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Radiation-induced cancer cell possibility to differentiate into cancer stem cell theory verification

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Ionizing radiation (IR) has been proven to be a powerful medical treatment in cancer therapy. Rational and effective use of its killing power depends on understanding IR-mediated responses at the molecular, cellular and tissue levels. Increasing evidence supports that cancer stem-like cells (CSCs) play an important role in tumor regrowth and spread post radiotherapy, for they are resistant to various therapy methods including radiation.

Researchers* at UCLA's Jonsson Comprehensive Cancer Center Department of Oncology found that that ionizing radiation reprogrammed differentiated breast cancer cells into induced breast cancer stem cells (BCSCs). This team found that these cells had more than 30-fold increased ability to form tumors compared with non-irradiated breast cancer cells. It is very important to verify in what dose the cancer cells may differentiate to cancer stem cells for the better prevention and effective medical treatment.

In this investigation it was checked if cancer cell after irradiation with various dose (1-30Gy) of proton radiation may differentiate into cancer stem cells. It was noticed that cancer cells after irradiation (1Gy) changed their morphology. The survival factor was 67%.

Evidence show that cancer cells are expressing different surface markers compared with cancer stem cells, it is also known that these cells have clearly different viability mechanism. To identify cancer stem cells from cancer cells the surface markers was used. The cell proliferation assay kit was used to measure proliferation. Viability was evaluated in two different methods: first with trypan blue (0,4%) using hemocytometer, second with propidium iodide and calcein using flow cytometer. With flow cytometer it was also analyzed cell cycle using Hoechst 33342 dye. For the survival fraction calculations all cells after irradiation were cultured into 6-well cell culture plate and analyzed by the colony clonogenic method.

- Lagadec C and et al., Radiation-induced reprogramming of breast cancer cells. Stem Cells. 2012 May;30(5):833-44

Primary author: Ms LIUBAVIČIŪTĖ, Aušra (Vilnius university Center for Physical Sciences and Technology)

Co-authors: Dr PLUKIS, Artūras (Vilnius university Center for Physical Sciences and Technology); Prof. BIZIULEVIČIENĖ, Genė (Public Research Institute of Innovative Medical Center. Stem Cell Biology Department); Mr GASPARIŪNAS, Mindaugas (Vilnius university Center for Physical Sciences and Technology); Mr MALCIUS, Mindaugas (Vilnius university Center for Physical Sciences and Technology); Prof. REMEIKIS, Vidmantas (Vilnius university Center for Physical Sciences and Technology); Dr PAŠUKONIENĖ, Vita (The Institute of Oncology Vilnius University Laboratory of Immunology); Dr KOVALEVSKIJ, Vitalij (Vilnius university Center for Physical Sciences and Technology)

Presenter: Ms LIUBAVIČIŪTĖ, Aušra (Vilnius university Center for Physical Sciences and Technology)

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