The effect of curcumin on proteasome activity in irradiated or non-irradiated lymphocytes

Nevena Aneva, Nora Kostova, Ilonka Ivanova, Ljubomira Popova-Hadjiiska and Rositsa Hristova

National Center of Radiobiology and radiation Protection, Sofia, Bulgaria

n.aneva@nccrp.org

Introduction

Proteasome is a multicatalytic enzyme complex that is responsible for decomposition of damaged or improperly folded proteins and is crucial for cell cycle, cell survival and other important cellular processes. Curcumin is known to have strong antioxidant, anti-inflammatory and anti-tumor effects and can be used as radioprotector. There is evidence that curcumin can inhibit NF-κB transcriptional pathway and affect, in this way, inflammatory pathways through proteasome-dependent proteolytic degradation.

Therefore, we analyze proteasome activity with fluorescent substrate N-succinyl-Leu-Leu-Val-Tyr-7-amino-4-ethylcoumarin (Suc-LLVY-AMC) in peripheral blood mononuclear cells after incubation with different concentrations of curcumin (0; 0,5; 10; 20 and 100 μg/ml) combine with irradiation of cells with different doses (0; 0,05; 0,5; 1 and 2 Gy) in three donors.

Materials and Methods

Human peripheral blood mononuclear cells were pre-treated with different concentrations of curcumin (0,5μg/ml; 10μg/ml; 20 μg/ml and 100 μg/ml) and were exposed to ^{60}Co γ-rays using various irradiation doses (0,05 Gy; 0,5 Gy; 1 Gy and 2 Gy). All samples were incubated for 24 hours and then lysed. The total amount of protein in the lysates was determined using the Bradford analysis, after that all samples were reduced to the same amount of protein. Proteasome activity was analyzed with fluorescent substrate Suc-LLVY-AMC.

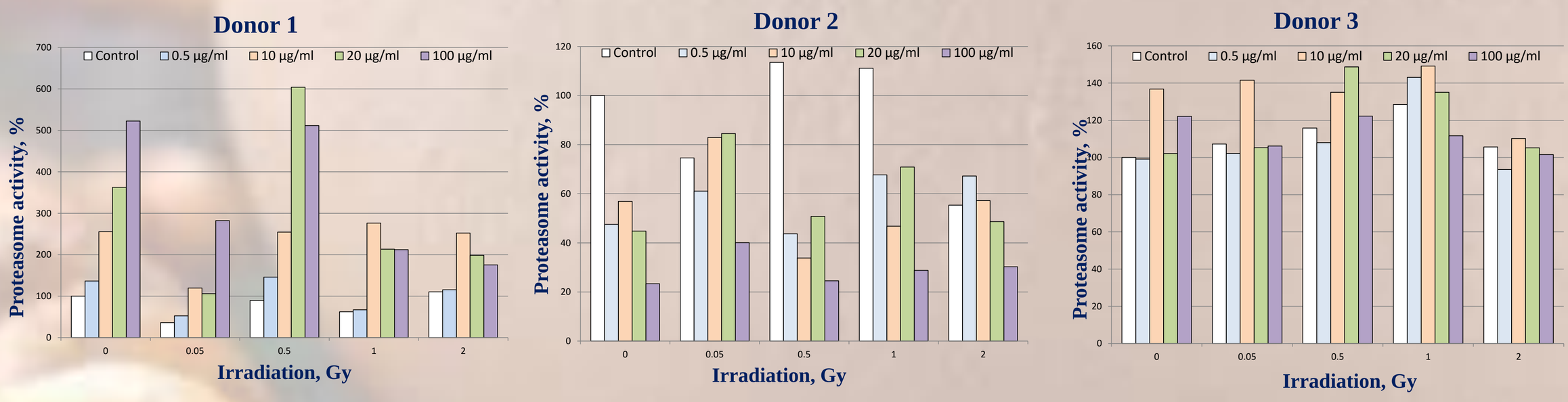

Figure 1. *Percentage proteasome activity in mononuclear cells irradiated with different doses γ radiation and incubated with different concentrations of curcumin in three donors.*

Results

We found significant differences in proteasome activity between the three donors. *In vitro* irradiation with doses ranging from 0.05 Gy to 1 Gy γ-rays in curcumin-untreated cells of the first donor show inhibition of proteasome activity in varying degrees. There is also concentration dependent increase in the proteasome activity in the cells that are non-irradiated or irradiated with low doses (0,05 and 0,5 Gy). The effect of ionizing radiation on proteasome activity in curcumin-untreated cells from the second donor showed that, at doses of 0.5 Gy and 1 Gy the activity of the proteasome is slightly increased, while at doses of 0.05 Gy and 2 Gy there is suppression. Treatment of the cells with 100 μg/ml curcumin shows decrease of proteasome activity regardless of the dose. In the peripheral blood mononuclear cells of the third donor, we didn't observe significant changes in proteasome activity. We can conclude that changes in proteasome activity can be very different in individuals.

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