CLAIMS

1. A cell culture microdevice for maintaining and culturing a cell therein comprising:

a cell culture unit having at least a first cell carrier unit defining a cell culture chamber formed therein,

the first cell carrier unit formed from at least,

a chamber base shaped to support the cell thereon, and one or more chamber walls having one or more chamber wall surfaces enclosing the cell culture chamber about a chamber boundary,

the first cell carrier unit further providing a guiding surface to guide instruments or fluids into the cell culture chamber located at an aperture through a chamber wall,

wherein the dimensions of the cell culture microdevice are between 0.1 μm and 1000 μm in width, height and length,

wherein the cell culture microdevice is configured to be maintained in a liquid medium within a larger vessel and to enable the passive exchange of liquid fluids with the larger vessel, and

the cell culture microdevice is configured at a scale to substantially enclose a single cell or cell mass therein.

2. The cell culture microdevice of claim 1, wherein the one or more chamber walls comprises one or more inner wall surfaces sloped towards a proximal point of the chamber and are configured to guide the placement of an instrument or a cell within the culture chamber.

3. The cell culture microdevice of claim 1 or 2, wherein the cell culture chamber is open from above and the chamber base comprises a curved inner surface.

4. The cell culture microdevice of claim 1 or 3, wherein the one or more chamber walls comprises:

a proximal wall having a curved inner wall surface configured to guide the placement of an instrument within the culture chamber, and

a distal wall defining a distal chamber boundary and having the aperture through the chamber wall formed therethrough, the aperture defining an opening in communication with an elongated guiding portion projecting outwardly from the cell culture chamber having a channel formed therein providing the guiding surface to guide instruments or fluids into the cell culture chamber.

5. The cell culture microdevice of claim 4, wherein the one or more chamber walls comprises at least a left side wall and a right side wall each having a left side aperture and a right side aperture formed therethrough.

6. The cell culture microdevice of claim 2 or 4, wherein the proximal wall has a proximal aperture formed therethrough, configured in horizontal alignment with the guiding surface to ease the flow of fluid through the cell culture chamber between the aperture and the proximal aperture.

7. The cell culture microdevice of claim 6, wherein the proximal wall comprises a perfusion inlet opening adapted for fluid perfusion therethrough, and a tubing fitting configured for engagement of a perfusion tube to the perfusion inlet opening.

8. The cell culture microdevice of any one of claims 1 to 7, wherein the first cell carrier unit comprises a cell chamber wall having an exterior wall coupling adapted to engage with a corresponding exterior wall coupling on at least a second cell carrier unit, thereby forming a cell carrier array.

9. The cell culture microdevice of any one of claims 1 to 7, further comprising at least a second cell carrier unit formed integrally with the first cell carrier unit, thereby forming a cell carrier cartridge.

10. The cell culture microdevice of claim 3 or 9, further comprising a first cell cover unit having a first cover wall configured to cover at least a portion of the opening from above of the cell culture chamber when the first cell cover unit and the first cell carrier unit are connected to form a cell culture unit base.

11. The cell culture microdevice of claim 10, wherein the first cell cover unit comprises an exterior wall coupling adapted to engage with a corresponding exterior wall coupling on at least a second cell cover unit, thereby forming a cell cover array.

12. The cell culture microdevice of claim 11, further comprising at least a second cell cover unit formed integrally with the first cell cover unit, thereby forming a cell cover cartridge.

13. The cell culture microdevice of claim 12, wherein the first cell cover unit further comprises an access aperture formed therethrough, the access aperture formed through the

first cell cover unit is configured to permit access to the opening from above in a first position and cover at least a portion of the opening from above in a second position, and is adapted to slidably engage the first cell carrier unit from the first position to the second position.

14. The cell culture microdevice of any one of claims 1 to 13, wherein an exterior surface of the chamber base comprises a notch configured to receive a lug projecting outwardly from a cell carrier unit or a cell cover unit.

15. A method of use of the cell culture microdevice of any one of claims 1 to 14, comprising the steps of: placing at ease one cell within the cell culture chamber of the cell culture microdevice, and culturing the cell therein.

16. A method of use of the cell culture microdevice of any one of claims 1 to 14, comprising the steps of: obtaining instructions for constructing the cell culture microdevice, and executing the instruction in an additive manufacturing process.