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Cell Killing Induced by 160 nm,190 nm, 230 nm Photons in Cultured Lymphoblast AT, XP and Normal Cells

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Introduction

Ozone depletion in stratoshere is considered to be an important cause to increase ultraviolet light and induce serious damage on biological systems on the earth. We should know the qualitative and quantitative effect of UV light on biological systems in detail. In this study some kind of human cultured cells were used in order to clarify the moleclar mechanism in cell killing induced by far-UV and vacuum-UV irradiation. 160 nm, 190 nm and 230 nm photons from synchrotron radiation were used as UV light source. Cell killing, chromosomal aberration, DNA strand breaks and base damage were analysed on the irradiated cells.

Materials and Methods

Human lymphoblast cells such as AT cells (Ataxia telangiectasia, AT5KYL), XP cells (Xeroderma pigmentosum, GM02252) and normal lymphobalst cells (GM14511) were purchased fromCoriell Cell Repository. These cells were suspended in PBS in concentration of 1.0 x 10^6/120 µl in special made irradiation cell having MgF_2 window. 120 µl of suspension were irradiated with monochromatic light from synchrotron radiation stirring with small glass-coated iron tip. Wavelengthes of 160 nm, 190 nm and 230 nm were used for the irradiation and the cells were analysed after 24 hours incubation treatment by some methods. These were the hoechst staining for apoptosis detection, PI and calcein double staining for survival detection, chemical-induced PCC for chromosomal aberration and electrophoresis for detection of DNA double strand breaks and base damage using S1 nuclease.

Results and Discussion

By the method of double staining with PI and calcein, it is clarified that cell killing of XP cells irradiated with 230 nm has effectively ocurred. 1 Gy irradiation on XP cells cause 56 % cell killing in 1.0 x 10^6 XP cells after 24 hours incubation treatment post irradiation. On the other hand, 230 nm irradiation on AT cells and normal cells cause only 0.2% and 12% cell killing respectively with 1 Gy irradiation. Lack of repair mechanism in XP cells should be a main reason to cause such a high efficinecy of cell killing. It is generally thought that AT cells are resistant to ultraviolet radiation, and the experimental results in this study are consistent with the idea. Few study of vacuum-UV irradiation effect on cells has been carried out yet, however, in this study, cell killing caused by 160 nm irradiation are clearly observed in normal cell and XP cell. 6% and 7% cell killing in 1.0 x 10^6 cells were caused by 1 Gy irradiation, respectively. The cell killing in AT cells irradiated with 160, 190, 230 nm UV light were not shown clearly. The role of chromosomal aberration and DNA strand breaks were discussed on the relation to cell killing caused by VUV and far UV radiation.

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