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Radiation Effects on Rat Brain

Metalloporphyrin antioxidants ameliorate normal tissue radiation damage in rat brain

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Abstract

Purpose: We examined the effects of manganese (III) meso-tetrakis (diethyl-2-5-imidazole) porphyrin, a metalloporphyrin antioxidant (MPA), on neural tissue radiation toxicity in vivo and on tumour cell radiosensitivity in vitro.

Materials and methods: MPA was administered directly into the right lateral ventricle of young [illegible] with a single fr[illegible]. The effects c[illegible] points followin[illegible]

Resu[illegible]adiation-induced [illegible]ier and radiatior[illegible]peroxide disumta[illegible]ation-

induced apoptosis in primary neuronal cultures and increased clonogenic survival of irradiated rat glioma C6 cells, but had no discernible effect on radiation-induced DNA double-strand breaks. MPA, a low molecular weight SOD mimic, significantly increased mitochondrial SOD activity in C6 cells, but not total cellular SOD activity. MPA up-regulated C6 expression of heme-oxygenase 1 (HO-1), an endogenous radioprotectant, but had no effect on HO-1 levels in human astrocytoma U-251 cells, human prostatic carcinoma LNCaP cells, or primary rat brain microvascular endothelial cells in vitro, nor on brain tissue HO-1 expression levels in vivo.

Conclusions: Metalloporphyrin antioxidants merit further exploration as adjunctive radioprotectants for cranial radiotherapy/radiosurgery applications, although the potential for tumour protection must be carefully considered.

Keywords: antioxidant radioprotection normal tissue complication probability pre-conditioning

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Declaration of interest: One of the authors JDC is a patent holder for the compound manganese (III) meso-tetrakis (diethyl-2-5-imidazole) porphyrin used in this study. None of the other authors report any conflicts of interest.