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PROCEEDINGS

Microcarrier Systems for Cell Co-Culture Reveal Cell-Cell Interactions

Zhanwu Hou[1] and Linfeng Xu[2,*]

[1]School of Life Science and Technology, Xi'an Jiaotong University, Xi'an, 710049, China

[2]School of Automation Science and Engineering, Faculty of Electronic and Information Engineering, Xi'an Jiaotong University, Xi'an, 710049, China

[*]Corresponding Author: Linfeng Xu. Email: xu.linfeng@xjtu.edu.cn

ABSTRACT

The cell-cell interaction between immune cells and tumor cells in the tumor microenvironment plays an important role in the genesis and development of tumors. However, due to the lack of methods to systematically identify the interaction between the two, the specific molecular mechanisms involved are not well understood. The microfluidic platform provides a high-throughput and precise method for studying cell interactions in microreactive systems. However, the traditional platform for studying cell interactions is the closed droplet system, which is easy to cause the consumption of nutrients and the accumulation of wastes, thus interfering with cell interactions. For this purpose, we prepared microspheres with well-defined shapes and chemical modifications that can be used as microcarriers of cells for cell culture and the study of cell-cell interactions. The method utilizes a polymerizable polyethylene glycol and dextran two-phase system with conditional phase separation within droplets produced by microfluidics. After droplet formation, phase separation was induced, and the separated droplet was crosslinked to form uniform crescent shaped hollow shell particles. The cells were implanted into the crescent shaped particles with sub-nanometer size by seeding. The particle has a semi-open structure that preserves the shape and position of the cells while facilitating the exchange of nutrients and waste, allowing for a more precise study of cell interactions. The communication mechanism between tumor cells and immune cells was investigated by co-culture of tumor cells, microfluidic fluorescence activated droplet sorting, proteomics and transcriptomic analysis. The work may help reveal why immune cells that are supposed to protect the body promote tumor development.

KEYWORDS

Cell-cell interaction; microfluidic; microcarriers; co-culture

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