CLAIMS

1. A device for electroporating at least one cell in a plurality of cells, comprising:

a cartridge divided into a plurality of separate chambers;

at least one exchange path fluidly connecting adjacent chambers of the plurality of separate chambers, the at least one exchange path having a constriction disposed therein functionally separating said adjacent chambers;

at least one high voltage electrode disposed in each chamber of the plurality of separate chambers and adjacent to the constriction of the at least one exchange path;

at least one counter electrode disposed opposite the at least one high voltage electrode and adjacent to the constriction of the at least one exchange path; and

an inlet.

2. The device of claim 1, wherein the inlet is disposed at an end of the at least one exchange path, the inlet having an injection inlet, a dead volume area, an electrically active area, and at least one inlet electrode pair consisting of a high voltage electrode and a counter electrode disposed therein.

3. The device of claim 1, wherein a first constriction of the at least one exchange path is formed along a Y-axis of the cartridge, the first constriction having a first edge and a second edge, the first edge defining a chamber width, the second edge defining a channel of the at least one exchange path.

4. The device of claim 1, wherein the constriction of the at least one exchange path is formed along a Z-axis of the cartridge, the constriction having a rounded protrusion extending into the at least one exchange path and defining a channel of the at least one exchange path, the rounded protrusion having a radius of at least 0.5 millimeters.

5. The device of claim 1, wherein the at least one high voltage electrode and the at least one counter electrode are of alternating polarities.

6. The device of claim 1, further including a plurality of high voltage electrodes and a plurality of counter electrodes, wherein the plurality of high voltage electrodes and the plurality of counter electrodes are alternately arranged within the cartridge within each chamber of the plurality of separate chambers.

7. A method of electroporating at least one cell in a plurality of cells, comprising:

injecting a media containing the at least one cell through an inlet of a cartridge, wherein the cartridge is divided into a plurality of separate chambers;

flowing the media through the plurality of separate chambers of the cartridge, including flowing the media through at least one exchange path fluidly connecting adjacent chambers of the plurality of separate chambers;

constricting the media as it flows through the at least one exchange path via a constriction disposed within the at least one exchange path, the constriction functionally separating the adjacent chambers;

applying an electrical field to the at least one cell via at least one high voltage electrode disposed in each chamber of the plurality of separate chambers and adjacent to the constriction of the at least one exchange path, and via at least one counter electrode disposed adjacent to the constriction of the at least one exchange path and opposite the at least one high voltage electrode; and

electroporating the at least one cell.

8. The method of claim 7, further including applying a polarly opposite electrical field to the at least one cell via the at least one counter electrode.

9. The method of claim 7, wherein the constriction of the at least one exchange path is formed along a Z-axis of the cartridge, the constriction further having a rounded protrusion defining a channel of the at least one exchange path for constricting the media as it flows through the at least one exchange path, the rounded protrusion having a radius of at least 0.5 millimeters.

10. The method of claim 7, wherein the inlet is disposed at an end of the at least one exchange path, and the inlet further includes an injection inlet having an insertion guide, a dead

volume area, and an electrically active area, and the injecting a media containing the at least one cell through the inlet of a cartridge further includes:

inserting a pipette tip into the insertion guide of the injection inlet to facilitate proper delivery of the pipette tip into the inlet; and

receiving the end of the pipette tip via an end stop disposed between the injection inlet and the dead volume area.

11. A method of transfecting at least one cell in a plurality of cells, comprising:

injecting a media containing the at least one cell and at least one nucleic acid through an inlet of a cartridge, wherein the cartridge is divided into a plurality of separate chambers;

flowing the media through the plurality of separate chambers of the cartridge, including flowing the media through at least one exchange path fluidly connecting adjacent chambers of the plurality of separate chambers;

constricting the media as it flows through the at least one exchange path via a constriction disposed within the at least one exchange path, the constriction functionally separating the adjacent chambers;

applying an electrical field to the at least one cell via at least one high voltage electrode disposed in each chamber of the plurality of separate chambers and adjacent to the constriction of the at least one exchange path, and at least one counter electrode disposed adjacent to the constriction of the at least one exchange path and opposite the at least one high voltage electrode; and

transfecting the at least one nucleic acid into the at least one cell.

12. The method of claim 11, further including applying a polarly opposite electrical field to the at least one cell via the at least one counter electrode.

13. The method of claim 11, wherein the constriction of the at least one exchange path is formed along a Z-axis of the cartridge, the constriction further having a rounded protrusion defining a channel of the at least one exchange path for constricting the media as it flows through the at least one exchange path, the rounded protrusion having a radius of at least 0.5 millimeters.

14. The method of claim 11, wherein the inlet is disposed at an end of the at least one exchange path, and the inlet further includes an injection inlet having an insertion guide, a dead volume area, and an electrically active area, and the injecting a media containing the at least one cell and at least one nucleic acid through the inlet of a cartridge further includes:

inserting a pipette tip into the insertion guide of the injection inlet to facilitate proper delivery of the pipette tip into the inlet; and

receiving the end of the pipette tip via an end stop disposed between the injection inlet and the dead volume area.

15. A system for electroporating at least one cell in a plurality of cells, comprising:

a cartridge divided into a plurality of separate chambers, wherein each chamber of the plurality of separate chambers is configured to hold at least one cell and is fluidly connected via at least one exchange path, the at least one exchange path having a constriction disposed therein;

at least one high voltage electrode disposed in said each chamber of the plurality of separate chambers and adjacent to the constriction of the at least one exchange path;

at least one counter electrode disposed opposite the at least one high voltage electrode and adjacent to the constriction of the at least one exchange path;

an inlet disposed at an end of the at least one exchange path, the inlet having an injection inlet, a dead volume area, an electrically active area, and at least one inlet electrode pair consisting of a high voltage electrode and a counter electrode disposed therein; and

an electroporation device configured to receive the cartridge and generate an electric pulse via the high voltage electrode and the counter electrode.

16. The system of claim 15, wherein the injection inlet further includes an insertion guide for receiving a dispenser into the inlet.

17. The system of claim 15, wherein a first constriction of the at least one exchange path is formed along a Y-axis of the cartridge, the first constriction having a first edge and a second edge, the first edge defining a chamber width, the second edge defining a channel of the at least one exchange path.

18. The system of claim 15, wherein the constriction of the at least one exchange path is formed along a Z-axis of the cartridge, the constriction having a rounded protrusion extending into the at least one exchange path and defining a channel of the at least one exchange path, the rounded protrusion having a radius of at least 0.5 millimeters.

19. The system of claim 15, wherein the at least one high voltage electrode and the at least one counter electrode are of alternating polarities.

20. The system of claim 15, further including a plurality of high voltage electrodes and a plurality of counter electrodes, wherein the plurality of high voltage electrodes and the plurality of counter electrodes are alternately arranged within the cartridge within each chamber of the plurality of separate chambers.