EVALUATION OF LOW-DOSE NEUTRON IMPACT ON IRRADIATED CHO CELLS

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Introduction

- Neutron interaction with biological tissues causes cell structural and functional changes that may lead to the death of cancerous cells but also may initiate radiation induced cancer due to the damages of healthy ones.
- The neutron beam can cause fission or segmentation of the nucleus.
- Exposure of cells to neutrons is expected to induce a variety of DNA lesions, including double strand breaks (DSBs), single strand breaks (SSBs) and oxidized bases, as well as loss of bases.
- Since neutron therapy is one of the cancer treatment methods it is important to investigate low dose radiation impact on healthy cells present in the irradiation field

Materials and methods

Neutron generator

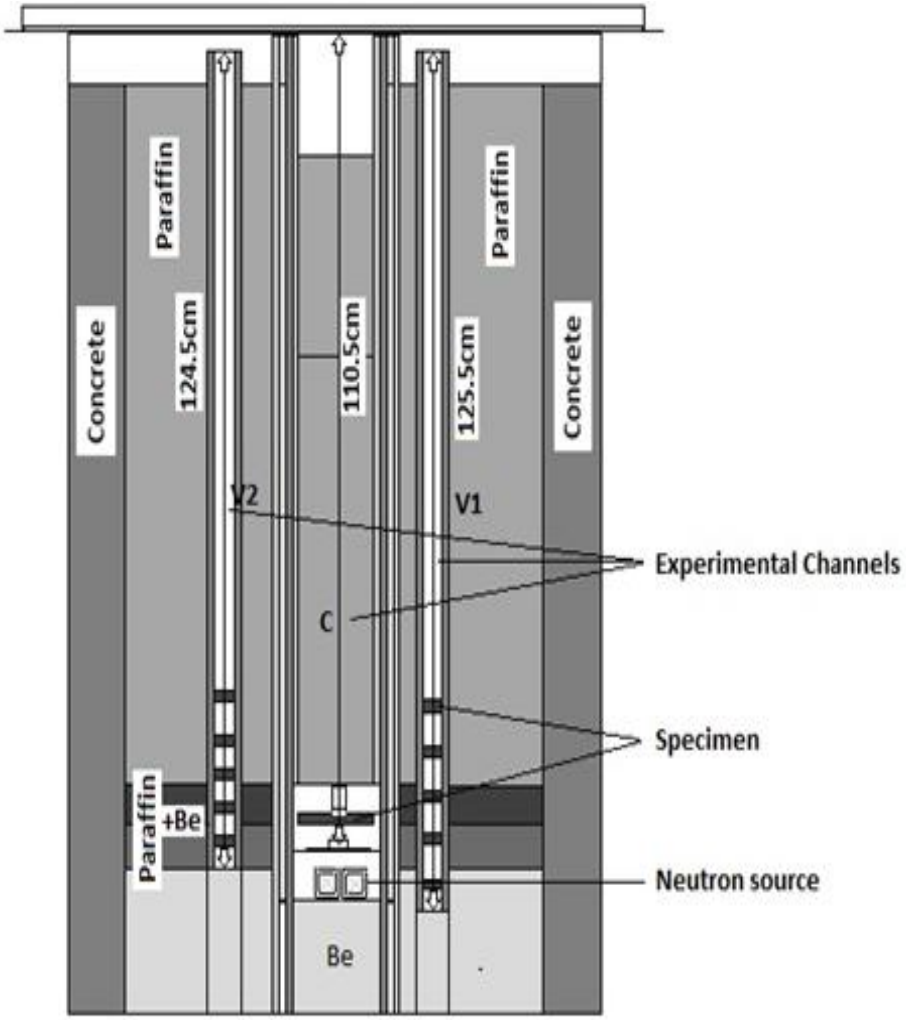


Fig.1. The scheme of neutron generator

- The isotopic neutron source is characterized by (α, n) an exo-energetic nuclear reaction, which proceeds according to (Eq.1)

