Description

A METHOD FOR USING CELL THERAPY PRODUCT FACILITY AND FRANCHISE MARKET BUSINESS METHOD BASED ON NETWORK USING THE SAME

Technical Field

[1] The present invention relates to a method for using a cell therapy product facility and a network-based franchise market business method using the same. More specifically, the present invention provides a modularized facility for production of a cell therapy product and operating method thereof and a use method and business method of a medical cell system including the above cell therapy product facility, a technology for production of a cell therapy product and a license. Consequently, the present invention enables easy production of the cell therapy product having a quality grade sufficient to transplant into patients within a short period of time at a low production cost and clinical application thereof to patients within an early time, via use of the above-mentioned cell therapy product facility. In addition, the present invention enables convenient installation and utilization of such a facility module in any place where a predetermined-size space is secured, by providing the facility module in a pre-fabricated type having specialized units according to the corresponding functions thereof. Therefore, the present invention enables accomplishment of remarkably improved quality and reliability of the product and thereby enhanced customer satisfaction.

Background Art

[2] As is generally known, cell therapy technology, a next-generation technology which is expected to bring fundamental changes into well-being trend peculiar to modern societies, and into public health industry, pharmaceutical industry and medical industry underlying aging society, is one of the most critical fields for advancement of the medical industry as technology-intensive and energy-saving industry.

[3] Cell therapy products are medicines used for the treatment, diagnosis and prevention of various diseases by a series of necessary steps involving collecting and proliferating somatic cells from living bodies of patients themselves (autologous) or other people (allogenic) or other animals (xenogenic), or differentiating stem cells into desired cell types, in order to repair impaired or defective cells or tissues and functions thereof. Therefore, such cell therapy products have a wide spectrum of applications thereof, and over recent several years, have been receiving a great deal of attention as a novel therapy having promising and unlimited potentialities for the treatment of various intractable diseases such as burns, cancers, senile dementia and the like.

[4] A lot of interest has been directed to cell therapy products as an important 21st century type, new drug technology which is expected to lead future life science and medical field, as they have indefinite application fields depending upon kinds of techniques being developed. Several hundreds of clinical tests and experiments on the cell therapy products are being undertaken in technologically advanced countries including USA, and a great deal of research related thereto is also being actively undertaken in Korea. Diseases that can be treated by the use of cell therapy products may include for example various cancers, as well as intractable diseases such as hematologic/immunological disorders and diseases, neurological diseases, diabetes, bone/cartilage diseases and cardiovascular diseases. Further, conquest of intractable diseases via application of stem cells has become as the crowning subject of life science world in the 21st century and as a result, there has been put technological innovations in all of medical fields such as cardiovascular systems, nervous systems, blood and immune systems, genetic diseases, hepatic diseases, endocrinal diseases, bone, cartilage and skin diseases and the like.

[5] In recent years, scientific world and many bio-venture companies have been actively conducting a great deal of research and study on cell therapy products, with some fruitful results, and therefore it is expected that the cell therapy products will be spotlighted as a medical industry to aim at world market. Experts in the related art propose that development of cell therapy products will make it possible to treat intractable diseases and substitute for organ transplantation, and therefore will become a next-generation medical industry with an increasing market size.

[6] As such, interests and necessity for cell therapy products, particularly autologous cell therapy products with secured safety and effectiveness have globally increased. However, upon considering the requirement that all factors such as procedures and technologies of manufacturing the cell therapy product with a quality grade transplantable into a patient, and manufacturing facilities should be completely equipped, there is substantially no case in which such cell therapy products are provided by a single system. Therefore, there is a difficulty in manufacture of the cell therapy products and extension of application thereof.

Disclosure of Invention

Technical Problem

[7] Therefore, the present invention has been made in view of the above problems, and it is a first aim of the present invention to provide a modularized facility for production of a cell therapy product and operating method thereof and a use method and business method of a medical cell system including the above cell therapy product facility, a technology for production of a cell therapy product and a license, and par-

ticularly, a cell therapy product facility, comprising a CT (Cell Therapy)-module capable of producing the cell therapy product and a BC (Banking of Cell and Tissue)-module capable of storing hematopoietic stem cells and bone marrow cells and other cells for a prolonged period of time through appropriate processes.

[8] For this purpose, a second aim of the present invention is to provide a facility module for production and storage of a cell therapy product, wherein the CT and BC modules are respectively comprised of five functionally specialized units: a preparation unit, a processing unit, a microbial sterility test unit, a quality control unit and a utility unit.

