4~~claim 1, wherein the viral vector is an adeno-associated virus (AAV) vector, a lentivirus vector, a retrovirus vector or a baculovirus vector.

~~6. The method of any one of claims 1-4, wherein the viral vector is a lentivirus vector.~~

~~7. The method of any one of claims 1-4, wherein the viral vector is a retrovirus vector.~~

~~8. The method of any one of claims 1-4, wherein the viral vector is a baculovirus vector.~~

~~9.~~4. The method of ~~any one of claims 2-8~~claim 2, wherein the mammalian cell is a Chinese hamster ovary (CHO) cell.

~~10. The method of any one of claims 2-8, wherein the mammalian cell is a human cell.~~

~~11.~~5. The method of claim ~~10~~2, wherein the ~~human~~ mammalian cell is a human embryonic kidney (HEK) cell.

~~12. The method of claim 10, wherein the human cell is a HEK293T cell.~~

~~13.~~6. The method of claim 1, wherein the engineered producer cell is an insect cell.

~~14. The method of claim 1, wherein the engineered producer cell is an Sf9 cell.~~

~~15. The method of claim 1, wherein an amount of viral vectors produced is at least about 10^{10} viral vectors.~~

~~16.~~7. The method of ~~any one of claims 1-15~~claim 1, wherein the closed and automated process comprises:

(a) monitoring with one or more of a temperature sensor, a pH sensor, a glucose sensor, a lactose sensor, an oxygen sensor, a carbon dioxide sensor, and an optical density sensor, and

(b) automatically adjusting one or more of a temperature, a pH level, a glucose level, a lactose level, an oxygen level, a carbon dioxide level, and an optical density.

~~17.~~8. The method of ~~any one of claims 1-16~~claim 7, wherein the transducing comprises viral infection, electroporation, liposome transfection, or membrane disruption.

~~18.~~9. The method of ~~any one of claims 1-17~~claim 8, wherein the isolating comprises passing the expanded producer cells through an elution column.

~~19.~~10. The method of ~~any one of claims 1-18~~claim 8, wherein the purifying comprises membrane polishing.

~~20. The method of any one of claims 1-19, further comprising formulating the viral vector.~~

~~21.~~11. A method for automated production of a viral vector, comprising:

(a) introducing a packaging cell into a fully enclosed cell engineering system;

(b) transducing the packaging cell with one or more vectors encoding a viral helper gene, a viral packing gene, and a gene of interest to produce a transduced cell;

(c) expanding the transduced cell and producing the viral vector within the transduced cell;

(d) transferring the expanded cell to a downstream processing module; and

(e) isolating the viral vector; and

(f) purifying the viral vector,

wherein (a) through (e) are performed in a closed and automated process.

~~22.~~12. The method of claim ~~21~~11, wherein the packaging cell is a mammalian cell.

~~23. The method of claim 22, wherein the mammalian cell is a mammalian cell culture.~~

~~24. The method of claim 23, wherein the mammalian cell culture is a suspension culture.~~

~~25.~~13. The method of ~~any one of claims 21-24~~claim 11, wherein the viral vector is an adeno-associated virus (AAV) vector, a lentivirus vector, a retrovirus vector, or a baculovirus vector.

~~26. The method of any one of claims 21-24, wherein the viral vector is a lentivirus vector.~~

~~27. The method of any one of claims 21-24, wherein the viral vector is a retrovirus vector.~~

~~28. The method of any one of claims 21-24, wherein the viral vector is a baculovirus vector.~~

~~29.~~14. The method of ~~any one of claims 22-28~~claim 12, wherein the mammalian cell is a Chinese hamster ovary (CHO) cell.

~~30. The method of any one of claims 22-28, wherein the mammalian cell is a human cell.~~

~~31.~~15. The method of claim ~~30~~12, wherein the ~~human~~ mammalian cell is a human embryonic kidney (HEK) cell.

~~32. The method of claim 30, wherein the human cell is a HEK293T cell.~~

~~33.~~16. The method of claim ~~21~~11, wherein the packaging cell is an insect cell.

~~34. The method of claim 21, wherein the packaging cell is an Sf9 cell.~~

~~35. The method of claim 21, wherein an amount of viral vectors produced is at least about 10^{10} viral vectors.~~

~~36.~~17. The method of ~~any one of claims 21-35~~claim 11, wherein the closed and automated process comprises:

(c) monitoring with one or more of a temperature sensor, a pH sensor, a glucose sensor, a lactose sensor, an oxygen sensor, a carbon dioxide sensor, and an optical density sensor, and

(d) automatically adjusting one or more of a temperature, a pH level, a glucose level, a lactose level, an oxygen level, a carbon dioxide level, and an optical density.

~~37.~~18. The method of ~~any one of claims 21-36~~claim 17, wherein the transducing comprises viral infection, electroporation, liposome transfection, or membrane disruption.

~~38.~~19. The method of ~~any one of claims 21-37~~claim 18, wherein the isolating comprises passing the expanded producer cells through an elution column.

~~39.~~20. The method of ~~any one of claims 21-38~~claim 18, wherein the purifying comprises membrane polishing.

~~40. The method of any one of claims 21-39, further comprising formulating the viral vector.~~