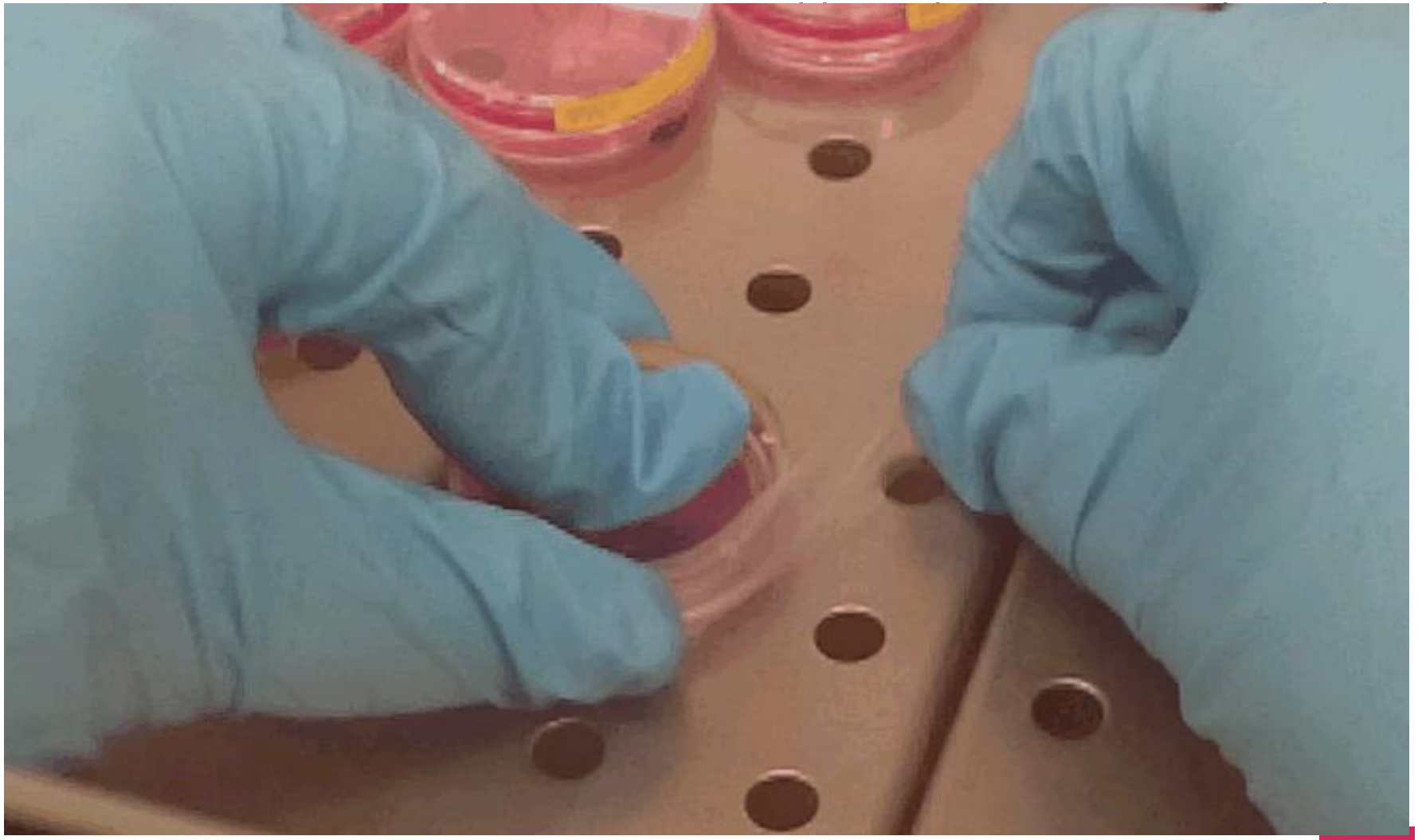
$$\alpha + {}^{9}Be \rightarrow n + {}^{12}C$$

- Thermal neutrons interact with mater in capture reactions

$$X + n \rightarrow X^{*} + n;$$

$$X^{*} \rightarrow X + \gamma.$$

Cells cultivation and transportation



Materials and methods

Clonogenic assay.

- *Clonogenic assay* or colony formation assay is an *in vitro* cell survival assay, which allows identifying the ability of a single cell to grow into a colony (at least 50 cells).

