Claims

1. A cell culture system comprising:

a first area configured to receive a fluid reservoir comprising a cell culture medium;

a second area configured to receive a waste reservoir;

a plurality of pumps; and

a substrate comprising a plurality of openings, wherein the substrate is configured to simultaneously receive and retain a plurality of discrete gas-impermeable cell culture chambers of different shapes and/or sizes releasably positioned within the plurality of openings, wherein the plurality of gas-impermeable cell culture chambers comprises at least a first cell culture chamber and a second cell culture chamber;

a plurality of tubing segments configured to be joined to one another to form a sealed fluidic connection extending between the fluid reservoir, the plurality of pumps, the plurality of cell culture chambers, and the waste reservoir, wherein the fluid reservoir is fluidically connected to the plurality of pumps via one or more of the tubing segments, each of the plurality of pumps is fluidically connected to a respective one of the plurality of gas-impermeable cell culture chambers via one or more of the tubing segments, and at least one of the tubing segments fluidically connects the first gas-impermeable cell culture chamber to the second gas-impermeable cell culture chamber via a respective inlet or outlet of the gas-impermeable cell culture chamber.

2. The cell culture system of claim 1, further comprising the fluid reservoir positioned in the first area and the waste reservoir positioned in the second area.

3. The cell culture system of claim 3, further comprising one or more tubes that fluidically connect from the fluid reservoir to the plurality of pumps, from the plurality of pumps to a respective cell culture chambers, and from the respective cell culture chambers to the waste reservoir.

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4. The cell culture system of claim 1, wherein a first portion of the substrate is configured to receive a first cell culture chamber of a first size and/or shape, and a second portion of the substrate is configured to receive a second cell culture chamber of a second size and/or shape which is different from the first size and/or shape.

5. The cell culture system of claim 1, further comprising a processor operably connected to the one or more pumps and one or more sensors operable to measure a characteristic of a fluid in the cell culture system, wherein the processor operates the one or more pumps based on the measured characteristic.

6. A method for culturing cells, the method comprising:

providing cell culture system comprising a first area configured to receive a fluid reservoir comprising a cell culture medium, a second area configured to receive a waste reservoir, one or more pumps fluidically connectable to the fluid reservoir, and a substrate comprising a plurality of openings, wherein the substrate is configured to simultaneously receive and retain a plurality of discrete gas-impermeable cell culture chambers of different shapes and/or sizes releasably positioned within the plurality of openings, wherein the plurality of gas-impermeable cell culture chambers comprises at least a first cell culture chamber and a second cell culture chamber, and a plurality of tubing segments configured to be joined to one another to form a sealed fluidic connection extending between the fluid reservoir, the plurality of pumps, the plurality of cell culture chambers, and the waste reservoir, wherein the fluid reservoir is fluidically connected to the plurality of pumps via one or more of the tubing segments, each of the plurality of pumps is fluidically connected to a respective one of the plurality of gas-impermeable cell culture chambers via one or more of the tubing segments, and at least one of the tubing segments fluidically connects the first gas-impermeable cell culture chamber to the second gas-impermeable cell culture chamber via a respective inlet or outlet of the gas-impermeable cell culture chamber;

loading the fluid reservoir into the first area and the waste reservoir into the second area;

loading a first cell culture chamber of a first size and/or shape onto a first portion of the substrate;

loading a second cell culture chamber of a second size and/or shape onto a second portion of the substrate;

connecting the fluid reservoir, the one or more pumps, the first and second cell culture chambers, and the waste reservoir with tubing; and

operating the system to culture cells in the first and second cell culture chambers.

7. The method of claim 6, wherein the substrate comprises a plurality of different openings in the substrate that are arranged such that the substrate is configured to simultaneously receive and retain multiple cell culture chambers of different shapes and/or sizes.

8. The method of claim 6, wherein the first cell culture chamber is of a first size and/or shape, and the second cell culture chamber is of a second size and/or shape that is different than the first cell culture chamber.

9. The method of claim 6, wherein the cell culture system further comprises a processor operably connected to the one or more pumps and one or more sensors operable to measure a characteristic of a fluid in the cell culture system, wherein the processor operates the one or more pumps based on the measured characteristic.

10. The method of claim 6, wherein after cell culturing is complete in the first and second cell culture chambers, the cultured cells in each of the first and second cell culture chambers are collected.

11. The method of claim 10, wherein the cultured cells in each of the first and second cell culture chambers are collected in the same collection vessel.

12. The method of claim 10, wherein the cultured cells in each of the first and second cell culture chambers are collected in different collection vessels.