

IN VIVO REAL-TIME MASS SPECTROMETRY FOR GASTRIC CANCER GUIDED SURGERY WITH SPIDERMASS

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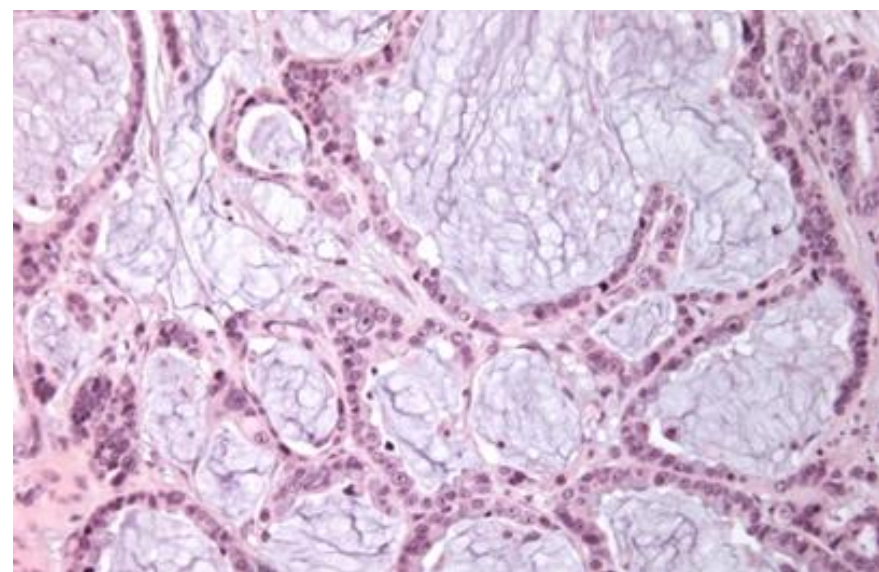
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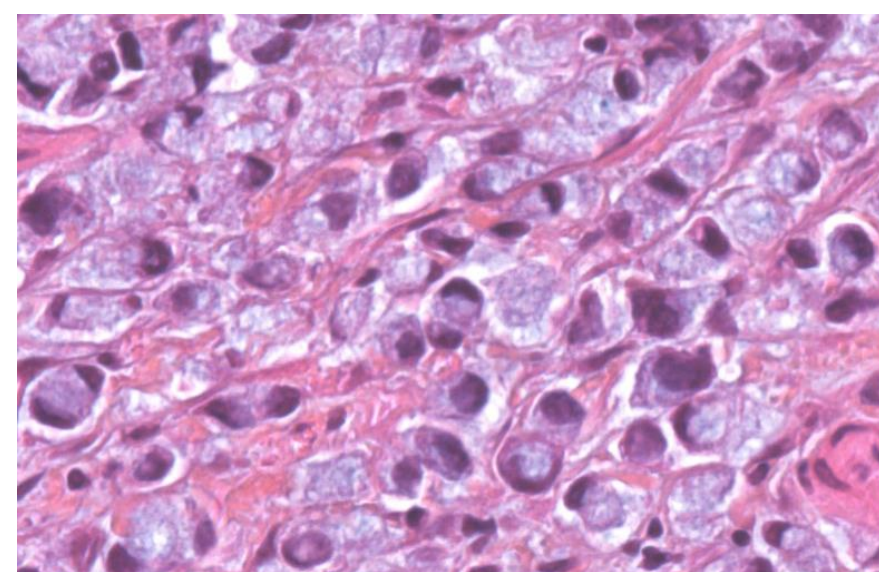
INTRODUCTION

