Modeling Diseases with ObaCell®

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Engineering 3D hydrogels suitable for disease modeling has become widely desired by the scientific community. The potential of mimicking the physiological microenvironment of tissues and diseases in vitro gives way to the further development of treatments and diagnostic tools to improve personalized medicine. Many scientific groups have already developed 3D models representing the liver, brain, skin, lung, and other tissues. Obatala Sciences™ is contributing to these innovative efforts by providing the scientific community with ObaCell®, a fat-on-a-chip tissue model.

The understanding of the biochemistry of adipose tissue (fat) has become more extensive in the last few decades. Early definitions of adipose tissue describe it as an inert tissue whose primary function is to store excess energy. However, it is now understood that, besides the energy storage role, adipose tissue plays an important role in the regulation of metabolic homeostasis. Additionally, adipose tissue is now considered an active endocrine tissue due to its involvement in cell function regulation. As an endocrine tissue, adipose tissue influences the response of a variety of tissues including the liver, hypothalamus, skeletal muscle, immune system and others[1]. To add to the complex nature of adipose tissue, current research has revealed that fat comprises of a heterogeneous group of cells including adipocytes, stromal vascular fraction (SVF), endothelial cells, pericytes, blood cells, and many others. The dynamic role of adipose tissue deserves more attention due to its crucial involvement with other organs and its ability to contribute to the development of diseases such as obesity, diabetes, cardiovascular diseases, osteoarthritis, and their associated comorbidities.

What is ObaCell®?

ObaCell® is the first commercially available human adipose-on-a-chip (fat-on-a-chip) model intended as a tool for disease modeling and drug screening. The 3D model includes Obatala's first commercially available human-derived hydrogel, ObaGel®, human stromal vascular cells (SVF) or human adipose derived stromal/stem cells (ASC), and culture media. Compared to 2D models, characterization of ObaCell® has demonstrated enhanced cell proliferation, maintenance of cellular heterogeneity, spheroid induction, robust adipogenic differentiation and adipose functionality[2].

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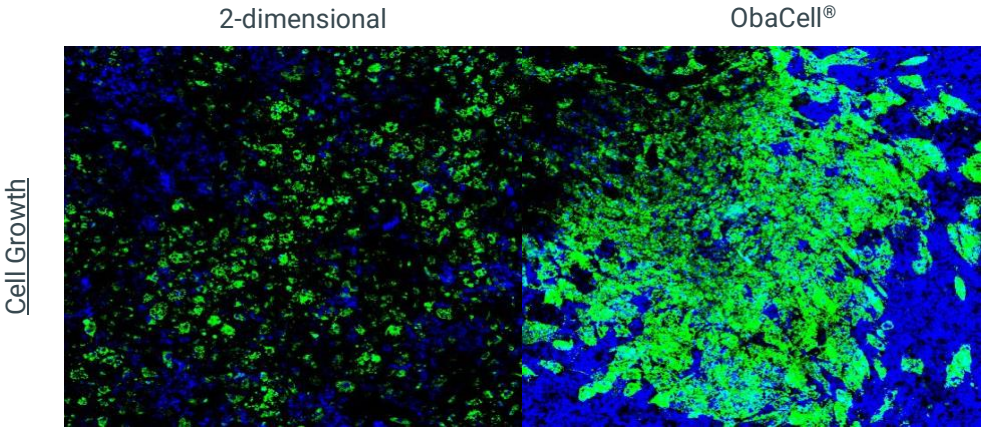
Culture Media:

Obatala Sciences™ offers a variety of 3D culture media to support the establishment and maintenance of ObaCell® cultures. These supporting culture media can be included in Obatala's ObaCell® kit or purchased directly from our website.

StromaQual3D™: StromaQual3D™ supports the maintenance of ObaCell® cultures prior to adipogenesis induction.

AdipoQual3D™: AdipoQual3D™ supports the differentiation of SVF or ASC into mature adipocytes. It also supports the maintenance of the differentiated adipose-on-a-chip model throughout the experimental process.

In addition to StromaQual3D™ and AdipoQual3D™ culture media, Obatala® can offer specific differentiation media to support the induction of cells into white adipose tissue (WAT) and brown adipose tissue (BAT).



Cell Selection:
ObaCell® kit can either include stromal vascular fraction cells (SFV) or adipose-derived stromal/stem cells (ASC). Both SVF and ASC used in the ObaCell® kit are isolated from human adipose tissue under an approved IRB protocol. Furthermore, Obatala Sciences™, Inc. supports customer's customization requests by maintaining a vast catalog of cells coming from a diverse group of adipose tissue donors. This means that our customers can select their cells based on the donor's gender, race, age, and BMI. To request a specific demographic to go with your ObaCell® kit, please contact us prior to placing an order.

Applications
It is apparent that modeling tissue microenvironment and diseases with 3D hydrogels represents an important, cost-effective advancement for the study of diseases and cell interactions in specific tissue types. Obatala Science's adipose-on-a chip represents our effort to provide an accurate model that closely resembles the microenvironment of adipose tissue in the human body. ObaCell® has been extensively validated against 2D models based on cell proliferation, adipogenic differentiation, and adipose tissue functionality (adipokine secretion, glucose uptake, lipolysis). Thus, as an adipose-on-a-chip model, ObaCell® allows researchers to investigate the short or long-term effects of drug treatments by analyzing endpoints that include immune response, gene expression, protein/adipokine expression, glucose uptake, lipolysis, cell/tissue morphology, etc. Additionally, Obatala® can offer researchers the opportunity to create demographic-targeted studies by taking advantage of our vast cell catalog representing donors from different genders, ages, body mass indexes (BMIs), and ethnicities. Recent health crises around the world demonstrate the great effect that health disparities have caused in healthcare management. Thus, there is a growing need to investigate how different demographic groups respond to diseases and treatments. With ObaCell® and the rest of our 2D and 3D products, Obatala® is committed to offer accurate, cost-effective research tools to tackle current health issues such as, faster drug development and reduction of health disparities.

Recent Publications:

1. **Fat-on-a-Chip models for research and discovery in obesity and its metabolic co-morbidities**
   McCarthy, M., Brown, T., Alarcon, A., Williams, C., Wu, X., Abbott, R., Gimble, J. M., & Frazier, T. (2020). Fat-on-a-Chip models for research and discovery in obesity and its metabolic co-morbidities. *Tissue engineering. Part B, Reviews*, 10.1089/ten.TEB.2019.0261. Advance online publication.
   https://doi.org/10.1089/ten.TEB.2019.0261

References:
[1]Coelho, M., Oliveira, T., & Fernandes, R. (2013). Biochemistry of adipose tissue: an endocrine organ. *Archives of medical science: AMS*, *9*(2), 191–200. https://doi.org/10.5114/aoms.2013.33181

[2] McCarthy, M., Brown, T., Alarcon, A., Williams, C., Wu, X., Abbott, R., Gimble, J. M., & Frazier, T. (2020). Fat-on-a-Chip models for research and discovery in obesity and its metabolic co-morbidities. *Tissue engineering. Part B, Reviews*, 10.1089/ten.TEB.2019.0261. Advance online publication. https://doi.org/10.1089/ten.TEB.2019.0261