[9] A third aim of the present invention is to enable easy production of a cell therapy product having a quality grade sufficient to transplant into patients within a short period of time at a low production cost and clinical application thereof to patients within an early time, via use of the above-constituted facility module.

[10] A fourth aim of the present invention is to enable convenient installation and utilization of such a facility module in any place where a predetermined-size space is secured, by provision of the facility module in a prefabricated type composed of specialized units according to the individual-specific functions.

[11] A fifth aim of the present invention is to provide a system capable of producing a cell therapy product to hospitals or universities of all the countries of the world, whereby they secure treatment technologies using such a cell therapy product and thus provide extended opportunity for treating patients, and at the same time, to provide the above system to global medical market, thereby accelerating development of cell therapy products.

[12] A sixth aim of the present invention is to provide a method for using a cell therapy product facility and a network-based franchise market business method using the same, which enables accomplishment of remarkably improved quality and reliability of the product and thereby enhanced customer satisfaction.

Technical Solution

[13] Accordingly, there is provided a method for using a cell therapy product facility, comprising: producing a cell therapy product by a CT (Cell Therapy)-module 1 composed of a plurality of separately prefabricated units having individual-specific functions and having an entrance and exit separately partitioned from each other so as to minimize occurrence of contamination; and storing hematopoietic stem cells and bone marrow cells and other cells for a prolonged period of time through appropriate processes, by a BC (Banking of Cell and Tissue)-module 2 composed of a plurality of separately prefabricated units having individual-specific functions and having an entrance and exit separately partitioned from each other so as to minimize occurrence of contamination.

[14] In one embodiment of the present disclosure, there is provided a network-based franchise market business method using a cell therapy product facility, comprising providing a source to a management server from a computer connected to the cell therapy product facility via internet; transmitting a variety of licenses, authorization business, clinical data, supply and sale, management and business, education, audio and video data transmission means from the management server to the computer via internet; and controlling the cell therapy product facilities CT (Cell Therapy)-module and BC (Banking of Cell and Tissue)-module by the computer, thereby providing a technology for production of cell therapy product.

Brief Description of the Drawings

[15] The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

[16] Fig. 1 is a schematic plan block diagram of a cell therapy product facility CT (Cell Therapy)-module applied to the present invention;

[17] Fig. 2 is a front cross-sectional view of a preparation unit and a utility unit applied to the present invention;

[18] Fig. 3 is a front cross-sectional view of a processing unit and a utility unit applied to the present invention;

[19] Figs. 4 through 6 are respectively plan, front and side views of an air handling part applied to the present invention;

[20] Fig. 7 is a block diagram showing clean zones of a cell therapy product facility CT (Cell Therapy)-module applied to the present invention;

[21] Fig. 8 is a schematic plan block diagram view of a cell therapy product facility BC (Banking of Cell and Tissue)-module applied to the present invention

[22] Fig. 9 is a front cross-sectional view of a preparation unit and utility unit of Fig. 8;

[23] Fig. 10 is a block diagram showing clean zones of a cell therapy product facility BC (Baby Cell)-module applied to the present invention; and

[24] Fig. 11 is a block diagram of a network-based franchise market business method. using a cell therapy product facility applied to the present invention.

Best Mode for Carrying Out the Invention

[25] The preferred embodiments of the present invention for accomplishing the above-mentioned objects will now be described in more detail with reference to the accompanying drawings.

[26] A method for using a cell therapy product facility and a network-based franchise

market business method using the same, which are applied to the present invention, are constituted as shown in Figs. 1 through 11.

[27] In connection with description of the present invention hereinafter, if it is considered that description of known functions or constructions related to the present invention may make the subject matter of the present invention unclear, the detailed description thereof will be omitted.

[28] Terms which will be described hereinafter are established taking into consideration functions in the present invention and may vary according to manufacturer's intention or general practices in the related art. Therefore, the terms used herein should be defined based on the contents of the specification of the present invention.

[29] The present invention is directed to a cell therapy product facility, comprising a CT (Cell Therapy)-module 1 (see Fig. 1) including a plurality of separately prefabricated units having individual-specific functions and having separately partitioned entrance and exit so as to minimize occurrence of contamination, and being capable of producing the cell therapy product, and a BC (Banking of Cell and Tissue)-module 2 (see Fig. 8) including a plurality of separately prefabricated units having individual-specific functions and having separately partitioned entrance and exit so as to minimize occurrence of contamination, and being capable of storing hematopoietic stem cells and bone marrow cells and other cells for a prolonged period of time through appropriate processes. Here, each module 1 and 2 is designed to follow a basic layout taking into account a minimal space necessary for processes and optimal size and weight advantageous for transportation.

