Non-melanoma skin cancer refers to a group of cancers that slowly develop in the upper layers of the skin. The term non-melanoma distinguishes more common types of skin cancer from less common skin cancer known as malignant melanoma, which remains the most contentious of all diagnoses. While classic histologic criteria have been described extensively over the past four or five decades, interpretation of these criteria in clinical practice still remains difficult. Today, using anatomic pathology, the differences in appearance of a normal or a malignant lesion can be difficult to tell when just using light microscopy. Moreover, due to its differential growth (radial = top layers or vertical = deep layers), melanoma can spread (metastasize) quickly to other parts of the body through the lymph or circulatory systems.

Those difficult calls that pathologists have may be overpassed by an adding value with mass spectrometry imaging (MSI) technology. Newer histological and molecular criteria/factors could be highlighted by MSI, which is able to simultaneously record the distribution of hundreds of biomolecules (proteins, peptides, glycans, lipids, metabolites and drugs) directly from tissue, without labeling and without prior knowledge. MALDI MSI is particularly suited to biomedical research because the MSI-analyzed tissue section can be aligned with high definition histological images. In this manner, the molecular signatures from specific histopathological entities may be extracted from the often-heterogeneous tissues encountered in biomedical research, especially in oncology.

Our actual pre-clinical studies present some examples that englobes pharmacokinetics, pharmacodynamics and toxicity analyses, all accomplished by MALDI MSI of skin tissue sections. Different compounds penetration profiles, metabolism, accumulation and tissue sub-structures targeting (sebaceous or sweat glands, dermis, etc.) has been well highlighted. The results show a high co-localization histological specificity between the compound and its targeted area, where some metabolites, lipids and peptides could be implicated and identified as treatment response biomarkers. These are key information for the evaluation of active compounds that will provide a better understanding of diagnostic and prognostic factors in cutaneous melanoma. Finally, all these findings may give more information in available or new treatment modalities, as personalized medicine.