Does curcumin protect cell DNA against γ-rays induced damage?

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Background: The cells are highly sensitive to ionizing radiation (IR). Radiation exposure causes double strand breaks (DSBs) in DNA. If DSBs are non-repaired or misrepaired by cell repair system, that can result in either loss or rearrangement of genetic information, cell death or malignant transformation. On the other hand, radiotherapy of malignant formations affects both tumour cells and normal cells located in vicinity. The scientific interest is focused on radioprotectors that could limit the deleterious effect of IR on healthy tissue. **Curcumin** is a natural compound of turmeric ***Curcuma longa***. It could be a potential radioprotective agent because of its high antioxidant activity and ability to neutralize the free active oxygen radicals resulting from various mutagenic factors, particularly IR.

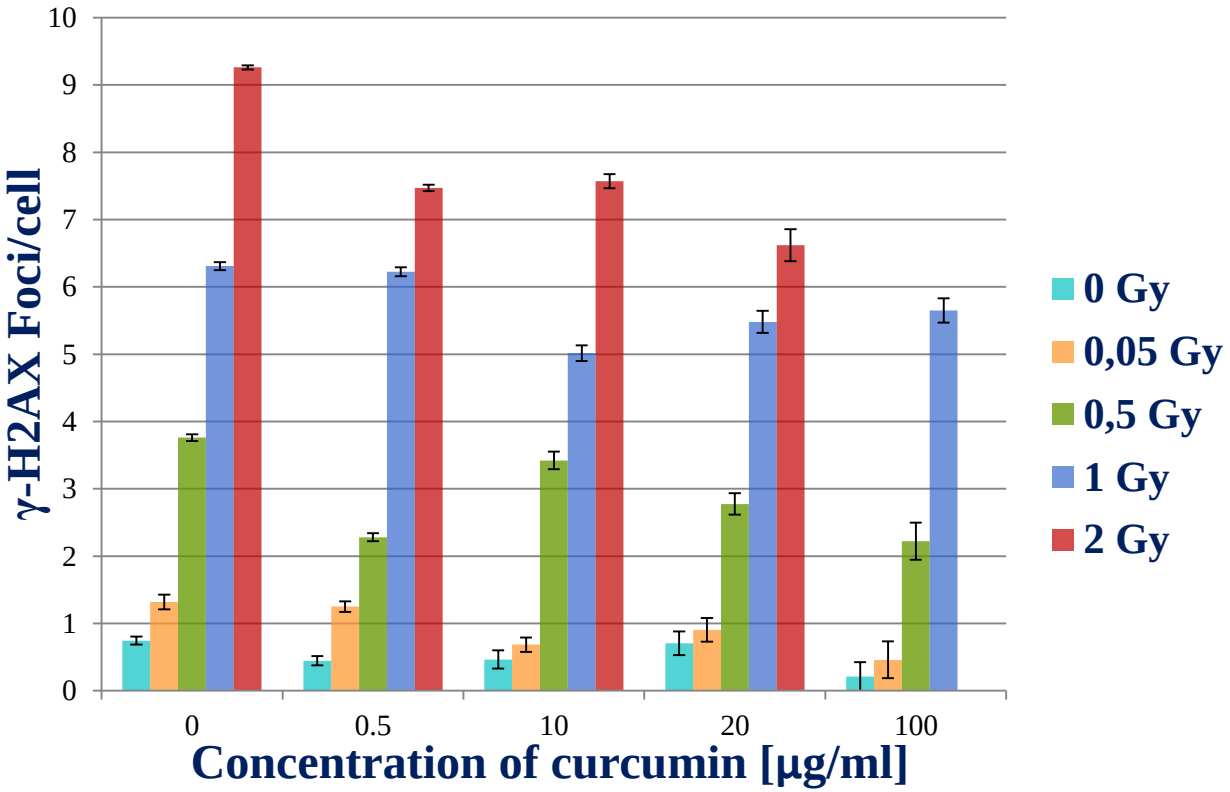
The aim of present study is to evaluate curcumin effect on cell DNA after *in vitro* exposure to γ-rays. Our interest is directed on both DSBs and chromosomal translocations frequency.

Material and Methods:

- **Human peripheral blood samples;**
- **Pre-treatment with different curcumin concentrations (0.5 µg/ml; 10 µg/ml; 20 µg/ml and 100 µg/ml)**
- **Irradiation with ^{60}Co γ-rays at various doses (0.05 Gy; 0.5 Gy; 1 Gy and 2 Gy)**
- **DSBs analysis by fluorescence miscroscopy - γ-H2AX/53BP1 foci assay**
- **Assessment of translocation frequencies - tri-colored FISH analysis on metaphase chromosomes**