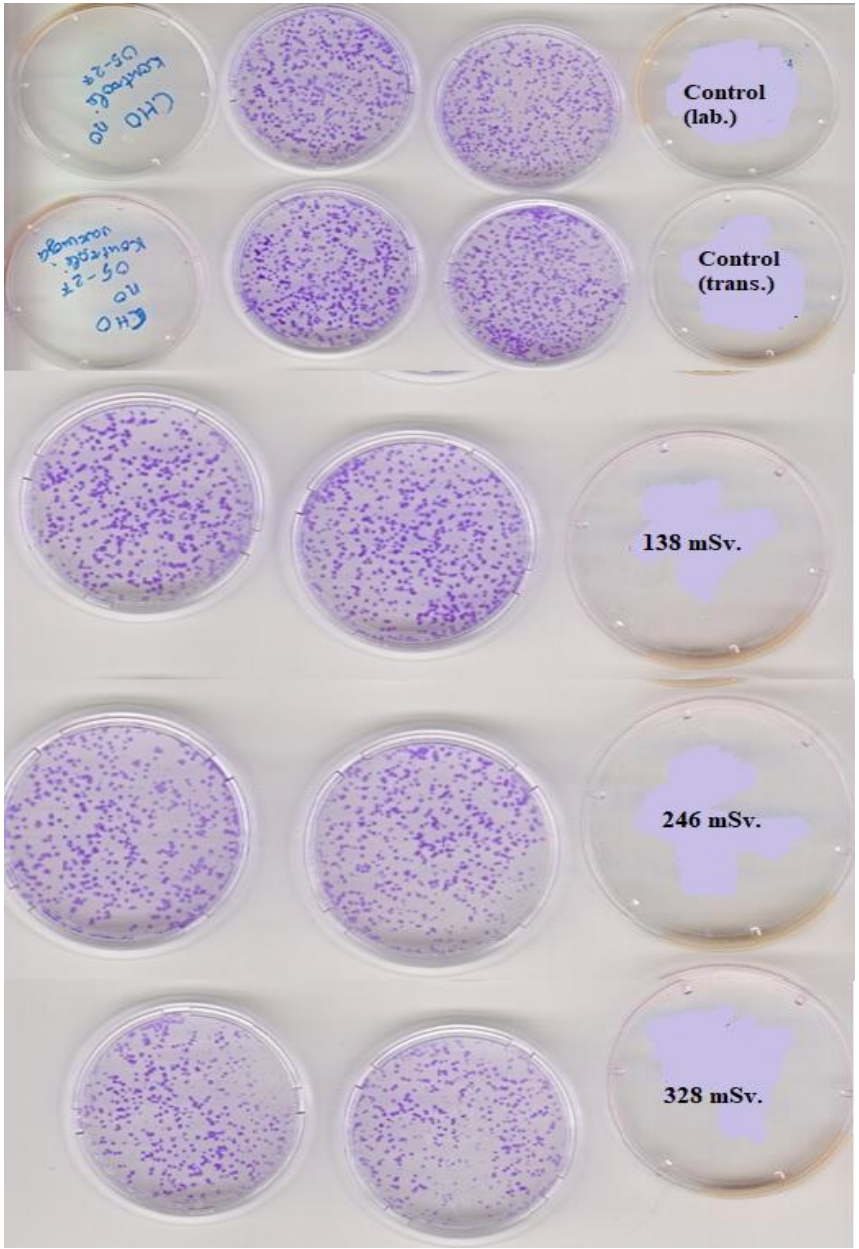


Fig.3. Photograph of investigated cell colonies

Comparison of control samples

