CSC-BASED MALIGNANT MELANOMA MODEL BY 3D-BIOPRINTING

A new tri-layered malignant melanoma 3D model has been developed by 3D bioprinting, and based on cancer stem cells. This model reproduces the heterogeneity and complexity of the tumor microenvironment, and would comprise an alternative to animal testing and clinical trials for cancer diagnosis, prognosis and treatment studies.

Technology for Licensing

Keywords:

Bioprinting, 3D, malignant melanoma, MM, cancer stem cells, CSC, skin tumor model, three dimensional model, tumor microenvironment

Description:

Tumor microenvironment is crucial for understanding native tumor behaviour. It consists of a complex and dynamic network of cells, blood vessels and secreted factors that continually changes its composition and state. A small fraction of those cells are cancer stem cells (CSC), an essential therapeutic target for cancer research due to its role in drug resistance and tumor recurrence.

In comparison to traditional 2D models, and 3D in vitro models that include a biomimetic extracellular matrix, 3D-bioprinting comprises the most optimal alternative to produce a tumor model, since the heterogeneity and complexity of the microenvironment can be replicated through co-printing of the different components by loading them in different bioinks.

In this invention, a 3D-model of CSC-based malignant melanoma (MM) has been developed by using 3D-bioprinting. It uses primary MM cells from patients or commercial lines, comprises the three skin layers, and permits its vascularization even in the absence of vascular endothelial growth factor (VEGF).

The resulting model is able to replicate the heterogeneity and treatment response of the tumor, which will allow to identify drug resistant tumors, discover drugs against MM and optimize current treatments towards a more reliable precision and personalized medicine, while also involving important savings in time and resources compared to the use of animal testing and clinical assays.

Advantages and Benefits

- Higher model fidelity

  It more accurately replicates celular components, the tri-layer structure and microenvironment tan current 2D, and 3D in vitro models.

- Overcomes difficulties associated with current 3D in vitro models

  Such as limited vascularization, lack of well-organized spatial distribution of the biological components, and oversimplified structure.

- High standardization, scalability and repeatability of assays

  Thanks to the optimized generation via bioprinting, which favors asset commercialization.

- Ethic alternative to animal testing

  The use of a skin model reduces the need of animal testing, and it can even reduce the need of clinical trials.

- Time and resource savings

  Linked to the reduced use of experimental animals and the conduction of clinical trials.

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