[30] Hereinafter, such technical constitution of the present invention will be described in more detail.

[31] That is, as shown in Fig. 1, the CT (Cell Therapy)-module 1 is provided with a preparation unit 10 for wearing a clean room garment to enter sterile clean zones, and preparing/sterilizing raw materials and storing finished/semi-finished products.

[32] In addition, the CT module 1 includes a processing unit 20 for maintaining a desired level of cleanliness to produce cell therapy products such as cultured chondrocytes and cultured osteoblasts, at the rear of the preparation unit 10.

[33] The facility module of the present invention also includes a microbial sterility test unit 30 for examining probable microbial contamination such as by bacteria during an incubation period for production of cell therapy products, at the rear of the processing unit 20.

[34] At one side of the microbial sterility test unit 30, a quality control unit 40 for confirming safety and effectiveness of the cell therapy products is also provided.

[35] Further, a utility unit 50 for maintenance of essential items such as a desired level of cleanliness, constant temperature and humidity, fire service and electricity for the

respective units 10, 20, 30 and 40 is provided at one side of the preparation unit 10.

[36] In accordance with the present invention, as shown in Figs. 2 and 3, the preparation unit 10, processing unit 20, microbial sterility test unit 30 and quality control unit 40 except utility unit 50 are fixedly installed with sterile panels at a predetermined height from the bottom thereof, wherein the preparation unit 10, microbial sterility test unit 30 and quality control unit 40 are provided with blank panels 68 at the top of multiple height-adjusting tools 68a arranged at regular intervals, and the processing unit 20 is provided with a grating panel 69 at the top of multiple supporting tools 69a arranged at regular intervals.

[37] In addition, the module of the present invention includes an air handling part 65 provided inside the utility unit 50 and connected to an air cooler 66, wherein the air handling part 65, as shown in Figs. 4 through 6, is provided with an air filter 65a for preventing entry of foreign materials and a cooling and heating coil 65b for heat exchange of fluid, a damper 65c for air volume control and a humidifier 65d for water level control, and a fan 65e for air volume control.

[38] The air handling part 65 is connected with a first duct 67a, a passage through which air is allowed to flow through the preparation unit 10, quality control unit 40 and microbial sterility test unit 30, wherein the first duct 67a is provided with first HEPA (High Efficiency Particulate Air) filter units 63 connected thereto at regular intervals, a second duct 67b discharging air to the inside of the processing unit 20, and a third duct 67c for entry of air installed in the respective units 10, 20, 30 and 40. In the third duct 67c, a plurality of second HEPA filter units 64 are provided at regular intervals.

[39] Further, the inside of the preparation unit 10 is provided with a first dressing room 11 for wearing a first working uniform to enter a washing room or processing unit, a second dressing room 12 for wearing a clean room garment to enter the processing unit, a washing room 13 providing a space for washing, sterilizing and delivering articles to enter the processing unit and having an ultrapurification system, a packaging room 14 for packaging products manufactured in the processing unit, a semi-finished product depository 17 for storing semi-finished products manufactured during processes in liquid nitrogen, a finished product depository 18 for final storage of finished products manufactured in the processing unit until shipment after packaging them in the packaging room 14, and first and second buffering zones 15 and 16 for providing clean conditions, serving as buffer areas with external environment.

[40] In addition, the facility module of the present invention further includes, as shown in Fig. 1, first and second air showers 60 and 61 in the first dressing room 11 of the preparation unit 10, and further includes a second air shower 61 in the microbial sterility test unit 30, whereby entrance of contaminating particles from the outside is prevented upon entering clean zones and dust or bacteria adhered to the workers are

washed and eliminated by high-velocity clean air.

[41] Finally, in accordance with the present invention, between the microbial sterility test unit 30 and quality control unit 40 is provided a pass box 62 that enables only entrance and exit of articles without personnel entry, thereby preventing escape of contamination source or clean air.

[42] Hereinafter, technical constitution of the BC (Banking of Cell and Tissue)-module 2 applied to the present invention will be described in more detail. In this connection, details of technical constitution overlapped with those of the CT-module 1 will be omitted herein.

