The Effect of Kaempferol on the Change in Vitality of Breast Cancer Cells in Combination with Ionizing Radiatio

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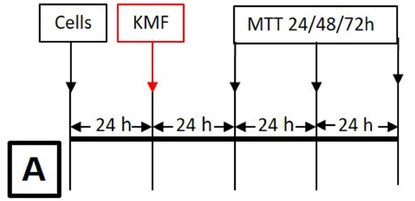
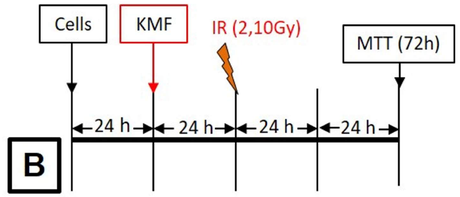
Objective

Breast cancer is the most common women's oncologic disease and a leading cause of morbidity and mortality. The main treatment of breast cancer is radiotherapy. Ionizing radiation (IR) causes DNA structure instability and disruption which leads to activation of DNA repair mechanisms, cell cycle arrest and cell death. Although radiotherapy is widely used and provides substantial benefits it is associated with accumulating cancer cell resistance to IR which leads to decrease in treatment effectiveness. Consequently, there is a growing interest in compounds which could inhibit cancer cell viability or sensitize them, thus improving treatment efficiency. Phytochemicals have attracted attention of many researchers as potential anti-cancer agents. In addition, phytochemicals might enhance cancer cell sensitivity to IR. Therefore the aim of this study was to evaluate human breast cancer MCF-7 and MDA-MB-231 cell line response to a single dose of IR in combination with phytochemicals.

Methods

- Breast cancer cell lines were used as experimental models to test KMF and IR effect: **MCF-7** and **MDA-MB-231**;
- KMF was prepared by dissolving it in dimethyl sulfoxide;
- KMF concentrations used in this study: **0, 5, 10, 20, 30, 40 μM**;
- IR doses used in this study: **2 and 10 Gy**;
- Cell viability was measured after 24, 48, 72 hours of exposure to KMF alone;
- Cell viability was measured after 72 hours of treatment with KMF and IR combination;
- Cell viability measurement method: **MTT**.

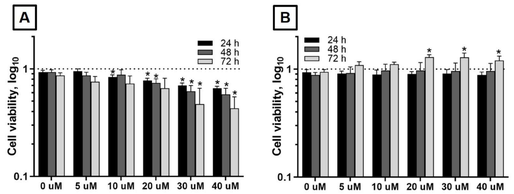




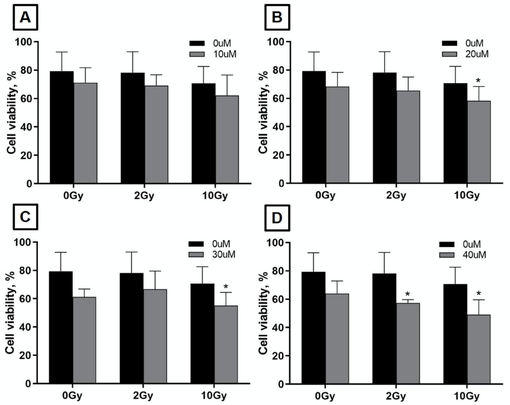
Experimental design depicting time points of cell exposure to the KMF alone (A) and KMF combination with IR (B).

Results

This study showed that KMF had different effect on chosen breast cancer cell survival. There was a significant decline in MCF-7 cell viability which was KMF concentration-dependent. The same effect was observed following all three incubation periods. However, significant decrease of MDA-MB-231 cell viability was not found. Therefore, only MCF-7 cell line was selected for further analysis. Our study revealed that a combination of 2 Gy and 40 μM KMF caused a significant decrease in cell viability when compared to 2 Gy alone. Furthermore, we found that combination of 10 Gy with KMF at all tested concentrations (10, 20, 30, 40 μM) led to significant decrease in cell viability.



*Graphs depict changes in MCF-7 (A) and MDA-MB-231 (B) cell line viability after exposure to different concentrations of KMF for 24, 48, 72 hours. Mean ± SD (n = 3), * - statistically significant differences (p≤0,05).*



*Graphs show changes in MCF-7 cell line viability after IR and IR+KMF treatment. Mean ± SD (n = 3), * - statistically significant differences (p≤0,05).*

Conclusions

Our study revealed that KMF negatively affected MCF-7 cell viability and sensitized them to IR. However, KMF had no significant impact on MDA-MB-231 cell viability decrease. Therefore, further studies are required to elucidate molecular mechanisms responsible for the sensitising effect of KMF.

Key words

Breast cancer; kaempferol; ionising radiation