Comportement sous rayonnements ionisants du collagène de type II : Etude de polypeptides modèles comme substituts du collagène en phase condensée

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Abstract
Collagen, the most abundant protein in mammals, primarily forms the extracellular matrix of cartilage and is essential for its mechanical properties, owing to its characteristic triple helix structure. In the context of hadron therapy, the effects of ionizing radiation on type II collagen have been examined by characterizing macromolecular defects and radiationinduced gas emissions using substitute polymers, including homopolymers of major collagen amino acids (polyglycine, poly-DL-alanine, and poly-L-proline) as well as triple helix model peptides. Irradiation of homopolypeptides, with or without side chains, revealed remarkable radiation stability, with approximately 20% of altered structures, increasing the proportion of chains in random coils and chain scission. In the absence of side chains, such as polyglycine, CO-NH bond scission is frequent, while in the presence of side chains, such as poly-DL-alanine and poly-L-proline, CO-CαH bond scission seems significant, explaining isocyanate formation. Additionally, in the case of poly-L-proline, N-CαH or N-CH2 bonds also appear affected by irradiation. These results differ from observations during gamma irradiation, where Cα-N bond scission is considered primary in homopolypeptides. Identified gases were H2, CO, CO2, and CH4, and the effect of linear energy transfer (LET) was observed with increased yields of H2 and CO when LET is high, along with IR bands specific to high-LET irradiation. Irradiation of collagen model peptides, (PPG)10 and (POG)10, revealed new absorption bands not specific to the triple helix structure, but rather correlated with constitutive amino acids of the peptide. Results obtained on (POG)10 highlighted the impact of water molecules and the presence of hydroxyproline, with the formation of the hydroxyl radical.