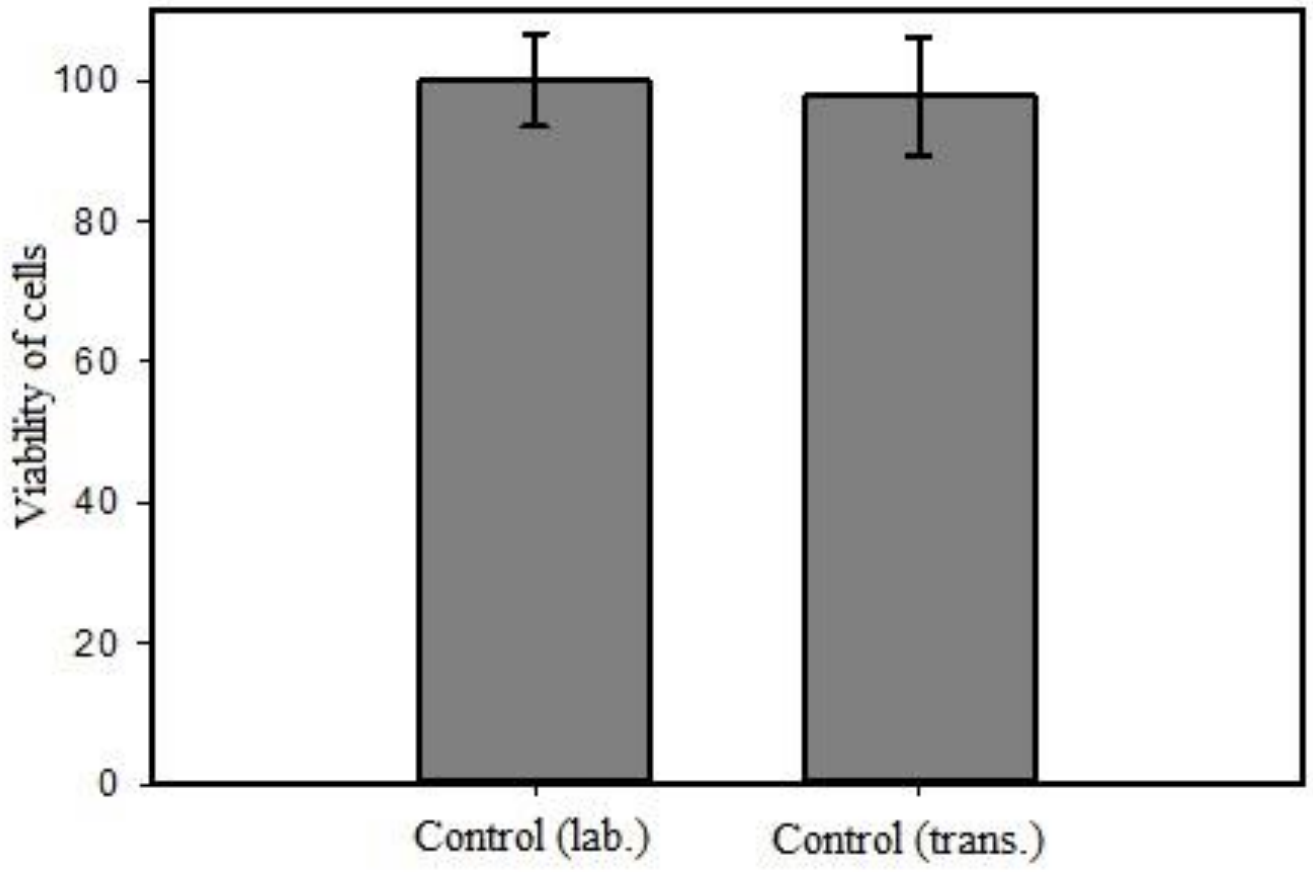


Fig. 4. Comparison of the control samples:
Control (lab.) – cultivated in lab; control (trans.) - transported.

