HORMONAL RESPONSIVE WHITE ADIPOSE TISSUE MICRO-PHYSIOLOGICAL SYSTEM

Tech ID: 32481 / UC Case 2022-012-0

PATENT STATUS
Patent Pending

BRIEF DESCRIPTION
The inventors have developed a first-of-its-kind human stem cell-derived metabolically functioning white adipose tissue micro-physiological system (WAT-MPS). The system reconstructs actual physiological circulation and provides a supportive microenvironment that promotes differentiation and maintains long-term cell viability that is superior to traditional tissue culture conditions.

Previous studies of stem cell-derived human adipocytes often result in insulin resistant cells due to suboptimal differentiation conditions. The inventors systematically screened key differentiation factors and identified a window of conditions that can create insulin sensitive human adipocytes from mesenchymal and induced pluripotent stem cells without decreasing adipogenesis. To facilitate the rapid and scalable assessment of these human adipocytes, the inventors also optimized an MPS platform that can be used to quantify insulin responsiveness of adipocytes.

This WAT-MPS platform will enable high throughput drug screening for insulin sensitizers, regulators of lipolysis, and environmental insulin desensitizers, and power personalized medicine approaches to investigate genetic risks of insulin resistance and pharma-co-genetics.

SUGGESTED USES
This WAT-MPS platform could be used:

» for sale and/or licensing of a new differentiation medium for the creation of hormonally responsive adipocytes from human stem cells

» for high throughput drug screening for new insulin resistance/type-diabetes mellitus (T2DM) drugs with or without integration with other organ-on-a-chip systems

» for high throughput screening of insulin desensitizing effects of new drugs or chemicals

» in conjunction with patient derived (iPSC) adipocytes to assess genetic predispositions for developing insulin resistance/T2DM

» in conjunction with patient derived (iPSC) adipocytes to determine the safest and most efficient treatment options

ADVANTAGES

» Adipocytes generated with currently published adipogenesis protocols for human stem cell and commercially available human WAT from stem cells lack physiological insulin responsiveness.

» This WAT-MPS is the first device to support the prolonged viability and functional assessment of human stem cell derived adipocytes.

» A dedicated MPS combined with a 3D culture microenvironment allows for extended viability and function (several weeks) in comparison to current tissue culture conditions (several days).

» As a micro-scaled platform, this WAT-MPS can lower drug discovery costs compared to standard in vitro models by reducing the required cell numbers, culture media, and drugs for experimental treatment.

» The system is user-friendly. The WAT-MPS can be automatically maintained, assayed, and analysed by programmed pumping units and MPS-computer interfaces allowing for short training of personnel and integration into automated processes.

RELATED MATERIALS

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

» Brown Adipose Tissue Myosin II Activators for Metabolic Therapy