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Isolation and In Vitro Characterization of Breast Cancer Stem Cells From Breast Cancer Cell Lines

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Abstract

Introduction Breast cancer stem cells (BCSCs) have specific markers such as CD44+/CD24- and behaviors including self-renewal, differentiation, metastasis, migration and therapy resistance. BCSCs can be enriched by culturing of cells in non-adherent non-differentiating circumstances. With regard to therapy resistance of CSCs, it is important to enrich CSCs for more efficient cancer therapy which directly targets CSCs with suitable doses of drugs. This study compares stemness phenotypes of mammospheres generated from three breast cancer cell lines. Selecting the best cell line to isolate BCSCs with the most stemness phenotypes may help to discover the best therapy strategy through targeting BCSCs.

Materials and Methods: In this study, two luminal subtypes of cell lines MCF7 (ER+/PR+/HER2-) and SKBR3 (ER-/PR-/HER2+) and a basal subtype cell line MDA-MB-231 (ER-/PR-/HER2-) were chosen. We used optimal enrichment culturing system for BCSCs. Then, the mammosphere formation efficiency (MFE), CD44+/CD24- cell ratio, stemness genes expression, proliferation rate and migration of mammospheres (passaged during 3 weeks) were evaluated and compared.

Results: Mammospheres could be formed in all three cell lines, in which MCF-7 had the highest MFE. CD24 marker (a differentiation marker for breast cancer cells) was significantly reduced in mammospheres generated from MCF7 and SKBR3, during three weeks. Also, stemness gene expression including Oct4 and Nanog was significantly high in all the three types of mammospheres. Proliferation rate and migration of mammospheres generated from all three cell lines were significantly high.

Conclusions: The results showed that SKBR3-derived mammospheres have the most stemness phenotypes among three types of mammospheres generated from three cell lines. Studying on SKBR3-derived mammospheres may help discover the best therapy strategy through targeting BCSCs.