Comparison of control samples

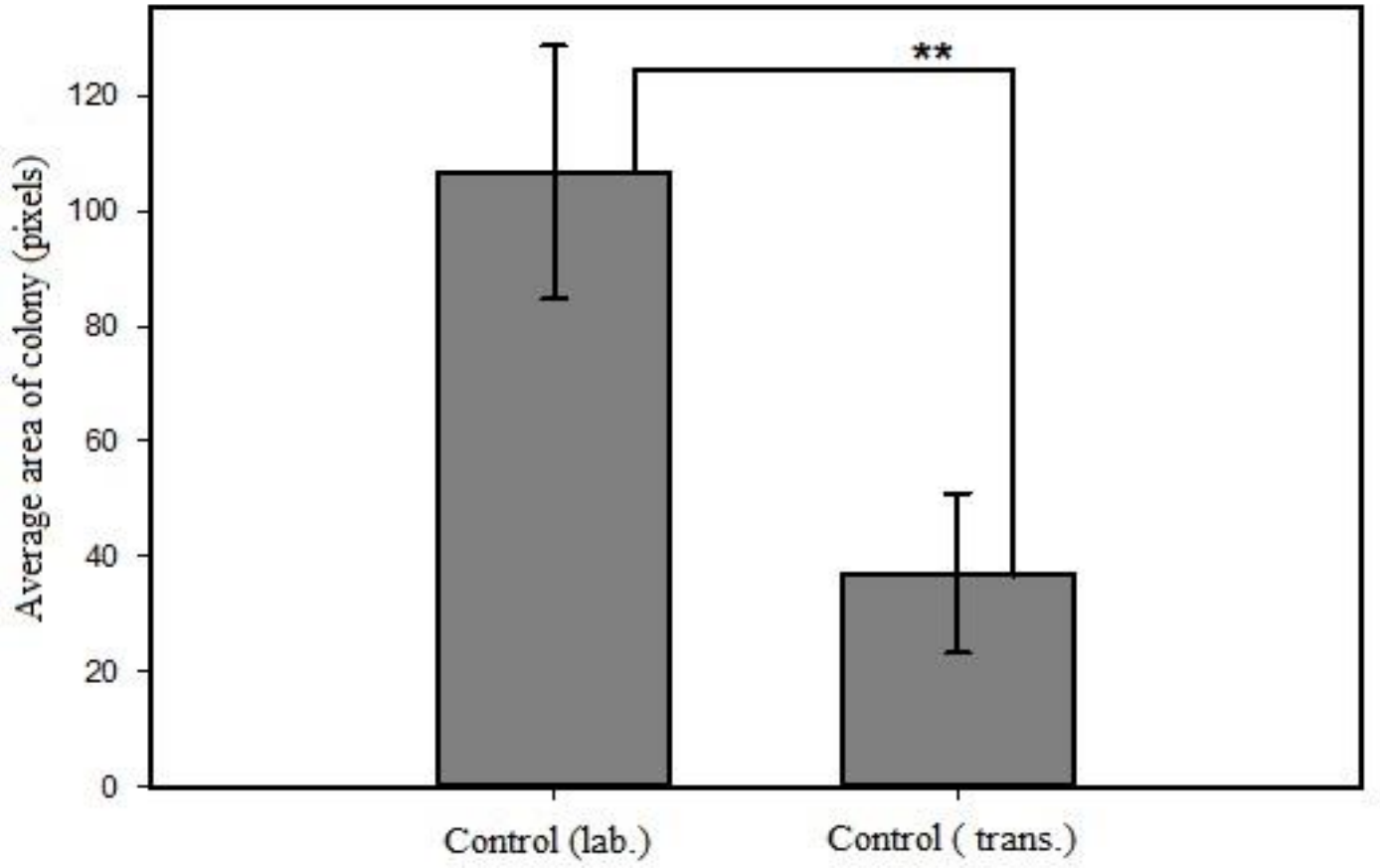


Fig.5. Comparison of colony's areas formed by different control samples. ** - $p<0.01$.

