Claims

1. A method for concurrent micro-positron emission tomography (micro-PET) or micro-single photon emission computed tomography (micro-SPECT) of at least two cell cultures in a biocompatible column (1),

the column comprising an inlet (2), an axially oriented perfusion chamber (3) and an outlet (4), wherein the inlet (2) is fluidly connected to the perfusion chamber (3) and the outlet (4) is fluidly connected to the perfusion chamber (3), wherein the perfusion chamber (3) comprises a porous solid phase, an aqueous liquid phase (5), a first cell culture (6a) and a second cell culture (6b), wherein at least a portion of the first cell culture (6a) and at least a portion of the second cell culture (6b) are in contact with the solid phase and wherein the first cell culture (6a) is separated from the second cell culture (6b) by at least a portion of the solid phase;

the method comprising the steps of

(A) inserting the column (1) into a micro-PET or micro-SPECT scanner;

(B) conducting an aqueous labelling liquid comprising a radioactive tracer via the inlet (2) through the perfusion chamber (3) towards the outlet (4), such that at least a portion of the cells of the first cell culture (6a) and at least a portion of the cells of the second cell culture (6b) are contacted with the radioactive tracer;

(C) conducting an aqueous washing liquid via the inlet (2) through the perfusion chamber (3) towards the outlet (4), such that at least a portion of the radioactive tracer is removed from the perfusion chamber (3) through the outlet (4); and

(D) scanning the column (1) with the micro-PET or micro-SPECT scanner.

2. The method of claim 1, wherein the first cell culture (6a) and/or the second cell culture (6b) is a spheroid or an organoid.

3. The method of claim 2, wherein the first cell culture (6a) and/or the second cell culture (6b) is a multicellular tumour spheroid (MTS).

4. The method of any one of claims 1 to 3, wherein the conducting of step (B) and/or step (C) comprises turbulent liquid flow through the perfusion chamber (3), preferably with a flow rate of 0.01 ml/min to 10 ml/min, preferably 0.025 ml/min to 7.5 ml/min, more preferably 0.05 ml/min to 5 ml/min, especially 0.1 ml/min to 2 ml/min.

5. The method of any one of claims 1 to 4, wherein the porous solid phase comprises at least one sponge (7a, 7b, 7c, 7d) comprising at least one biopolymer, preferably wherein the biopolymer is selected from silk, silk fibroin, collagen, gelatin, agarose, alginate, polylactic acid, agar, methyl-cellulose and mixtures thereof and/or wherein the sponge (7a, 7b, 7c, 7d) is pre-cut to fit into the perfusion chamber (3).

6. The method of any one of claims 1 to 5, wherein the porous solid phase has an average pore diameter between 50 µm and 1000 µm, preferably between 75 µm and 750 µm, more preferably between 100 µm and 600 µm, even more preferably between 125 µm and 500 µm, yet even more preferably between 150 µm and 450 µm, especially between 200 µm and 400 µm.

7. The method of any one of claims 1 to 6, wherein the minimal distance between the first cell culture (6a) and the second cell culture (6b) is at least 600 µm, preferably at least 700 µm, more preferably at least 800 µm, even more preferably at least 900 µm, yet even more preferably at least 1000 µm, especially at least 2000 µm or even at least 5000 µm.

8. The method of any one of claims 5 to 7, wherein the porous solid phase comprises at least a first and a second of said sponges (7a, 7b, 7c, 7d), wherein at least a portion of the first culture (6a) is in contact with the first sponge (7a) and

at least a portion of the second culture (6b) is in contact with the second sponge (7b).

9. The method of claim 8, wherein the first sponge (7a) has a recess (8a) comprising at least a portion of the first cell culture (6a) and the second sponge (7b) has a recess (8b) comprising at least a portion of the second cell culture (6b).

10. A biocompatible column (1) for concurrent micro-PET or micro-SPECT of at least two cell cultures,

the column comprising an inlet (2), an axially oriented perfusion chamber (3) and an outlet (4), wherein the inlet (2) is fluidly connected to the perfusion chamber (3) and the outlet (4) is fluidly connected to the perfusion chamber (3),

wherein the perfusion chamber (3) comprises a porous solid phase comprising at least one sponge (7a, 7b, 7c, 7d) comprising at least one biopolymer, an aqueous liquid phase (5), a first cell culture (6a) and a second cell culture (6b), wherein at least a portion of the first cell culture (6a) and at least a portion of the second cell culture (6b) are in contact with the solid phase and wherein the first cell culture (6a) is separated from the second cell culture (6b) by at least a portion of the solid phase.

11. The column (1) of claim 10, wherein the biopolymer is silk fibroin.

12. A system for concurrent micro-PET or micro-SPECT of at least two cell cultures, comprising the column (1) of any one of claims 10 to 11 fluidly connected to a pump via the inlet (2) and/or the outlet (4), preferably wherein the system further has a temperature control for the column (1) and/or a sample injector fluidly connected to the inlet (2) of the column (1).

13. A micro-PET or micro-SPECT scanner with the column (1) of any one of claims 10 to 11 inserted.

14. A kit for concurrent micro-PET or micro-SPECT of at least two cell cultures, comprising:

- at least one biocompatible column (1) for concurrent micro-PET or micro-SPECT of at least two cell cultures,

the column comprising an inlet (2), an axially oriented perfusion chamber (3) and an outlet (4), wherein the inlet (2) is fluidly connected to the perfusion chamber (3) and the outlet (4) is fluidly connected to the perfusion chamber (3); and

- at least two sponges (7a, 7b, 7c, 7d) comprising at least one biopolymer, preferably selected from silk, silk fibroin, collagen, gelatin, agarose, alginate, polylactic acid, agar, methyl-cellulose and mixtures thereof, wherein the sponges (7a, 7b, 7c, 7d) are pre-cut to fit into the perfusion chamber (3).

15. The kit of claim 14, further comprising at least two filters (50) pre-cut to fit into the perfusion chamber (3), preferably wherein the filters (50) have a higher density than the at least two sponges (7a, 7b, 7c, 7d), more preferably at least 1.25x as high, even more preferably at least 1.5x as high, especially at least 2x as high.