[43] That is, as shown in Figs. 8 and 9, the BC (Banking of Cell and Tissue)-module 2 is provided with a preparation unit 70 for wearing a clean room garment to enter sterile clean zones, and preparing/sterilizing raw materials. Here, the preparation unit 70 is provided with a first dressing room 72 for wearing a clean room garment to enter a washing room or processing unit, a washing room 73 providing a space for washing, sterilizing and delivering articles to enter the processing unit and including an ultrapurification system, first and second buffering zones 74 and 75 for providing clean conditions, serving as buffer areas with external environment, and a head room 71 as a buffer area to enter the processing unit.

[44] In addition, a processing unit 80 for processing and storing the umbilical cord is provided at the rear of the preparation unit 70.

[45] A microbial sterility test unit 90 for examining probable microbial contamination such as by bacteria during transportation or processing of the umbilical cord blood is also provided at the rear of the processing unit 80.

[46] At one side of the microbial sterility test unit 90, a quality control unit 100 for confirming safety and effectiveness of the cell therapy products is also provided.

[47] Further, at one side of the preparation unit 70, a utility unit 110 is provided for maintenance of essential items such as a desired level of cleanliness, constant temperature and humidity, fire service and electricity for the respective units 70, 80, 90 and 100.

[48] In addition, the BC module of the present invention includes an air handling part 65 provided inside the utility unit 110 and connected to an air cooler 66, a first duct 67a connected to the air handling part 65 through the preparation unit 70, processing unit 80, quality control unit 100 and microbial sterility test unit 90, first and second HEPA filter units 63 and 64 connected at regular intervals to the first duct 67a, a third duct 67c for entry of air provided in the respective units 70, 80, 90 and 100, and second air showers 61 provided in the preparation unit 70 and microbial sterility test unit 90.

[49] A method for using the cell therapy product facility in accordance with the present invention, as constituted above, will be described hereinafter.

[50] Firstly, the CT-module 1 for production of the cell therapy product in accordance with the present invention is comprised of 5 units, i.e., the preparation unit 10, processing unit 20, microbial sterility test unit 30, quality control unit 40 and utility unit 50. The preparation unit 10 is composed of a dressing room for entering sterile clean zones, a washing room for preparing and washing raw materials/auxiliary materials used to manufacture products and a depository room for storing finished/ semi-finished products of cell therapy products. The processing unit 20 is the place where cleanliness is kept in class 100 levels and a variety of processes for isolating cells from tissues and differentiating/proliferating cells are carried out. The microbial sterility test unit 30 is a germ-free testing room where cleanliness is kept in class 10000 levels and a sterility test is conducted on raw materials/auxiliary materials before/after processes and final products. The quality control unit 40 is the place where a variety of QC tests except a sterility test are conducted on raw materials/auxiliary materials before/after processing thereof and final products. The utility unit 50 is the place where equipment to constantly maintain temperature/humidity of the module and a desired level of cleanliness corresponding to the respective units is operated and details thereof will be disclosed hereinafter.

[51] The method for using the cell therapy product facility in accordance with the present invention comprises producing a cell therapy product by a CT (Cell Therapy)-module 1 composed of a plurality of separately prefabricated units having individual-specific functions and having an entrance and exit separately partitioned from each other so as to minimize occurrence of contamination; and storing hematopoietic stem cells and bone marrow cells and other cells for a prolonged period of time through appropriate processes, by a BC (Banking of Cell and Tissue)-module 2 composed of a plurality of separately prefabricated units having individual-specific functions and having an entrance and exit separately partitioned from each other so as to minimize occurrence of contamination.

[52] That is, the process of producing the cell therapy product includes wearing a clean room garment in a preparation unit 10 in order to enter sterile clean zones, and preparing/sterilizing raw materials and storing finished/semi-finished products therein; maintaining a desired level of cleanliness in a processing unit 20 in order to produce cell therapy products such as cultured chondrocytes and cultured osteoblasts; examining the presence of microbial contamination such as by bacteria during an incubation period for production of the cell therapy product, in a microbial sterility test unit 30; confirming safety and effectiveness of the cell therapy product in a quality control unit 40; and maintaining essential items such as a desired level of cleanliness, constant temperature and humidity, fire service and electricity for the respective units 10, 20, 30 and 40, in a utility unit 50.

