Effects of irradiation on the [Methyl-3H]choline uptake in the human prostate cancer cell lines LNCaP and PC3.

**Abstract:**

BACKGROUND AND PURPOSE: Choline positron emission tomography (PET) can help to optimize radiation treatment strategy of prostate cancer. Therefore, the aim of this study was to elucidate the effects of ionizing radiation on the choline uptake in an androgen-dependent (LNCaP) and an androgen-independent (PC3) prostate cancer cell line. MATERIAL AND METHODS: Uptake of [methyl-(3)H]choline chloride was investigated between 4 and 96 h after irradiation with 6 Gy. Dose dependence of choline uptake was examined following irradiation with 2-12 Gy, and cell survival was analyzed via the clonogenic assay. Michaelis-Menten kinetics was determined 24 h (PC3) and 48 h (LNCaP) after irradiation with 6 Gy. RESULTS: PC3 cells showed a significant transitory increase of [methyl-(3)H]choline uptake with a maximum at 24 h after irradiation. In LNCaP cells irradiation induced a significant decrease with a minimum at 48 h. Changes in choline uptake in both cell lines were almost dose-independent up to 12 Gy. Following irradiation with 6 Gy, transport capacity (v(max)) increased and Michaelis-Menten constant (K(M)) decreased in PC3 cells, while in LNCaP cells the two parameters behaved vice versa. CONCLUSION: Changes in choline uptake following irradiation might be due to metabolic changes associated with initiation of
processes that finally cause cell death. Thus, changes in tumor choline uptake monitored by PET after radiotherapy might not exclusively reflect therapeutic success but also altered tracer uptake as a consequence of irradiation.

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