Gamma Radiation Effect on Physiologically Relevant Peptides

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The reaction products produced by radiolysis of important macromolecules are object of several studies and they are involved in many pathological disorders. In order to unravel the potential of gamma irradiation strategy for generating this phenomenon, the vasoactive bradykinin (RPPGFSPFR, BK), its Pro^4-BK analogue and also the melanocyte-releasing hormone (Ac-SYSMEHFRWGKPV-amide, α-MSH) were investigated in the present study. They were submitted to 1 to 15 kGy gamma radiation doses and a non-linear progressive degradation of their structures was observed as the radiation dose increases. To better characterize the by-products generated by the gamma irradiation, greater amount of irradiated Pro^4-BK originated three prominent analogues with molecular weight containing a variation of +16 Da. To elucidate which Phe residue (position 5 or 8) was modified, an electrospray triple-quadrupole tandem mass spectrometry was used for peptide sequencing, using the daughter ion scanning by collision induced dissociation (CID-MS/MS) strategy. These findings revealed the possibility of Phe residues oxidations likely at associated with the hydroxyl moiety insertion at *o*-, *m*- or *p*-positions of its aromatic side chain. A similar hydroxylation of Phe residue seemed to have occurred also with the α-MSH peptide, generating an analogue with increase of 16 Da in its molecular weight. The main objective of this innovative approach lies in the feasibility of generating unusual peptides analogues for further structure-function investigations.

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