[53] Specifically, in the preparation unit 10, the following processes are carried out including wearing a first working uniform in a first dressing room 11 in order to enter a washing room or processing unit; wearing a clean room garment in a second dressing room 12 in order to enter the processing unit; washing, sterilizing and delivering articles to enter the processing unit and providing an ultrapurification system, in the washing room 13; packaging products from the processing unit in a packaging room 14; storing semi-finished products produced during the manufacturing processes in liquid nitrogen in a semi-finished product depository 17; packaging finished products from the processing unit in the packaging room, followed by final storage of finished products in a finished product depository 18 until shipment; and providing clean conditions by first and second buffering zones 15 and 16 as buffer areas with external environment.

[54] In addition, the first dressing room 11 of the preparation unit is provided with first and second air showers 60 and 61, and the microbial sterility test unit 30 is provided with a second air shower 61, whereby entrance of contaminating particles from the outside is prevented upon entering clean zones and dust or bacteria adhered to the workers are washed and eliminated by high-velocity clean air. In addition, a pass box 62 provided between the microbial sterility test unit 30 and quality control unit 40 enables only entrance and exit of articles without personnel entry, thereby preventing escape of contamination source or clean air.

[55] According to the present invention, as shown in Fig. 7, in order to achieve optimal temperature and humidity for cell culture and minimized microbial contamination by the CT-module 1, the processing unit 20 is maintained at a cleanliness level of less than 100 particles having a particle size of 0.5 micrometer (μm) per cubic feet (ft), the preparation unit 10 and the microbial sterility test unit 30 except the first dressing room and finished product depository are maintained at a cleanliness level of less than 10000 particles having a particle size of 0.5 micrometer (μm) per cubic feet (ft), and other areas are divided into zones capable of maintaining cleanliness and differential pressure.

Mode for the Invention

[56] Example 1

[57] In the facility module of the present invention, when an air handling part 65 is driven, air is circulated, as indicated by arrows, through the respective ducts 67a, 67b and 67c and grating panel 69. Particularly, where the CT-module 1 is used, preparation of various media and reagents and sterilization of various implements and materials, which are necessary for production of cell therapy products, are conducted in the preparation unit 10, and a variety of processes for isolating cells from tissues and differentiating/proliferating cells are conducted in the processing unit 20. For chondrocyte

therapeutic, processing processes of the cell therapy products were carried out in the processing unit 20 of CT-module 1 as follows.

[58] As a first step, cartilage isolation and primary culture were carried out as follows.

[59] 1) Biopsy harvested from hospitals was transferred to the processing unit in the CT module, followed by isolation of cartilage.

[60] 2) The thus-transferred biopsy was cut into small pieces on the sterile workbench, treated with enzymes and placed in a CO_2 incubator, followed by isolation of chondrocytes.

[61] 3) The chondrocytes thus isolated were cultured in a culture flask containing a culture medium for about one month.

[62] As a second step, media change and subculture were carried out as follows.

[63] 1) For one-month cell culture, chondrocytes were allowed to proliferate continuously.

[64] 2) Numbers of chondrocytes were proliferated by about 500-fold from initial numbers of $1x10^5$ cells to more than $5x10^7$ cells immediately prior to manufacturing Chondron.

[65] 3) During proliferation of chondrocytes, media change was carried out to periodically supply nutrients to cells, and subculture was carried out to facilitate cell proliferation by changing a culture flask.

[66] As a third step, a manufacturing process of chondrocyte therapeutic was carried out. For this purpose, test samples collected before/after processes and from final products were subjected to sterility tests in the microbial sterility test unit (30). Further, except a sterility test, a variety of QC tests such as endotoxin test, mycoplama test using PCR, cell count, cell viability test, virus test, cytotoxicity test and identity test were conducted in the quality control unit 40. Such processes for producing the cell therapy products were collectively carried out in the CT-module 1. After processes and QC tests for the products were complete, the chondrocyte therapeutic was transported to an operating room, followed by chondrocyte transplantation for the treatment of patients with cartilage defects.

[67] The above-mentioned processes were carried out to manufacture chondrocyte therapeutic and bone cell therapy products. Therefore, even though the CT-module 1 is the facility capable of producing chondrocyte therapeutic and bone cell therapy products, such a module may also be used to produce other cell therapy products. When production technologies of chondrocyte therapeutic and bone cell therapy products are introduced in conjunction with the CT-module 1, it is possible to perform patient treatment utilizing such cell therapy products and do business associated with treatment of patients.