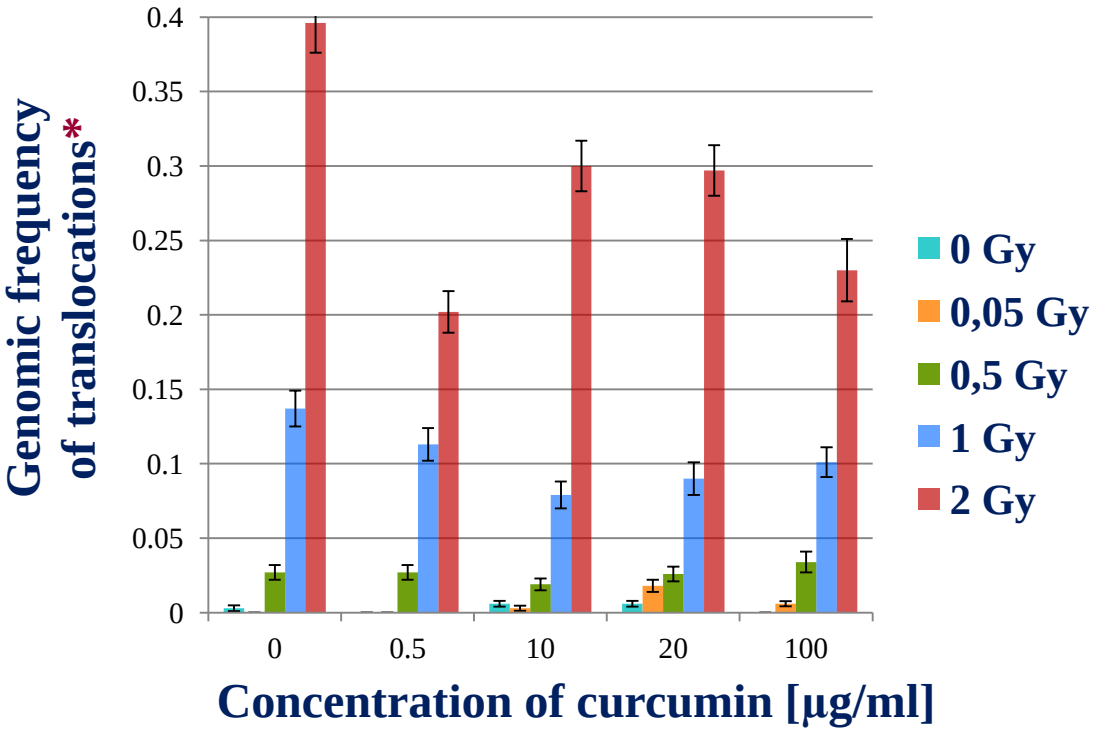
Results:

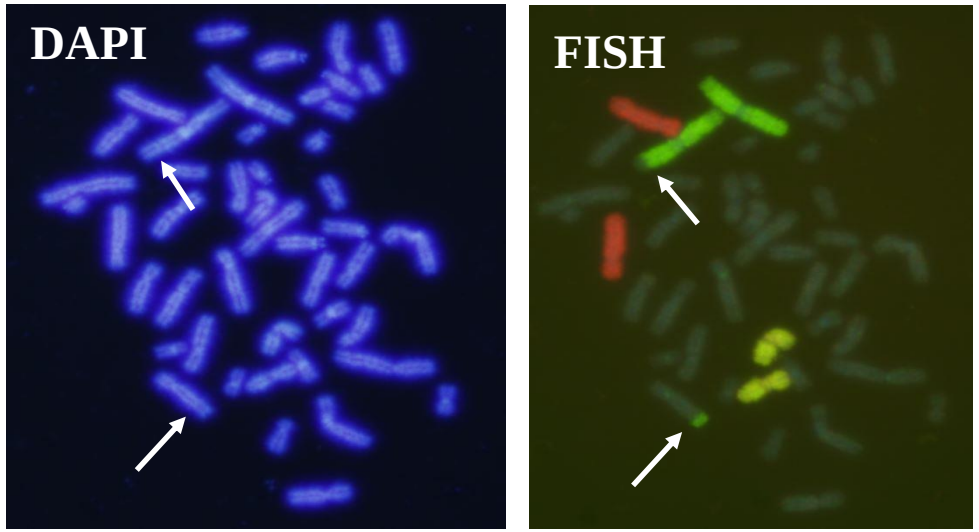
- Both γ-H2AX and 53BP1 proteins are sensitive markers for DNA damage. The present immunoassay shows that curcumin pre-treatment leads to significant lower γ-H2AX/53BP1 foci appearance compared to untreated lymphocytes, after exposure to γ-rays regardless of dose used. **Decreased number of radiation-induced γ-H2AX foci respectively DSBs has been found at all curcumin concentrations.**



Results

Curcumin pre-treatment leads to decreased translocations frequency compared to untreated irradiated lymphocytes. When cells were treated with **10 µg/ml curcumin followed by 1 Gy γ-rays exposure, the reduction of total translocations frequency was 42%. The most protective concentration of curcumin at 2 Gy irradiation, was 0.5 µg/ml.** In this case, translocations declined almost twofold compared to curcumin non-treated cells.





Arrows show the sites of chromosome translocations, analyzed by fluorescence microscopy

*Genomic translocation frequencies were calculated according to **Lucas at al., 1992**

Conclusion: Our *in vitro* results showed that curcumin expresses a protective effect on peripheral blood lymphocytes by decreasing both γ-H2AX foci and translocations appearance after exposure to γ-irradiation.

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