CLAIMS

~~What is claimed is:~~

1. A method for introducing a payload into cells, the method comprising:

directing cells from a first incubator to an assembly that contains multiple microfluidic devices;

within the multiple microfluidic devices, driving cells from a cell culture medium to an electroporation medium;

within the multiple microfluidic devices, applying an electric field to cells in the electroporation medium in a sheath flow configuration in which the electroporation medium flows in a central stream; and

within the multiple microfluidic devices, transferring or allowing the transfer of the payload into the cells.

2. The method of claim 1, further comprising driving cells containing the payload from the electroporation fluid into a cell culture fluid.

3. The method of claim 2, further comprising storing cells containing the payload in a second incubator.

~~4. The method of claim 1, further comprising administering cells containing the payload to a subject in need of diagnosis, prophylaxis or treatment.~~

~~5~~4. ~~A~~ The method ~~for manufacturing cells for immunotherapy~~of claim 1, ~~the method comprising:~~

~~transferring cells from a first buffer, wherein the first buffer is a cell culture medium, into an electroporation buffer;~~

~~permeabilizing the cells by electroporation;~~

~~allowing a payload to transfer into the permeabilized cells; and~~

~~transferring the cells containing the payload into a second buffer,~~

wherein, the method is conducted in an automated and continuous flow mode; and

wherein, the throughput is ~~possibly~~ at least 4 million cells per minute.

~~6. A system for an automated, continuous flow transfer of cargo into cells, the system comprising:~~

~~a first incubator for storing cells;~~

~~an electroporation assembly comprising a layer supporting multiple microfluidic channels disposed in a parallel configuration;~~

~~a first buffer exchanger for driving cells from a cell culture medium to an electroporation medium;~~

~~a second buffer exchanger for driving cells from the electroporation medium into a culture medium; and~~

~~a controller.~~

~~7. The system of claim 6, further comprising a pump system for delivering electroporation buffer to the electroporation assembly, for delivering cells to the first buffer exchanger and/or for delivering cells from the second buffer exchanger to a second incubator.~~

5. A system for introducing a payload into cells, the system comprising a first incubator, a pump, an assembly containing multiple microfluidic devices, and a controller,

wherein the pump is configured to direct cells from the first incubator to the assembly containing multiple microfluidic devices;

wherein each multiple microfluidic device includes a first buffer exchanger configured to drive cells from a cell culture medium to an electroporation medium; and

wherein each multiple microfluidic device includes a second buffer exchanger configured to apply an electric field to cells in the electroporation medium in a sheath flow configuration in which the electroporation medium flows in a central stream to transfer or allow the transfer of the payload into the cells.

~~8~~6. The system of claim ~~6~~5, wherein each microfluidic ~~channel~~ device has trifurcating inlets and outlets.

~~9~~7. The system of claim ~~6~~5, wherein ~~the electroporation assembly~~ each second buffer exchanger further comprises an electrode layer.

~~10~~8. The system of claim ~~6~~5, wherein each microfluidic ~~channel~~ device is configured to support a central stream and side sheath streams.

~~11~~9. ~~An electroporation assembly~~The system of claim 5, ~~comprising:~~

(a) wherein each microfluidic device further includes:

a channel layer including at least two microfluidic channels arranged in a parallel configuration;

an electrode layer including a pair of electrodes for each microfluidic channel; and

a port layer for fluid connections to trifurcating inlets and outlets of the microfluidic channels~~,~~; and

(b) wherein the layers are stacked in a laminate configuration.

~~12~~10. The ~~electroporation assembly~~system of claim ~~11~~9, ~~further~~ wherein each microfluidic device further comprises ~~comprising~~ a window layer and/or an electrode frame layer.

~~13~~11. The ~~electroporation assembly~~ system of claim ~~11~~9, wherein the layers are adhered to one another.

~~14. A process for transferring cargo into cells using the electroporation assembly of claim 11.~~

~~15~~12. ~~A system for bulk transfer of cargo into cells~~The system of claim 5, ~~comprising:~~

wherein the first~~an~~ incubator is configured to~~for~~ maintain the cells at a desired temperature; and

wherein the first incubator includes an agitator apparatus for preventing the cells from settling in the incubator~~;~~.

~~a buffer exchanger for moving the cells into an electroporation buffer;~~

~~a flow electroporation device for electroporating the cells in electroporation buffer to transfer the cargo; and~~

~~an incubator for receiving the cells from the flow electroporation device.~~

~~16~~13. The system of claim ~~15~~12, wherein the agitator apparatus comprises an impeller within a cell reservoir.

~~17. The system of claim 15, further comprising a pump between the incubator and the buffer exchanger.~~

~~18. The system of claim 17, further comprising a pump for flowing electroporation buffer into the buffer exchanger.~~

~~19~~14. The system of claim 5~~15~~, further comprising a fluidic capacitor between the first incubator and the first buffer exchanger of each microfluidic device.

~~20~~15. The system of claim ~~15~~5, further comprising an acoustic transducer and an acoustic driver for driving buffer exchange in the first buffer exchanger of each microfluidic device.