CO7-1 The Effect of Post-Irradiation Tumor Oxygenation Status on Recovery from Radiation-Induced Damage *in vivo*, Referring to That in Quiescent Cell Population

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PURPOSE: To elucidate the effect of tumor oxygenation status on recovery from damage following γ-ray or accelerated carbon ion irradiation *in vivo*, including in quiescent (Q) cells.

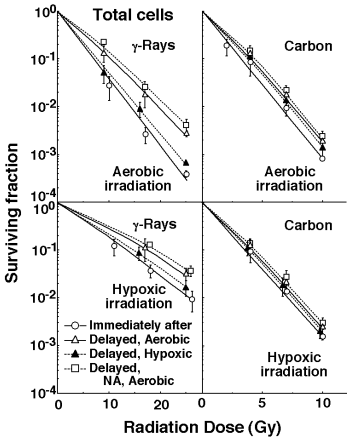
INTRODUCTION: Some recent reports showed that oxygenation status of irradiated cultured tumor cells influences sensitivity to radiation *in vitro*, probably through suppressing homologous recombination (HR) under hypoxic conditions, one of the two major pathways for the repair of DNA double-stranded breaks [**1**].

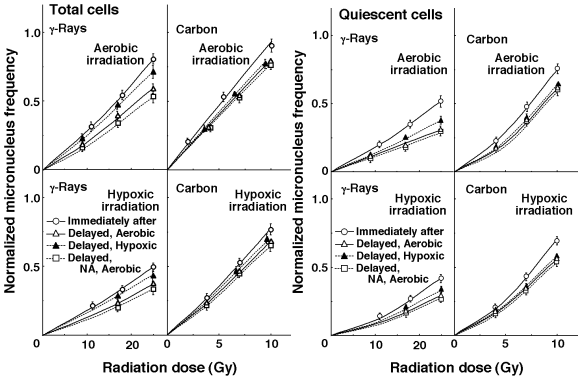
We examined the effect of post-irradiation oxygenation status on recovery from radiation-induced damage in the total (= proliferating (P) + Q) and Q cell populations in solid tumors *in vivo* after low-LET γ-ray or high-LET 290 MeV/u accelerated carbon ion beam irradiation, using our original method for selectively detecting the response of Q cells within solid tumors [**2**]. This is the first attempt to detect the effect of post-irradiation oxygenation status on recovery from radiation-induced damage *in vivo*.

MATERIALS AND METHODS: SCC VII tumor-bearing mice were continuously given 5-bromo-2'-deoxyuridine (BrdU) to label all P cells. They received γ-ray or accelerated carbon ion irradiation with or without tumor clamping for inducing hypoxia. Immediately after irradiation, cells from some tumors were isolated, or acute hypoxia-releasing nicotinamide was loaded to the tumor-bearing mice. For 9 hours after irradiation, some tumors were kept aerobic or hypoxic. Then isolated tumor cells were incubated with a cytokinesis blocker. The response of Q cells was assessed in terms of the micronucleus frequency using immunofluorescence staining for BrdU. That of the total (= P + Q) tumor cells was determined from BrdU non-treated tumors.

RESULTS: Clearer recovery in Q cells than total cells and after aerobic than hypoxic γ-ray irradiation was efficiently suppressed with carbon ion beams. Inhibition of recovery through keeping irradiated tumors hypoxic after irradiation and promotion of recovery by nicotinamide loading were observed more clearly with γ-rays, after aerobic irradiation and in total cells than with carbon ion beams, after hypoxic irradiation and in Q cells, respectively.

CONCLUSION: Tumor oxygenation status following irradiation can manipulate recovery from radiation-induced damage, especially after aerobic γ-ray irradiation in total cells. Carbon ion beams are promising because of their efficient suppression of the recovery [**3**].





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採択課題番号20007　低酸素指向性中性子捕捉化合物の開発と有用性の評価　　共同通常
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