Viability in cells irradiated to different doses

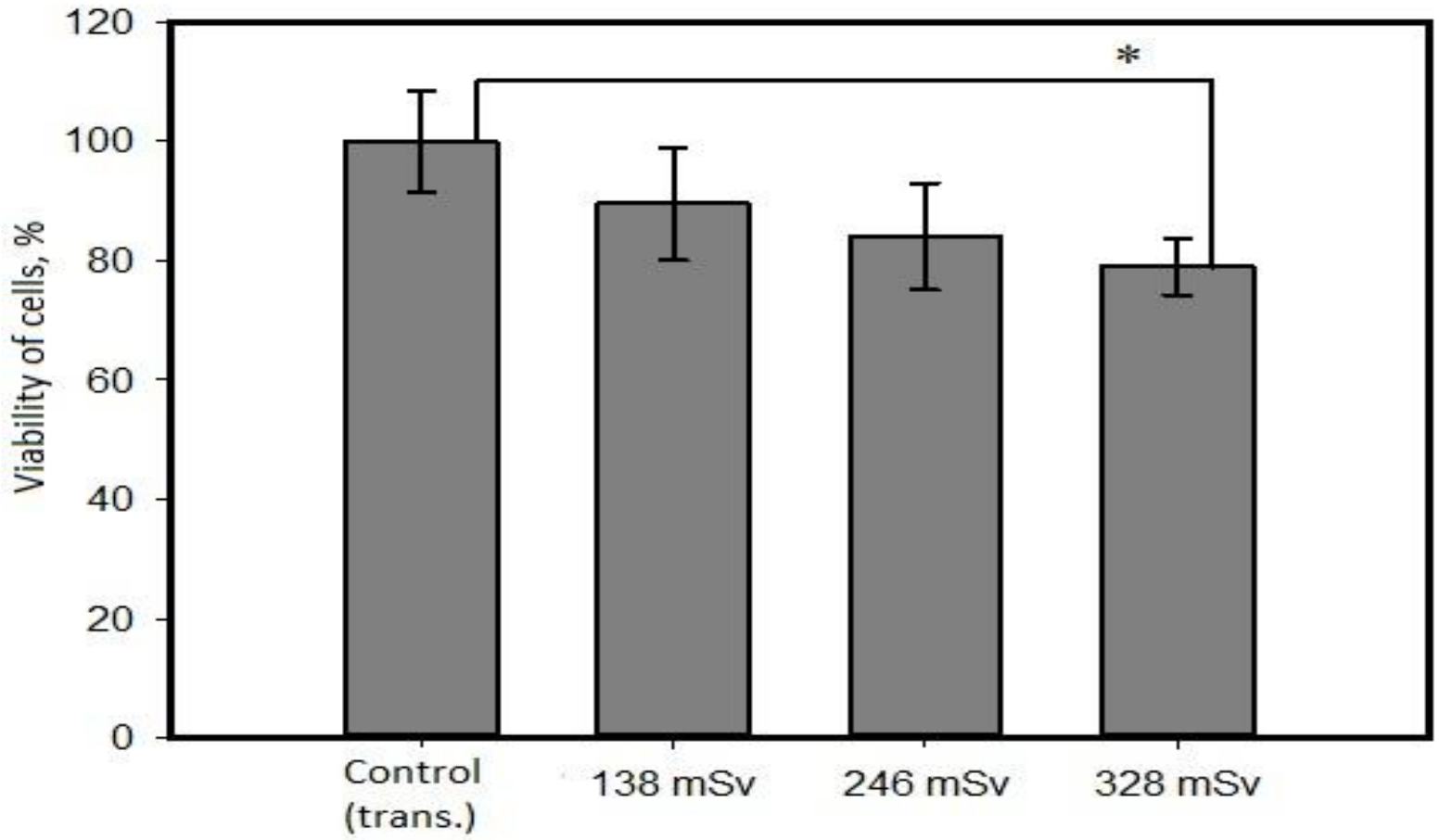


Fig.6. Comparison of viability in cells irradiated to different doses.* - $p<0,05$

