

The analyses of the cell lethal effect induced by low-dose radiation in glioma

— Relation of bystander effect and trace elements —

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Abstract

So far, the effects of low dose radiation have only been estimated by extrapolation from the data obtained by the higher dose radiation. Recently low dose radiation effects such as bystander effect cannot be explained by extrapolation from the data obtained by higher dose radiation. Cell death induced by bystander effect was induced by factors secreted from irradiated cell to unirradiated cell. And it is considered that cell membrane is important target for induction of bystander effect. In this study, to elucidate bystander effect, we investigated the relationship cell membrane effect (sphingomyelinase activity) and bystander effect, and divalent metal ion that are necessary for sphingomyelinase activation using PIXE analysis.

Cell death by radiation induced bystander effect was observed in glioma cell (A172 cell). This bystander effect was inhibited by sphingomyelinase inhibitor. When fluctuation of intracellular metal element was analyzed after irradiation, concentration of intracellular zinc element increased for 5 min and decreased for 15 min after irradiation. It is reported that sphingomyelinase activated for 5min after irradiation, sphingomyelinase activation and fluctuation of zinc metal was corresponding.

This result suggested that radiation induced bystander effect was caused by sphingomyelinase activation that was relative to zinc element.