

Producing 3D co-culture cell laden microstructures by Cell Origami

Qian He, Takaharu Okajima, and Kaori Kuribayashi-Shigetomi

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Abstract

This paper describes utilizing cell traction force based cell origami technique to form three-dimension (3D) co-culture cell laden microstructures with two kinds of culture conditions and the function detection of these 3D co-culture cells. The preference of cell culture conditions and interactions between different kinds of cells are essential for cell functions and proliferation [1-3], therefore, many 3D co-culture structures were reported to create the accurate microenvironments for cells [4, 5]. However, the operation and processes of making these 3D cell co-culture structures are complicated and time taking, and a few of them can provide suitable culture conditions according to cell preference and sufficient cell-cell interaction at the same time. Here, we used cell origami, the technique developed by our previous research [6] (Fig. 1A), to produce 3D co-culture cell laden microstructures with two kinds of culture conditions and sufficient cell-cell interaction simultaneously between different kinds of cells (Fig. 1B).

According to the preference of different kinds of cells, one kind of cells was seeded firstly and cultured on the flat microplates, another kind of cells was seeded on the first kind of cells and aggregated together spontaneously. After lifted off the microplates, the flat cultured cells provided their traction force to fold the microplates immediately and wrapped the aggregated culture cells inside to form the 3D co-culture cell laden microstructures. And the sufficient cell-cell interaction between these two kinds of cells was achieved by this wrapping layout (Fig. 1B, Fig. 2A). Comparing the co-culture cells on the microplates without folding, the higher function was detected from the co-culture cells inside of 3D microstructures (Fig. 2B). We believe this these microstructures can be provided to investigate the many functions of different co-culture cell combinations, for example, the drug screening by using different cells combinations.

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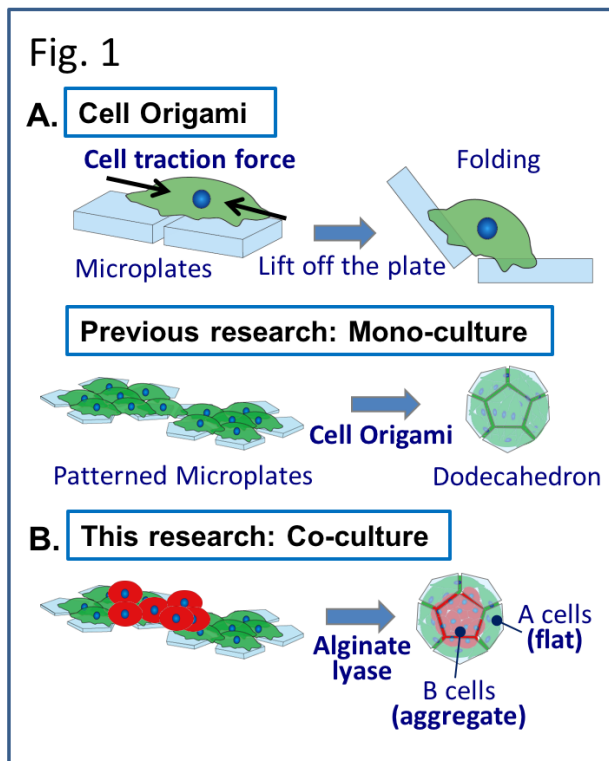


Fig. 1 The production of 3D co-culture cell laden microstructures by cell origami technique. Cells apply traction force to fold the microplates and form a 3D co-culture cell laden microstructure. Comparing to previous research, co-culture two kinds of cells was investigated in this research.

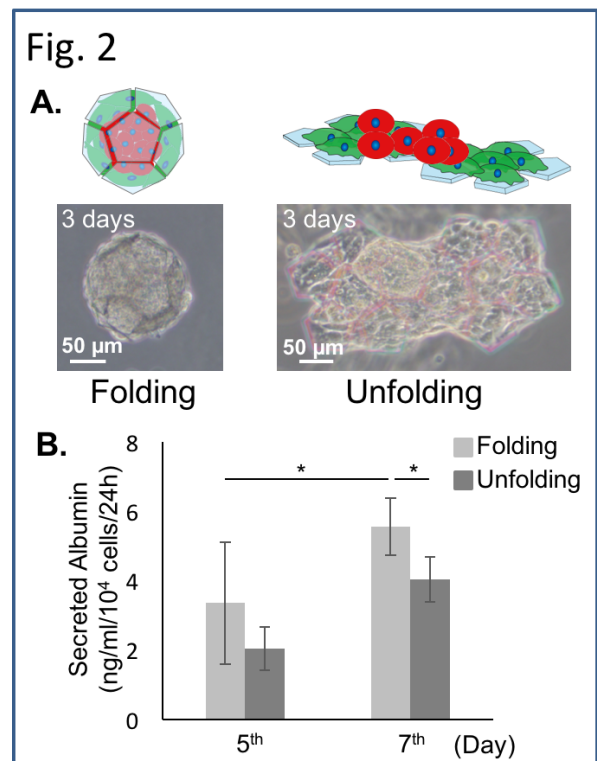


Fig. 2 The detection of secreted albumin. After 5th and 7th days, the albumin of the co-culture cells was detected and the cells number of each group was calculated. The significant difference was found between folding and unfolding groups on 7th day. In addition, the albumin secretion on 7th day was increased compared with 5th day in folding groups.

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