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

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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 H1, 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 N₂-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 N₂-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, $-\text{CH}_2-\dot{\text{C}}\text{H}-\text{CO}-\text{NH}-$, 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.