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DESCRIPTION KR20240150078A

Transport composition of Yamanaka factors using exosomes and mathematical modeling
business model {Equal proportion transporting using exosomes of Yamanaka Factors and
modeling technology business model}

[0001]

[This technology is equivalent to the fields of biotechnology and biomedical science within the field of science and technology.]

[0002]

[Exosomes are divided into natural exosomes and fabricated exosomes. Exosomes, regardless of whether they have been artificially modified. Ultimately, natural exosomes are divided into animal-derived exosomes and plant-derived exosomes. Since exosomes are produced in normal and tumor states, animal-derived exosomes are further divided into normal states.]

[0003]

[They are also classified as exosomes and tumor exosomes.

Almost all types of normal cells can produce exosomes, and they are also present in mesenchymal stem cells (MSCs), such as human umbilical vein endothelial cells, T cells, B cells, macrophages, dendritic cells (DC), and natural killer (NK) cells.]

[0004]

[If engineering technologies are developed as a result of scientific and technological innovation that enable human exosomes to safely reach specific target tissues and exert effects without being destroyed by the RES (Reticulo Endothelial System), etc., we intend to supply pharmaceuticals to the medical market that can treat patients more safely and effectively by developing upgraded exosome therapeutics using these technologies.

]

[0006]

[.

]

[0007]

[Business model enhancing stem cell factor delivery through exosome treatment]

[0008]

[Disease Treatment via Exosome Targeted Drug Delivery Systems]

[0009]

Exosomes can be effectively avoided because of their small size.

]

[0010]

[Monocytes can freely perform phagocytosis.

]

[0011]

[It crosses the blood vessel wall and the extracellular matrix.

To that extent, the expression of CD55 and CD59 on the surface prevents the activation of opsonins and coagulation factors, so they can spread widely.

It is distributed in biological fluids and is stable.

It has much better biocompatibility compared to liposomes.

]

[0012]

[In other nano-delivery systems being synthesized, exosomes derived from the body have better and theoretically better biocompatibility and lower immunogenicity.

Due to the heterogeneity of exosomes, they can perform techniques of administration after contacting surface proteins that enter the cell in various ways.

]

[0013]

[[Fig. 1] Schematic diagram of intercellular exosome exchange [Fig. 2] Schematic diagram of transport effect modeling according to Reynolds number: A diagram illustrating the shape of exosomes, such as liposomes, that change as the Reynolds number changes.

]

[0014]

[1.

For exosomes and Reynolds blood values to calculate fusion rates, the Reynolds number of blood is about 2000 and is between turbulence and eddy.

Liposomes can be estimated using biocompatibility versus bioavailability and the Reynolds number.

]

[0015]

[2.

Transfusion time to target area.

Activation energy is required for the dynamics of life phenomena.

]

[0016]

[3.

And it is considered that monitoring at the μm (10^{-6}m) level with the percentage of the predicted value administered to iPSCs would suffice.

]

[0017]

[4.

Since the Yamanaka factors that follow are the ones that won the Nobel Prize, not only the first factor, Oct4, has been studied, but various other studies such as Oct3 have also been conducted.

Oct 3 is used for cardiac myoblast activation and regeneration.

]

[0018]

[5.

Other effects are as follows.

]

[0019]

[5-1 Communication between exosomes and target tissues]

[0020]

[5-2 Optimizing the Exosome Endocytosis Process]

[0021]

[5-3 Internalization and Promotion of Encapsulated Drugs]

[0022]

[5-4 Continuous and stable transport of blood contents]

[0023]

[5-5 High transportation efficiency]

[0024]

[Powerful ability to induce and penetrate 5-6 target tissues or cells]

[0025]

[5-6 Biological barrier affinity like the blood-brain barrier]

[0026]

[5-7 Advantages of natural drug delivery and targeted drug carriers that can be used to deliver promising genes]

[0027]

[[Business Model]]

[0028]

[Human exosomes are known to exist within the human body and act as messengers between cells.

In order to develop and manufacture such exosomes as biological drugs, they must satisfy the requirements for biological preparations.

However, various medical and scientific studies on the efficacy of exosomes are being conducted and accumulated.

Therefore, as science and technology advance, it appears that more stable and highly effective exosome-based biological agents will continue to be developed.

]

[0029]

[At the current stage, we should develop the most appropriate exosomal drug at the current level of scientific and technological advancement, and then manufacture improved or innovative products in line with future scientific and technological progress.]

]

[0030]

[Based on this principle]

[0031]

[Step 1 is to establish cells/cell lines that secrete human exosomes,]

[0032]

[Phase 2 involves developing optimal conditions for producing exosomes from these cells
/cell lines,]

[0033]

[Step 3 involves identifying the route that allows these exosomes to reach the target tissue, brain tissue, most stably, and]

[0034]

[Phase 4 aims to develop formulations suitable for routes to administer these exosomes.

]

[0035]

[We intend to proceed with the above step-by-step approach to obtain approval for the biological drug in the shortest possible time at this point in time and apply it to patient treatment.

]

[0036]

[[Non-patent literature]]

[0037]

[[Example 1] Niwa, H., Miyazaki, J., Smith, A. G. Quantitative expression of Oct-3/4 defines differentiation, dedifferentiation or self-renewal of ES cells.

Nature Genet.

24: 372-376, 2000.

]

[0038]

[[Example 2] Okita, K., Ichisaka, T., Yamanaka, S. Generation of germline-competent induced pluripotent stem cells.

Nature 448: 313-317, 2007.

]

[0039]

[[Example 3] Alvarez-Erviti L, Seow Y, Yin H, Betts C, Lakhal S, Wood MJ. Delivery of siRNA to the mouse brain by systemic injection of targeted exosomes.

Nat Biotechnol.

2011;29(4):341-345. doi:10.1038/nbt.1807]

[0040]

[[Example 4] , Image[attributes={}; value=[ImageFormatCategory[attributes={}; value=[JPEG]], ImageFileName[attributes={}; value=[pat00001.jpg]], HeightMeasure[attributes={measureUnitCode=Px}; value=[5]], WidthMeasure[attributes={measureUnitCode=Px}; value=

[12]]], Tatischeff AA. A new biological strategy for drug delivery: eucaryotic cell-derived nanovesicles.

J Biomater Nanobiotechnol.

2011;2(5).

]

[0041]

[[Example 5] van den Boorn JG, Schlee M, Coch C, Hartmann G. SiRNA delivery with exosome nanoparticles.

Nat Biotechnol.

2011;29(4):325-326. doi:10.1038/nbt.

1830]

[0042]

[Dendritic cells (DCs) are genetically modified to express.

Fusion proteins containing membrane proteins, such as Lamp2b and RVG peptides, are already available for industrial use, and exosomes derived from cells are included.

]