[68] Similar to the CT-module for production of the cell therapy product, the BC-module

2 for storage of cell therapy product in accordance with the present invention is also comprised of 5 units, i.e., the preparation unit 70, processing unit 80, microbial sterility test unit 90, quality control unit 100 and utility unit 110. The preparation unit 70 is composed of a dressing room for entering sterile clean zones, and a washing room for preparing and washing raw materials/auxiliary materials necessary for manufacturing processes. The processing unit 80 is the place where cleanliness is kept in class 10000 levels and a variety of processes for isolating cells from tissues or blood and storing cells are carried out. The microbial sterility test unit 90 is a germ-free testing room where cleanliness is kept in class 10000 levels and a sterility test is conducted on raw materials/auxiliary materials before/after processing thereof and cells for final storage. The quality control unit 100 is the place where a variety of QC tests except a sterility test are conducted on raw materials/auxiliary materials before/after processing thereof and cells for final storage. The utility unit 110 is the place where equipment necessary for constant maintenance of temperature/humidity of the module and cleanliness levels corresponding to the respective units is operated and details thereof will be disclosed hereinafter.

[69] The process of storing hematopoietic stem cells and bone marrow cells and other cells, applied to the present invention, for a prolonged period of time through appropriate processes, includes wearing a clean room garment in a preparation unit 70 in order to enter sterile clean zones, and preparing/sterilizing raw materials therein; storing/preserving the umbilical cord blood in a processing unit 80; examining the presence of microbial contamination such as by bacteria during transportation or processing of the umbilical cord blood, in a microbial sterility test unit 90; confirming safety and effectiveness of the cell therapy products in a quality control unit 100; and maintaining essential items such as a desired level of cleanliness, constant temperature and humidity, fire service and electricity for the respective units 70, 80, 90 and 100, in a utility unit 110.

[70] Further, in the preparation unit 70, the following processes are carried out including wearing a clean room garment in a first dressing room 72 in order to enter a washing room or processing unit; washing, sterilizing and delivering articles to enter the processing unit and providing an ultrapurification system, in the washing room 73; providing clean conditions by first and second buffering zones 74 and 75 as buffer areas with external environment; and providing a buffer area to enter the processing unit by a head room 71.

[71] Further, as shown in Fig. 10, in order to achieve optimal temperature and humidity for cell culture and minimized microbial contamination, the preparation unit 70, the processing unit 80 and microbial sterility test unit 90 except a quality control unit 100, a utility unit 110 and a first dressing room 72 are maintained at a cleanliness level of

less than 10000 particles having a particle size of 0.5 micrometer (μm) per cubic feet (ft), and other areas are divided into zones capable of maintaining a desired level of cleanliness and differential pressure.

[72] In addition, the CT-module 1 and BT-module 2 in accordance with the present invention are preferably maintained at a temperature of $22+2^{0}C$, and humidity of 50+5%.

[73] Example 2

[74] Where the BC-module 2 of the present invention was used, preparation of various media and reagents and sterilization of various implements and materials, which are necessary for cell storage, were conducted in the preparation unit 70, and a variety of processes for isolating cells from tissues or blood and storing cells were conducted in the processing unit 80. For storage of umbilical cord blood-derived hematopoietic stem cells, processing of storage cells were carried out in the processing unit 80 of BT- module 2 as follows.

[75] As a first step, from the umbilical cord blood which was harvested from the umbilical cord, nucleated cells were isolated as follows.

[76] I) A sample was collected from whole blood of the umbilical cord blood harvested from hospitals.

[77] 2) Nucleated cells were separated from the sample and were allowed to stand for separation of a red blood cell layer, followed by centrifugation to concentrate a nucleated cell layer.

[78] 3) After centrifugation was complete, the top plasma layer was removed using an Auto-Expressor, thereby leaving only a concentrate containing a small amount of the red blood cell layer and a concentrated layer of nucleated cells in the blood unit collection bag.

[79] As a second step, a packaging step was carried out as follows.

[80] 1) The concentrated layer of nucleated cells separated in the first step was transferred to a freezing bag with removal of air contained therein.

[81] 2) The freezing bag containing the nucleated cell concentrates was placed in a case, followed by sealing.

[82] 3) Bar cord was attached to the freezing bag.

[83] 4) The freezing bag was packaged to prevent the risk of contamination and was finally inserted into a canister to prepare a finished product.

[84] As a third step, freezing and storage processes were carried out as follows.

[85] 1) The finished canister was put into a frame and placed in a freezer equipped with an automatic thermostat.

[86] 2) A freezing program was operated to initiate freezing.

