Intrinsic processes induced by the irradiation of rifamycin/collagen non-covalent complexes

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Probing the intrinsic effects of ionizing radiation on biologically-relevant molecular systems is of high fundamental interest, but is also crucial for understanding the first molecular physical and chemical events underlying the modification of biomaterials for medical applications. Our group has a long standing experience in crossed-beam experiments where photons, electrons or ions collide with molecular systems in the gas phase. These last years, thanks to collaborations with the groups of T. Schlathölter (University of Groningen, Netherlands) and P. Dugourd (Institut Lumière Matière, Lyon), we irradiated collagen mimetic peptides with ionizing photons and carbon ions and studied its structure by means of ion mobility spectrometry, and showed that the high stability of these systems is an intrinsic property due to their triple-helix structure, typical of collagen (see figure 1).[1,2] Furthermore, we recently performed experiments involving ionization and fragmentation of rifamycin, a natural antibiotic that has been loaded in a collagen-based biomaterial for healing chronic wounds. It has been shown in the literature that the collagen-rifamycin bond is strong, and that the antibiotic modifies the structure of collagen fibers.[3] However, detailed molecular information is lacking, and we plan to investigate the radiation-induced processes in collagen-rifamycin complexes to bridge this gap. Products of the irradiation of complexes between collagen mimetic peptides and rifamycin by X-rays or carbon ions will be analyzed by mass spectrometry.

In this internship, the selected student will perform experiments, acquire and analyze data, write summaries, and give short talks to present the obtained results to other researchers. All these tasks require strong team-working abilities but also self-sufficiency.

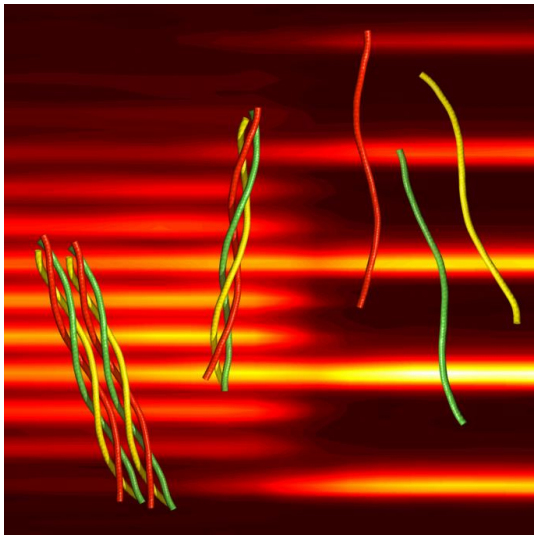

Figure 1 : Ion-mobility coupled to mass spectrometry allows studying the structure of collagen triple-helix peptidic models, and probing their intrinsic stability.

References

(1) Lalande, M.; Comby-Zerbino, C.; Bouakil, M.; Dugourd, P.; Chirot, F.; Poully, J.-C. Isolated Collagen Mimetic Peptide Assemblies Have Stable Triple-Helix Structures. *Chem.- Eur. J.* **2018**, *24* (52), 13728–13733. https://doi.org/10.1002/chem.201802929.

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(3) Portier, F. Collagen/gelatin biomaterials : from the liquid crystal phases to the hybrid materials, Université Pierre et Marie Curie - Paris VI, 2016.