

# Characterization of a cancer stem cell-like side population derived from human pancreatic adenocarcinoma cells

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## ABSTRACT

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**Aims and background.** To identify and partially characterize the side population cells derived from three human pancreatic adenocarcinoma cell lines.

**Methods.** Side population cells were sorted from the human pancreatic adenocarcinoma cell lines SW1990, Capan-2, and BxPC-3 using flow cytometry and then analyzed for cell proliferation, clone formation, differentiation, chemoresistance, invasive potential, and tumorigenicity in a mouse model.

**Results.** Human pancreatic carcinoma cell lines SW1990, Capan-2, and BxPC-3 contain  $2.7\% \pm 0.35\%$ ,  $3.6\% \pm 1.2\%$ , and  $2.8\% \pm 0.8\%$  side population cells, respectively. We further investigated cancer stem cell characteristics with the moderately differentiated human pancreatic adenocarcinoma cell line SW1990. Flow cytometry analysis revealed that side population cells could differentiate into side population and non-side population cells and could exhibit differentiation potential. Using a clone formation assay, side population cells were shown to have a higher proliferation than non-side population cells. Compared to non-side population cells, side population cells were also more resistant to gemcitabine, a commonly used anti-cancer agent against pancreatic carcinoma, and were more invasive. Importantly, the CD133 level in side population cells was significantly higher than that in non-side population cells. The enhanced tumorigenicity was further confirmed in a male diabetic/severe combined immunodeficiency mouse model. As few as  $3 \times 10^3$  side population cells were sufficient to induce tumor formation in the mouse model, compared to  $10^7$  non-side population or unsorted cells.

**Conclusions.** Side population cells isolated from human pancreatic adenocarcinoma cell lines harbor cancer stem cell-like properties that may be related to the invasive potential and therapeutic-resistance of pancreatic adenocarcinoma. Free full text available at [www.tumorionline.it](http://www.tumorionline.it)

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**Key words:** cancer stem cell, pancreatic adenocarcinoma, side population cells.

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