[87] 3) The thus-frozen sample was stored in a liquid nitrogen storage container.

[88] 4) Thereafter, in order to demonstrate safety and effectiveness of baby cells, a quality control was carried out as follows.

[89] For this purpose, test samples collected from raw materials/auxiliary materials before/after processing thereof and cells for final storage were subjected to sterility test in the microbial sterility test unit (90). Further, a variety of QC tests such as cell count, cell viability, hematopoietic stem cell count and colony-forming unit (CFU) assay were also conducted. The above-mentioned processes were carried out to separate and store hematopoietic stem cell from the umbilical cord blood. Therefore, even though the BC-module 2 is the facility capable of separating and storing umbilical cord blood-derived hematopoietic stem cells, such a module may also be used to process and store cell types other than hematopoietic stem cells. When technologies for separation and storage of hematopoietic stem cells from the umbilical cord blood are introduced in conjunction with the BC-module 2, it is possible to do business associated with separation and storage of hematopoietic stem cells.

[90] As shown in Fig. 11, the present invention provides a network-based franchise market business method using the cell therapy product facility, comprising providing a source to a management server 120 from a computer connected to the cell therapy product facility via internet; transmitting a variety of licenses, authorization business, clinical trial book, supply and sale, management and business, education, audio and video data transmission means from the management server 120 to the computer via internet; and controlling the cell therapy product facilities CT (Cell Therapy)-module 1 and BC (Banking of Cell and Tissue)-module 2 by the computer, thereby providing a technology for production of cell therapy product. In particular, the present invention provides procedures and technologies for preparing the cell therapy product having a quality grade sufficient to transplant into patients, and a system including all constituents such as a modularized facility. In addition, the present invention supplies a system capable of producing a cell therapy product to hospitals or universities of all the countries of the world, whereby they secure treatment technologies using the cell therapy product and thereby provide extended opportunity for treating patients, and at the same time, to provide the above system to global medical market, thereby accelerating development of cell therapy products.

[91] Meanwhile, although the preferred embodiments of the present invention have been disclosed with reference to the accompanying drawings, those skilled in the art will recognize that the present invention may be embodied in different forms with various modifications.

[92] It should be understood that the drawings and detailed description thereof are not intended to limit the invention to the particular form disclosed, but on the contrary, the intention is to cover all modifications, equivalents and alternatives falling within the

spirit and scope of the invention as defined by the appended claims.

Industrial Applicability

[93] As apparent from the foregoing, the present invention provides a modularized facility for production of a cell therapy product and operating method thereof and a use method and business method of a medical cell system including the above cell therapy product facility, a technology for production of a cell therapy product and a license. In particular, the present invention includes a facility module for production and storage of a cell therapy product, comprising a CT (Cell Therapy)-module capable of producing a cell therapy product and a BC (Banking of Cell and Tissue)-module capable of storing hematopoietic stem cells and bone marrow cells and other cells for a prolonged period of time through appropriate processes, wherein the CT and BC modules are respectively composed of five functionally specialized units: a preparation unit, a processing unit, a microbial sterility test unit, a quality control unit and a utility unit. Therefore, the present invention enables easy production of the cell therapy product having a quality grade sufficient to transplant into patients within a short period of time at a low production cost and clinical application thereof to patients within an early time, via use of the above-mentioned facility module. In addition, the present invention enables convenient installation and utilization of such a facility module in any place where a predetermined-size space is secured, by providing the facility module in a prefabricated type having specialized units according to the corresponding functions thereof. Further, the present invention supplies a system capable of producing a cell therapy product to hospitals or universities of all the countries of the world, whereby they secure treatment technologies that can be achieved using the cell therapy product and thereby provide extended opportunity for treating patients, and at the same time, to provide the above system to global medical market, thereby accelerating development of cell therapy products. Consequently, the present invention enables accomplishment of remarkably improved quality and reliability of the product and thereby enhanced customer satisfaction.

Claims

[1] A method for using a cell therapy product facility, comprising:
producing a cell therapy product by a CT (Cell Therapy)-module 1 composed of a plurality of separately prefabricated units having individual-specific functions and having an entrance and exit separately partitioned from each other so as to minimize occurrence of contamination; and
storing hematopoietic stem cells and bone marrow cells and other cells for a prolonged period of time through appropriate processes, by a BC (Banking of Cell and Tissue)-module 2 composed of a plurality of separately prefabricated units having individual-specific functions and having an entrance and exit separately partitioned from each other so as to minimize occurrence of contamination.

