HYPERSPECTRAL IMAGING BASED ON SURFACE ENHANCED RAMAN SCATTERING: FIRST STEP OF THE DEVELOPMENT OF A SPRAY-COATING METHOD ON BIOLOGICAL SAMPLES

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In the pharmaceutical and cosmetic drug development of dermal application medicine, drug formulation studies constitute one of the more laborious steps. Among them, the importance of *in vitro* formulation study stands out for its ability to predict the drug behaviour in its vehicle and to control the drug penetration into the different layers of the skin [1;2]. The European Agency of Medicines (EMA) currently recommends a reference method which is the permeation studies by Franz diffusion cell. This technique is a time consuming and destructive method giving no spatial information of the permeated substances [3-5].

Surface Enhanced Raman chemical imaging (SER-CI) is a Raman derived chemical imaging method, exalting the inherent Raman scattering of an analyte using metallic nanostructures (NPs) [2]. For instances silver (AgNPs) and gold nanoparticles (AuNPs) constitute what is commonly called SERS substrates. Combining spatial and spectral information, SER-CI is a promising technique. However, a major issue relies in the deposition technique of these SERS substrates onto the surface of analysed surfaces, leading to non-homogeneous deposition of NPs and thus spectral intensity variability [6]. Considering the lack of SER-CI implementation in biomedical applications, the present project aims to address for the first time these issues in the framework of the skin penetration of drugs. Solid polymeric hydrogels mimicking the basis structure of a biological tissue will be used to ensure the homogeneous distribution of a probe molecule. A Quality by Design (QbD) approach will be then considered for the robust optimisation of homogeneous NPs deposition by an automated spray-coating method, essential prior the conduction of SER-CI analyses. The optimized deposition method will then be transposed onto drug permeation studies of a pharmaceutical and a cosmetic substance in reconstructed and real skin tissues.

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