

CLAIMS

What is claimed is:

1. A cell culture system comprising:
 - a cell culture unit configured to hold at least one type of cell;
 - 5 a fresh medium unit configured to supply and receive the first fluid to the cell culture unit;
 - a waste removal unit configured to supply and receive a second fluid from the fresh medium unit;
 - a first pump connected between the cell culture unit and the fresh medium
 - 10 unit configured to circulate the first fluid;
 - a second pump connected between the fresh medium unit and the waste removal unit configured to circulate the second fluid,
 - wherein the cell culture unit, the fresh medium unit and the waste removal unit are separated from each other to avoid cross contaminations.
- 15 2. The system of claim 1, wherein the cells are obtained from skin, muscle, adipose, bone or any other tissues from mammals, fish, animals or plants.
3. The system of claim 1, wherein the fresh medium unit further comprises a first dialysis unit configured to extract the waste from the first fluid to the second fluid and to supply nutrients from the second fluid to the first fluid.
- 20 4. The system of claim 3, wherein the first dialysis unit further comprises at least one 500Da molecular weight cut-off (MWCO) membrane, wherein the membrane is selected from Cellulose Ester (CE), Regenerated Cellulose (RC), and Polyvinylidene fluoride (PVDF).
5. The system of claim 1, wherein the waste removal unit further comprises a second
- 25 dialysis unit configured to extract the waste from the second fluid.
6. The system of claim 5, wherein the second dialysis unit further comprises at least one 100 Da molecular weight cut-off (MWCO) membrane, wherein the membrane is selected from Cellulose Ester (CE), Regenerated Cellulose (RC), and Polyvinylidene fluoride (PVDF).
- 30 7. A method of growing cell culture comprising the steps of
 - providing a cell culture system of claim 1;
 - placing at least one type of cell into the cell culture unit;
 - circulating the first fluid between the cell culture unit and the fresh medium
 - unit;

circulating the second fluid between the fresh medium unit and the waste removal unit;

extracting waste from the first fluid to the second fluid at the fresh medium unit; and

5 replenishing nutrients from the second fluid to the first fluid at the fresh medium unit.

8. The method of claim 7, wherein the cells are obtained from skin, muscle, adipose, bone or any other tissues from mammals, fish, animals or plants.

9. The method of claim 7 further comprises the step of extracting waste from the
10 second fluid at the waste removal unit.

10. The method of claim 7 further comprising the steps of:

heating the culture vessel to a predetermined temperature for culturing;

agitating the first fluid in the cell culture unit;

growing the cell culture to a predetermined density; and

15 isolating cell culture from the first fluid.

11. The method of claim 10, wherein the first fluid is a culture medium and the second fluid is a fresh basal medium.

12. The method of claim 10 further comprising the step of forming the cells into the meat.

20 13. The method of claim 10 further comprising the step of forming the cells into tissue constructs.

14. The method of claim 7, wherein the cells are grown with or without microcarriers.

15. The method of claim 7, wherein the cells are grown with or without scaffolds.

16. The method of claim 7, wherein the cells can be stem cells of various origins
25 such as mesenchymal stem cells, induced pluripotent stem cells and satellite cells or genetically modified cells.

17. The method of claim 16 further comprising the step of supplying at least one component of differentiation medium to the second fluid at the first dialysis unit for
30 subsequent differentiation after the expansion of stem cells in order to form functional engineered tissues.