[2] The method according to claim 1, wherein the process of producing the cell therapy product includes:
wearing a clean room garment in a preparation unit 10 in order to enter sterile clean zones, and preparing/sterilizing raw materials and storing finished/semi-finished products therein;
maintaining a desired level of cleanliness in a processing unit 20 in order to produce cell therapy products such as cultured chondrocytes and cultured osteoblasts;
examining the presence of microbial contamination such as by bacteria during an incubation period for production of the cell therapy product, in a microbial sterility test unit 30;
confirming safety and effectiveness of the cell therapy product in a quality control unit 40; and
maintaining essential items such as a desired level of cleanliness, constant temperature and humidity, fire service and electricity for the respective units 10, 20, 30 and 40, in a utility unit 50.

[3] The method according to claim 2, wherein, in the preparation unit 10, the following processes are carried out including:
wearing a first working uniform in a first dressing room 11 in order to enter a washing room or processing unit;
wearing a clean room garment in a second dressing room 12 in order to enter the processing unit;
washing, sterilizing and delivering articles to enter the processing unit and providing an ultrapurification system, in the washing room 13;
packaging products from the processing unit in a packaging room 14;

storing semi-finished products produced during the manufacturing processes in liquid nitrogen in a semi-finished product depository 17; packaging finished products from the processing unit in the packaging room, followed by final storage of finished products in a finished product depository 18 until shipment; and

providing clean conditions by first and second buffering zones 15 and 16 as buffer areas with external environment.

[4] The method according to claim 3, wherein the first dressing room 11 of the preparation unit is provided with first and second air showers 60 and 61, and the microbial sterility test unit 30 is provided with a second air shower 61, whereby entrance of contaminating particles from the outside is prevented upon entering clean zones and dust or bacteria adhered to the workers are washed and eliminated by high-velocity clean air.

[5] The method according to claim 2, wherein a pass box 62 provided between the microbial sterility test unit 30 and quality control unit 40 enables only entrance and exit of articles without personnel entry, thereby preventing escape of contamination source or clean air.

[6] The method according to claim 2, wherein, in order to achieve optimal temperature and humidity for cell culture and minimized microbial contamination, the processing unit 20 is maintained at a cleanliness level of less than 100 particles having a particle size of 0.5 micrometer*(μm)* per cubic feet (f^3t), the preparation unit 10 and die microbial sterility test unit 30 except the first dressing room and finished product depository are maintained at a cleanliness level of less than 10000 particles having a particle size of 0.5 micrometer*(μm)* per cubic feet (f^3t), and other areas are divided into zones capable of maintaining a desired level of cleanliness and differential pressure.

[7] The method according to claim 1, wherein the process of storing hematopoietic stem cells and bone marrow cells and other cells for a prolonged period of time through appropriate processes includes:

wearing a clean room garment in a preparation unit 70 in order to enter sterile clean zones, and preparing/sterilizing raw materials therein; storing/preserving the umbilical cord blood in a processing unit 80; examining the presence of microbial contamination such as by bacteria during transportation or processing of the umbilical cord blood, in a microbial sterility test unit 90;

confirming safety and effectiveness of the cell therapy product in a quality contr ol unit 100; and

maintaining essential items such as a desired level of cleanliness, constant

temperature and humidity, fire service and electricity for the respective units 70, 80, 90 and 100, in a utility unit 110.

[8] The method according to claim 7, wherein, in the preparation unit 70, the following processes are carried out including:
wearing a clean room garment in a first dressing room 72 in order to enter a washing room or processing unit;
washing, sterilizing and delivering articles to enter the processing unit and providing an ultrapurification system, in the washing room 73; providing clean conditions by first and second buffering zones 74 and 75 as buffer areas with external environment; and providing a buffer area to enter the processing unit by a head room 71.

[9] The method according to claim 7, wherein, in order to achieve optimal temperature and humidity for cell culture and minimized microbial contamination, the preparation unit 70, the processing unit 80 and microbial sterility test unit 90 except a quality control unit 100, a utility unit 110 and a first dressing room 72 are maintained at a cleanliness level of less than 10000 particles having a particle size of 0.5 micrometer*(μm)* per cubic feet (f^3t), and other areas are divided into zones capable of maintaining a desired level of cleanliness and differential pressure.

[10] The method according to claim 6 or 9, wherein the temperature is 22±2°C, and humidity is 50±5%.