CLAIMS

1. An *in vitro* or *ex vivo* method of culturing human cells, the method comprising:

providing a device colonized by bone marrow tissue and having a partially or completely decellularised architecture;

treating the bone marrow tissue to retain the architecture;

introducing human hematopoietic cells into the architecture; and

providing a perfusion fluid to maintain the human hematopoietic cells *ex vivo*.

2. A method according to Claim 1, further comprising the step of removing the bone marrow tissue from the device prior to providing perfusion fluid, and optionally further comprising the step of placing the bone marrow tissue in a microfluidic system prior to providing perfusion fluid.

3. A method according to Claim 1 or 2, in which the device is a microfluidic device, and in which the method optionally further comprises connecting the microfluidic device to a microfluidic system; and/or

in which the microfluidic device includes at least one cell growth chamber and at least one open port providing a passage to the cell growth chamber to enable bone marrow tissue to enter the cell growth chamber for colonization; and/or

in which the microfluidic device includes at least one fluid channel separated from the at least one cell growth chamber by a porous separation component; and/or

in which the microfluidic device includes at least one inlet port and at least one outlet connecting the at least one fluid channel to the microfluidic system and providing perfusion fluid to the at least one cell growth chamber through the porous separation component.

4. A method according to Claim 1, 2 or 3, in which the hematopoietic cells are selected from the group consisting of red blood cells, white blood cells, platelets, hematopoietic stem cells, lymphocytes, eosinophils, neutrophils, monocytes, hematopoietic progenitor cells, stromal cells, and a mixture of two or more of these cell types.

5. A method according to Claim 4, in which the hematopoietic cells are suitable for administration to a subject,

in which the subject optionally has a condition selected from the group consisting of a compromised immune system, a cancer, an auto-immune disease, radiation toxicity, and a hematopoietic disease,

in which the cancer is optionally selected from the group consisting of leukemia, lymphoma, Hodgkin's lymphoma, myeloproliferative disorders, Langerhans cell histiocytosis, myeloma, and myelodysplastic syndromes,

in which the hematopoietic disease is optionally selected from the group consisting of thalassemia, factor IX deficiency, hemophilia, sickle cell disease, amyloidosis, agranulocytosis, anemia, leucopenia, neutropenia, thrombocytopenia, panctyopenia, Glanzmann's thrombasthenia, uremia, platelet storage pool disease, Von Willebrand disease, and afibrinogenemia,

in which the subject has optionally undergone chemotherapy and/or radiation therapy.

6. A method according to any preceding claim, further comprising culturing the hematopoietic cells maintained *ex vivo* with a compound selected from the group consisting of chemotherapeutics, radiation therapies, modifiers of differentiation, formation, function or remodeling, hormones, nucleic acids, peptides, proteins, antibodies, small molecules, drug leads, enzymes, cells, viruses, bacteria, parasites, nucleotides, markers, dyes, imaging agents, enzymes, nanoparticles, and gene silencing molecules.

7. A method according to any preceding claim, in which the device is suitable for implantation into a non-human subject; and/or

in which the device is suitable for implantation into a non-human subject having human or humanized hematopoietic cells; and/or

in which the non-human subject has human hematopoietic cells obtained from a cancer or a human having a hematopoietic disease; and/or

in which the cancer is selected from the group consisting of leukemia, lymphoma, Hodgkin's lymphoma, myeloproliferative disorders, Langerhans cell histiocytosis, myeloma, and myelodysplastic syndromes; and/or

in which the hematopoietic disease is selected from the group consisting of thalassemia, factor IX deficiency, hemophilia, sickle cell disease, amyloidosis, agranulocytosis, anemia, leucopenia, neutropenia, thrombocytopenia, panctyopenia, Glanzmann' s

thrombasthenia, uremia, platelet storage pool disease, Von Willebrand disease, and afibrinogenemia.

8. An *in vitro* or *ex vivo* method of culturing human cells for implantation into a subject, the method comprising: providing a device colonized by bone marrow tissue from a first subject and having a partially or completely decellularised architecture;

treating the bone marrow tissue to retain the architecture;

introducing human hematopoietic cells into the architecture and in which the device is suitable for implantation into a second subject thereby providing bone marrow tissue or cells to the second subject.

9. A method according to Claim 8, in which the device is a microfluidic device; and/or

in which the microfluidic device includes at least one cell growth chamber and at least one open port providing a passage to the cell growth chamber to enable cells to enter the cell growth chamber for cell colonization; and/or

in which the microfluidic device includes at least one fluid channel separated from the at least one cell growth chamber by a porous separation component; and/or

in which the microfluidic device includes at least one inlet port and at least one outlet connecting the at least one fluid channel to the microfluidic system and providing perfusion fluid to the at least one growth channel through the porous separation component.

10. A method according to Claim 8 or 9, in which the bone marrow tissue or cells comprise hematopoietic cells.

11. A method according to Claim 8, 9 or 10, in which the second subject has been diagnosed with a condition selected from the group consisting of a compromised immune system, a cancer, an auto-immune disease, and a hematopoietic disease; and/or has undergone chemotherapy and/or radiation therapy; and/or

in which the cancer is selected from a group consisting of leukemia, lymphoma, Hodgkin's lymphoma, myeloproliferative disorders, Langerhans cell histiocytosis, myeloma, and myelodysplastic syndromes; and/or

in which the hematopoietic disease is selected from the group consisting of thalassemia, factor IX deficiency, hemophilia, sickle cell disease, amyloidosis, agranulocytosis, anemia, leucopenia, neutropenia, thrombocytopenia, panctyopenia, Glanzmann' s thrombasthenia, uremia, platelet storage pool disease, Von Willebrand disease, and afibrinogenemia; and/or in which the device is provided from a non-human first subject having human or humanized hematopoietic cells; and/or

in which the first and second subjects are the same individual and the method comprises an additional step of maintaining the device containing bone marrow tissue and/or hematopoietic cells; and/or

in which maintaining the device containing bone marrow tissue or hematopoietic cells *ex vivo* comprises freezing or refrigerating either the device containing bone marrow tissue and/or hematopoietic cells; and/or

in which maintaining the device containing bone marrow tissue or hematopoietic cells *ex vivo* comprises connecting the device to a microfluidic system, and

providing a perfusion fluid to the device; and/or

in which the tissue or cells contained within the device are genetically modified before implantation into the second subject.

12. An *in vitro* or *ex vivo* method for producing or manufacturing hematopoietic cells, the method comprising providing a device colonized by bone marrow tissue and having a partially or completely decellularised architecture; treating the bone marrow tissue to retain the architecture; introducing human hematopoietic stem cells into the architecture; providing a perfusion fluid to the tissue to maintain the human hematopoietic stem cells *ex vivo*; in which the device includes at least one cell growth chamber and at least one open port providing a passage to the cell growth chamber to enable cells to enter the cell growth chamber for cell colonization; and in which the hematopoietic cells are optionally selected from the group consisting of red blood cells, white blood cells, platelets, hematopoietic stem cells, lymphocytes, eosinophils, neutrophils, monocytes, a hematopoietic progenitor cell, and a mixture of two or more of these cell types.