

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

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Abstract

Recently, the effects of low dose radiation have only been estimated by extrapolation from the data obtained by the higher dose radiation. Low dose radiation effects such as bystander effect cannot be explained by extrapolation from the data obtained by higher dose radiation. So far, we suggested that radiation induced bystander effect is closely relative with sphingomyelinase. To analyze mechanism between activation of sphingomyelinase and induction of bystander effect, in this study we investigated the relationship sphingomyelinase activity and divalent metal that are necessary for sphingomyelinase activation using PIXE analysis. Activation of sphingomyelinase induced by radiation (0.1Gy) was observed in glioma cell (A172 cell). The activity increased for 5 min and decreased for 15 min after irradiation inside the cell. On the other hand, the activity increased for 15 min after irradiation outside the cell. When fluctuation of intracellular and extracellular metal element was analyzed after irradiation, concentration of intracellular zinc element increased for 5 min and decreased for 15 min after irradiation and that of extracellular zinc element increase for 15 min after irradiation. These results indicate sphingomyelinase activation and fluctuation of zinc element was corresponding. It is considered that activation of sphingomyelinase induced by radiation was due to zinc element and sphingomyelinase itself is one of bystander factor.