HYDRATED ELECTRON INDUCED MAIN-CHAIN SCISSION IN CHROMOSOMAL BASIC PROTEINS AND THEIR RELATED COMPOUNDS

Osamu INANAMI

Department of Radiation Biology,
Faculty of Veterinary Medicine,
Hokkaido University, Sapporo 060, Japan

In order to obtain information concerning the mechanism of main-chain scission induced in chromosomal basic proteins by X-irradiation, the reaction of hydrated electrons with histone Hl, protamine and their related compounds (poly-L-lysine and poly-L-arginine) was investigated by electrophoretic analysis and the spin-trapping technique combined with ESR. A N_2-saturated aqueous solution of protein containing sodium formate was exposed to X-rays. Sodium formate was added to make protein react exclusively with hydrated electrons. The change of molecular weight of protein by X-irradiation was examined by polyacrylamide gel electrophoresis. The results of electrophoretic analysis showed that the hydrated electrons reacted with protein at a region near the terminal of peptide and caused a decrease in its molecular weight. In the case of the spin-trapping experiment, 2-methyl-2-nitrosopropane was added to the N_2-saturated aqueous solution of protein to trap the damaged site where the main-chain scission was induced. After X-irradiation of the solution to 0.48 Mrad, ESR spectrum was recorded. The ESR spectra obtained for all samples showed that a deamination radical, $-CH_2-\dot{C}H-CO-NH-$, was produced. It was suggested that when aqueous solution of the chromosomal basic protein was exposed to X-rays, hydrated electrons reacted with protein at a region near N-terminal of the peptide chain, and induced the deamination reaction which resulted in the main-chain scission.