CLAIMS

1- A bioreactor cell culture system comprising a closed chamber containing a plurality of suspended cell microcompartments, wherein the microcompartments each comprise an outer hydrogel layer that forms a hollow capsule encapsulating cells and extracellular matrix or an extracellular matrix substitute, wherein the cells self-organize into organoids or cysts within the hydrogel capsule.

2- The bioreactor cell culture system as claimed in claim 1, wherein the thickness of the outer hydrogel layer represents 5 to 40% of the radius of the microcompartment.

3- The bioreactor cell culture system as claimed in any one of previous claims, wherein the thickness of the extracellular matrix layer or extracellular matrix substitute represents 5 to 80% of the radius of the microcompartment.

4- The bioreactor cell culture system as claimed in any one of previous claims, wherein the thickness of the outer hydrogel layer represents 5 to 40% of the radius of the microcompartments, the thickness of the extracellular matrix layer or extracellular matrix substitute represents 5 to 80% of the radius of the microcompartments and the thickness of the cell layer represents about 10% of the radius of the microcompartments.

5- The bioreactor cell culture system as claimed in any one of previous claims, wherein the cell microcompartments have a spherical shape, wherein a diameter of said microcompartments is comprised between 10 µm and 1 mm.

6- The bioreactor cell culture system as claimed in any one of previous claims, wherein the cell microcompartments have an ovoid or tubular shape, wherein a smallest dimension of said an ovoid or tubular microcompartments is comprised between 10 µm and 1 mm.

7- The bioreactor cell culture system as claimed in any one of previous claims, wherein the ratio of convective volume outside the microcompartments to diffusive volume inside the microcompartments is comprised between 1 and 10000.

8- The bioreactor cell culture system as claimed in any one of previous claims, wherein all or part of the microcompartments comprise cells self-organized into cysts.

9- The bioreactor cell culture system as claimed in any one of previous claims, wherein all or part of the microcompartments comprise cells self-organized into organoids.

10- The bioreactor cell culture system as claimed in any one of previous claims, wherein the self-organized cells are selected from progenitors, stem cells, pluripotent cells, and mixture thereof.

11- The bioreactor cell culture system as claimed in any one of previous claims, wherein the self-organized cells are selected from pluripotent stem cells from a human mammal, progenitors thereof, and mixture thereof.

12- The bioreactor cell culture system as claimed in any one of previous claims, wherein the bioreactor is selected from batch mode bioreactors, fed-batch mode bioreactors and continuous mode bioreactors.

13- The bioreactor cell culture system as claimed in any one of previous claims, wherein the chamber has a volume comprised between 1 mL and 10,000 L.

14- The bioreactor cell culture system as claimed in any one of previous claims, wherein the microcompartments comprise between 0.01% and 98% by volume of cells.

15- The bioreactor cell culture system as claimed in any one of previous claims, wherein the cells of a microcompartment are all of the same cell type.

16- The bioreactor cell culture system as claimed in any one of previous claims, wherein the cells of a microcompartment are of at least two different cell types.

17- The bioreactor cell culture system as claimed in any one of previous claims, wherein the microcompartments all comprise the same cell types.

18- The bioreactor cell culture system as claimed in any one of previous claims, wherein the microcompartments have at least partially different cell types.

19- A process for the production of organoids or cells of interest comprising the steps according to which:

- a plurality of suspended cell microcompartments is introduced into a bioreactor cell culture system comprising a closed chamber, said microcompartments each comprising an outer hydrogel layer that forms a hollow capsule providing a cavity encapsulating cells and extracellular matrix or an extracellular matrix substitute;

- the microcompartments are cultivated under conditions allowing the multiplication of cells, and/or the self-organization of cells into organoids or cysts within the hydrogel capsule;

- the cell microcompartments are recovered.

20- The process as claimed in claim 19, wherein the cell microcompartments introduced contain pluripotent cells, said process comprising, inside the bioreactor, a step of cell differentiation into at least one cell type of interest.

21- The process as claimed in claim 19 or 20, wherein the cell microcompartments introduced contain already differentiated cells or progenitors, said process comprising, inside the bioreactor, a step of multiplication and/or maturation of said differentiated cells in the microcompartments.

22- The process as claimed in any one of claims 19 to 21, wherein the microcompartments introduced into the bioreactor have an initial cell density of less than 10% occupancy of the internal volume of the microcompartments.

23- The process as claimed in any one of claims 19 to 22, wherein the microcompartments recovered at the end of the culture step in the bioreactor have a cell density greater than 10% occupancy of the internal volume of the microcompartments.

24- The process as claimed in any one of claims 19 to 23, wherein the thickness of the outer hydrogel layer of the recovered cellular microcompartments represents 5 to 40% of the radius of said microcompartments, and the thickness of the layer of extracellular matrix or extracellular matrix substitute from the recovered cellular microcompartments represents 5 to 80% of the radius of said microcompartment.

25- The process as claimed in any one of claims 19 to 24, wherein the microcompartments introduced into the bioreactor have a cell density of less than 10% occupancy of the internal volume of said microcompartments, and the recovered microcompartments comprise between 10% and 98% by volume of cells.