PE and SF of irradiated cells

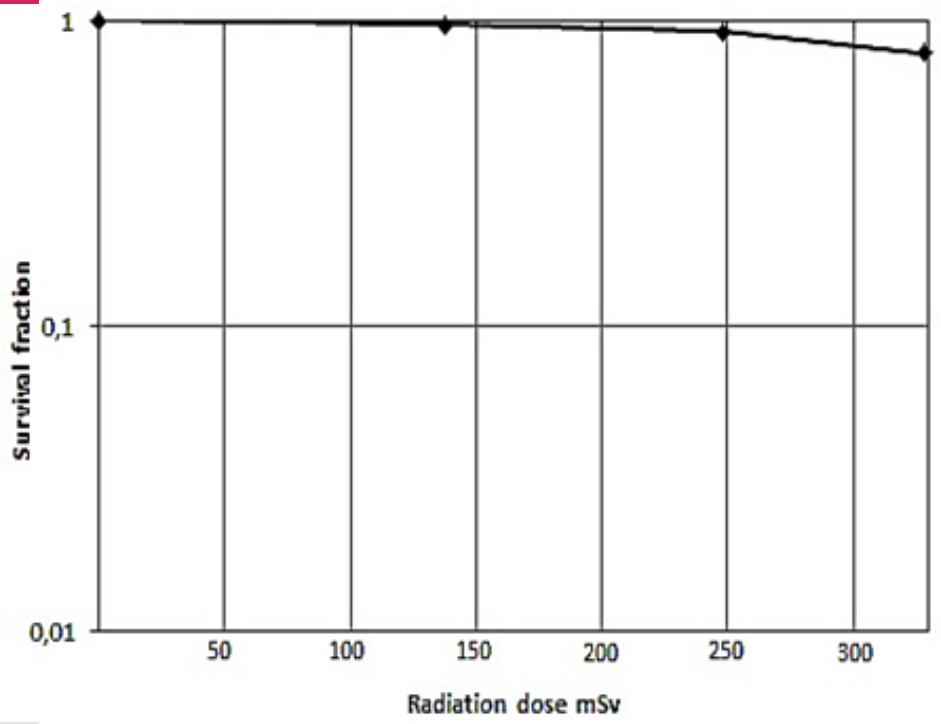


Fig.7. Cell's survival curve after neutron irradiation

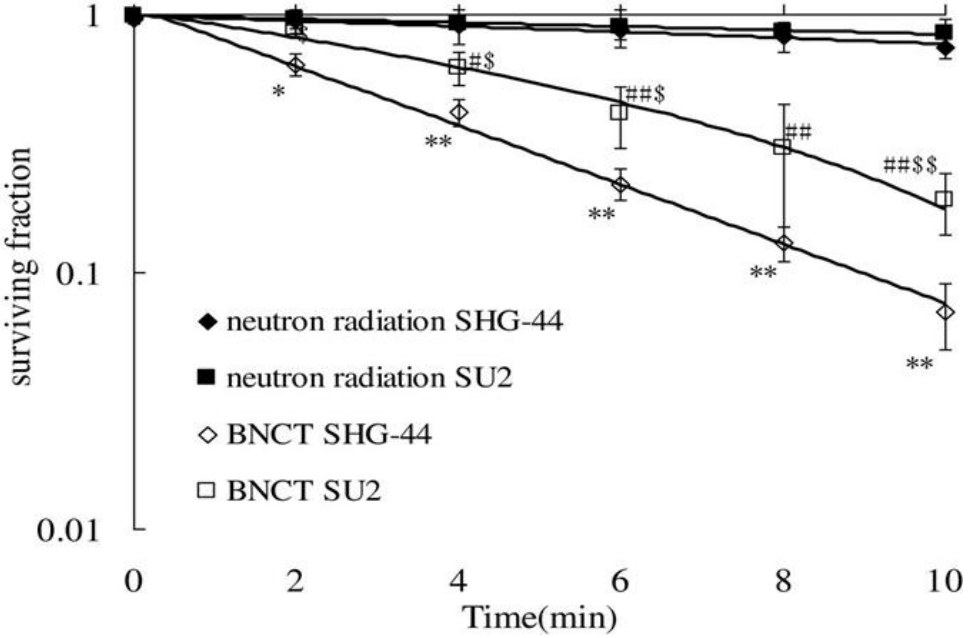


Fig.8. Surviving curves of SHG-44 and SU2 cells incubated with or without BPA and exposed with different dose of neutrons[1]

[1] -T. Sun, Z. Zhang, B. Li, G. Chen, X. Xie, Y. Wei, Z. Du, „Boron neutron capture therapy induces cell cycle arrest and cell apoptosis of glioma stem/progenitor cells in vitro". Radiation Oncology .2013 August.

Conclusions

- Experiments on cell irradiation to different neutron doses have been performed and neutron induced effects in irradiated cells were discussed using the results of cell viability assessment performed applying clonogenic assay.
- It was shown, that statistically significant cell viability decrease could be observed after cell irradiation to neutron doses > 328mSv.
- Methodology for cell transportation with low impact on cell survival was developed
- The control group cells which were transported, but not irradiated formed 62% smaller colonies than control group incubated in laboratory.

Acknowledgement

- I am grateful to VMU biolochemistry reserch laborotory and it‘s workers for oppurtunity to work with cells cultures

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Thank You for Your attention!