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## Detoxification of Aflatoxin B1 and Ochratoxin A by Gamma Radiation

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**Background of the study.** Mycotoxins aflatoxin B1 (AFB1) and ochratoxin A (OTA) are widely distributed food contaminants that have adverse effects to animal and human health. In order to reduce mycotoxins' contamination and protect animal and human health, various strategies are applied. Some studies indicate that gamma irradiation is effective in reducing mycotoxins' contamination. Therefore the aim of this study was to investigate the effect of gamma irradiation on the AFB1 and OTA degradation as well as toxicity of mycotoxins' radiolytic products in vitro.

**Methodology.** Mycotoxins stock solutions in methanol (50 mM) were gamma irradiated with doses of 5 and 10 kGy and dose rate of 140 Gy/min using panoramic <sup>60</sup>Co source in the Radiation Chemistry and Dosimetry Laboratory at the Ruđer Bošković Institute. The dose rate was established using the ethanol-chlorobenzene dosimetry system. Molecule structure analysis of non-irradiated and irradiated AFB1 and OTA was performed by liquid chromatography tandem mass spectrometry (HPLC-MS/MS). Toxicity of non-irradiated and irradiated AFB1 and OTA (in concentration 1-500 μM; 24 h) was tested on HepG2, SH-SY5Y and Pk15 cells by quantitative colorimetric MTT assay.

**Results.** Gamma irradiation even at 5 kGy effectively degraded AFB1 and OTA molecule. The signal intensity for non-irradiated AFB1 was 16 times higher than for irradiated AFB1 (5 kGy) and signal intensity for non-irradiated OTA was 2 times higher than irradiated OTA (5 kGy). These results indicate that AFB1 has greater susceptibility than OTA to gamma irradiation. Besides of fragment ions of AFB1 or OTA with mass less than parent ion, several radiolytic products with mass higher than parent ion were detected. These results strongly indicate the contribution of addition reactions caused by free radicals generated in solution during gamma radiolysis. Results on cytotoxicity indicate that radiolytic product of irradiated AFB1 and OTA are less toxic to HepG2, SH-SY5Y and Pk15 cell lines than non-irradiated mycotoxins (parent compounds).

**Conclusion.** Based on the AFB1 and OTA structure modifications induced by gamma irradiation, free radical mechanisms are operative in the irradiation of mycotoxins. Additionally, cell viability assay demonstrated that mycotoxins radiolytic products are less toxic to cells than parent non-irradiated compound. Based on these results gamma irradiation can be considered as an effective method for the detoxification of mycotoxins.

### Country/Organization invited to participate

Croatia

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