3 - 101 Analysis of Protein Expression in 2D and 3D Cultures after Exposed to C-beam

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Generally, we use the two-dimensional (2D) cell culture or animal model system to study the biological effect or medicine. However, cells grown on flat 2D tissue culture substrates can differ considerably in their morphology, cell-cell and cell-matrix interactions, and differentiation from those growing in more physiological three-dimensional (3D) environments[1]. In addition, animal models may not adequately reproduce features of, for example, human tumors, drug therapeutic responses, autoimmune diseases, and stem cell differentiation[2]. So in vitro 3D tissue models provide a third approach that bridges the gap between traditional cell culture and animal models[3].

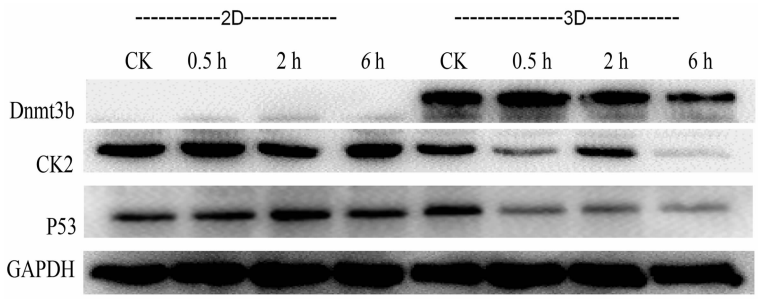

Fig. 1 The expression of Dnmt3b, CK2 and P53 proteins in 2D and 3D HBEC-3KT cells after irradiated by 4 Gy $^{12}C^{6+}$ beam.

Cell shape and architecture have profound impact on cellular behavior[4]. Model of normal and transformed cells impressively showed that 3D growth in an extracellular matrix(ECM) substantially modifies gene and protein expression, survival, proliferation, differentiation, and metabolism compared with conventional monolayer cell cultures[5-6].

Here, we investigated the expression of several key proteins (Dnmt3b, Ck2, P53) in 2D and 3D cultures after irradiated by high LET $^{12}C^{6+}$ beam (dose rate: 0.25 Gy/min, LET: 18 keV/m). As shown in Fig. 1, we can found that Dnmt3b expressed in a significant higher level in 3D HBEC-3KT cells compared with 2D cells, but the expressions of CK2 and P53 were higher in 2D cells than in 3D cells. Previously, we observed that high LET $^{12}C^{6+}$ induced more cellular killing in 2D cells than that of 3D cultures[7]. Dnmt3b is a methyltransferase which can methylate the promoter of some genes[8]. Methylation of gene promoter leads to transcriptional repression and subsequent loss of protein expression. CK2 is a regulator protein of P53. And P53 tumor suppressor protein is important in the cellular response to DNA damage. it can induce inhibition of cell cycle progression until damage is repaired. It may suggest that there are some links between the changes of these proteins and the differential damage of 2D and 3D cells after irradiation. In the future, we will focus on the pathway of the difference damage of 2D and 3D cells.

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