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Dynamics of natural killer cells cytotoxicity in microwell arrays with connecting channels

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Natural killer (NK) cells serve an important role in immune system by recognizing and killing potentially malign cells without antigen sensitization and could be important in cancer therapy. We have designed and fabricated microwell arrays with microchannel connections in polydimethylsiloxane (PDMS) substrates to study the interaction dynamics of NK-92MI cells with MCF7 breast cancer cells using time-lapse imaging by fluorescence microscopy for 15 h. Although cell seeding density is the same, NK cell cytotoxicity was found to be stronger in larger microwells, which is manifested as higher target death ratio ($D = \text{NMCF7 Death} / \text{NMCF7 Total}$) and shorter triggering time of first target lysis. Microchannel connection between adjacent microwell of the same size increased the overall target death ratio by >10%, while connection between microwells of different sizes led to significantly increased target death ratio and delayed first target lysis in smaller microwells. Our findings reveal unique cell interaction dynamics such as initiation and stimulation of NK cell cytotoxicity in a confined microenvironment, which is different from population-based study. The results could lead to a better understanding of the dynamics of NK cell cytotoxicity.

Biography

Xu Yuanhao has completed his BEng and MSc degree at City University of Hong Kong and he is currently pursuing his PhD study at the same university. He is currently a Member of Centre for Biosystems, Neuroscience and Nanotechnology.

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