In 2011, the number of esogastric cancers were estimated at 1,500,000 new cases and 2,110,100 new cases are expected in 2025. The detection of the esogastric cancer is generally at a late stage and a surgical procedure is usually carried out. To avoid a risk of relapse, the surgeons take between 5 and 8 cm of cancer margins but only a histological diagnosis is performed to ensure the total removal of cancer cells. However, the time of histological diagnosis lasts more than 30 minutes and cannot provide a quick answer for the surgeons. This diagnosis is long and shows an error rate around 25%. In addition, the poorly cohesive carcinoma, an aggressive form of esogastric cancer, is difficult to identify in some cases, and new diagnosis need to be developed to bring a more accurate diagnosis. Since 2014, Prism laboratory has been developing a new ambient mass spectrometry system designed for *in vivo* and real time guided surgery: the SpiderMass. This system has shown the capability to analyze biopsies and correctly assigned a classification of tumor subtype and grade. Here, we present the analysis of *ex vivo* biopsies using the Spidermass and Maldi-Imaging to classify the esogastric cancer.

Tubular, Papillary, Mucinous



Poorly cohesive cells



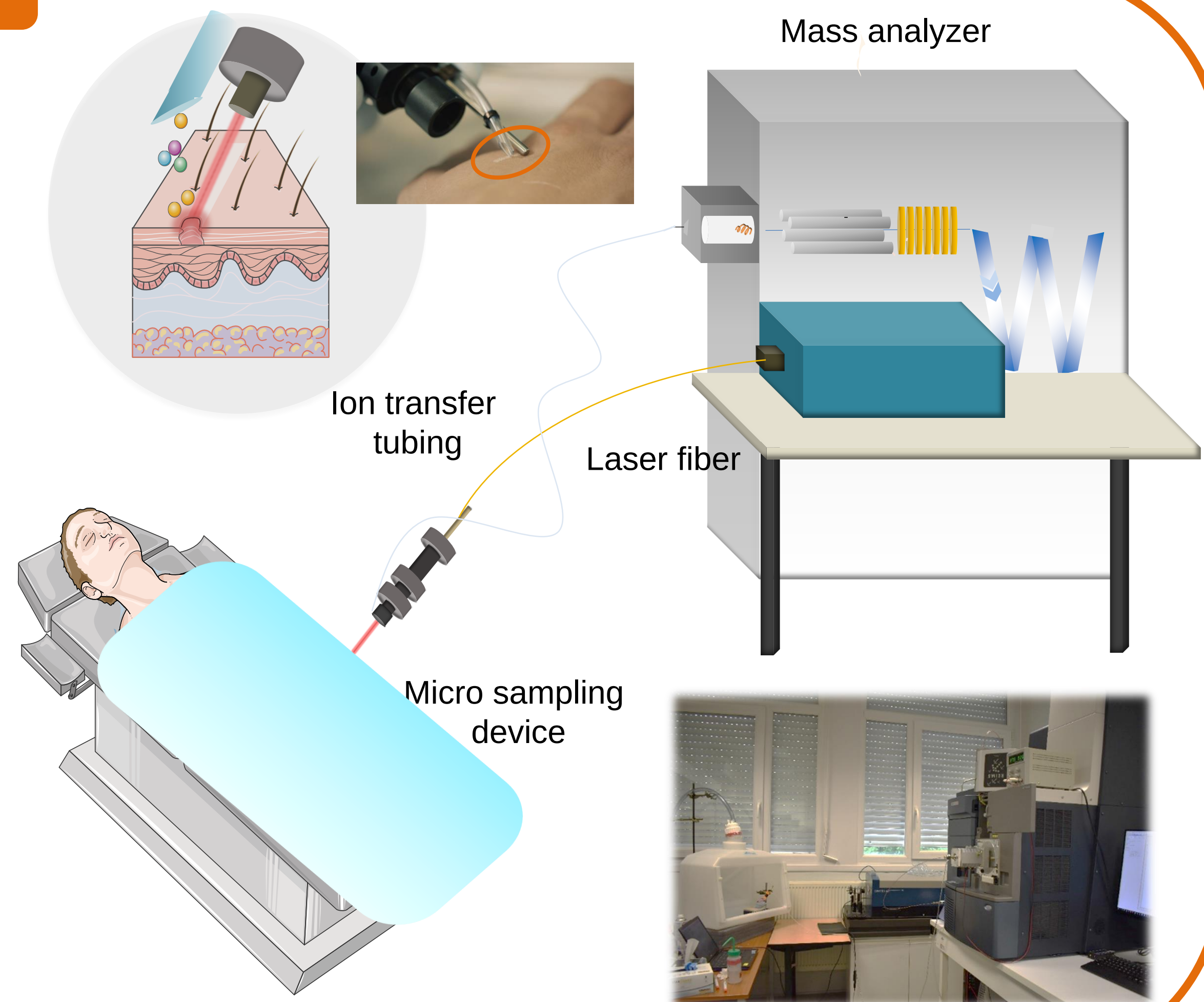
WHO, 2010

1. Laser microprobe
✓ Mini invasive sampling
✓ Generation of gas phase ions

2. Transfer line
✓ Real-time transmission of the generated aerosol from the probe to the MS system

3. Mass spectrometer (MS)
✓ Real-time MS analysis

4. Data Processing
✓ Real-time interrogation of a molecular databank via classification models

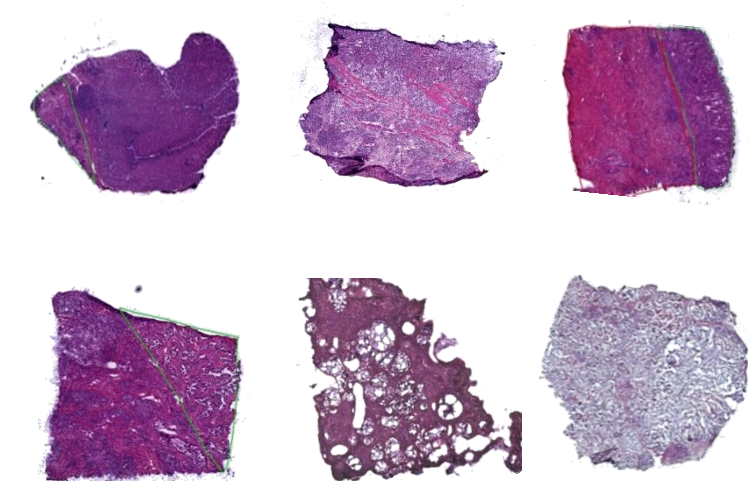
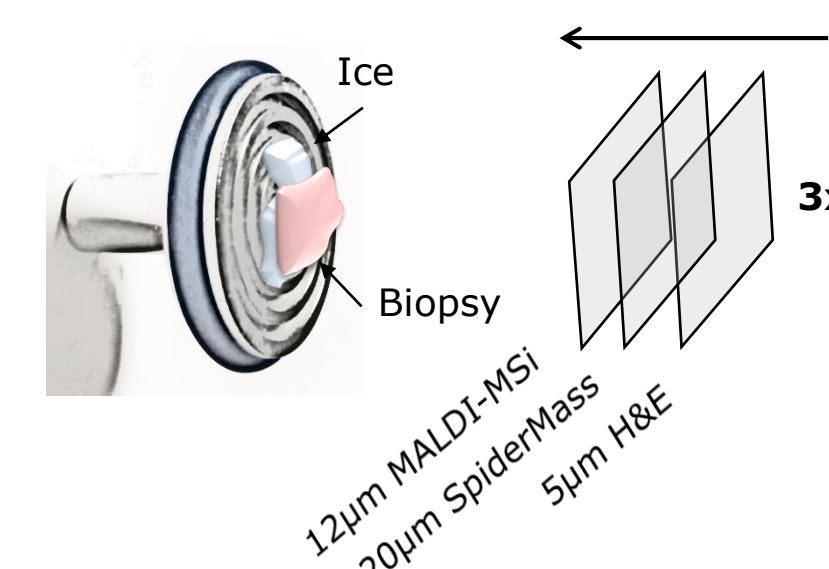


EXPERIMENTAL DESIGN

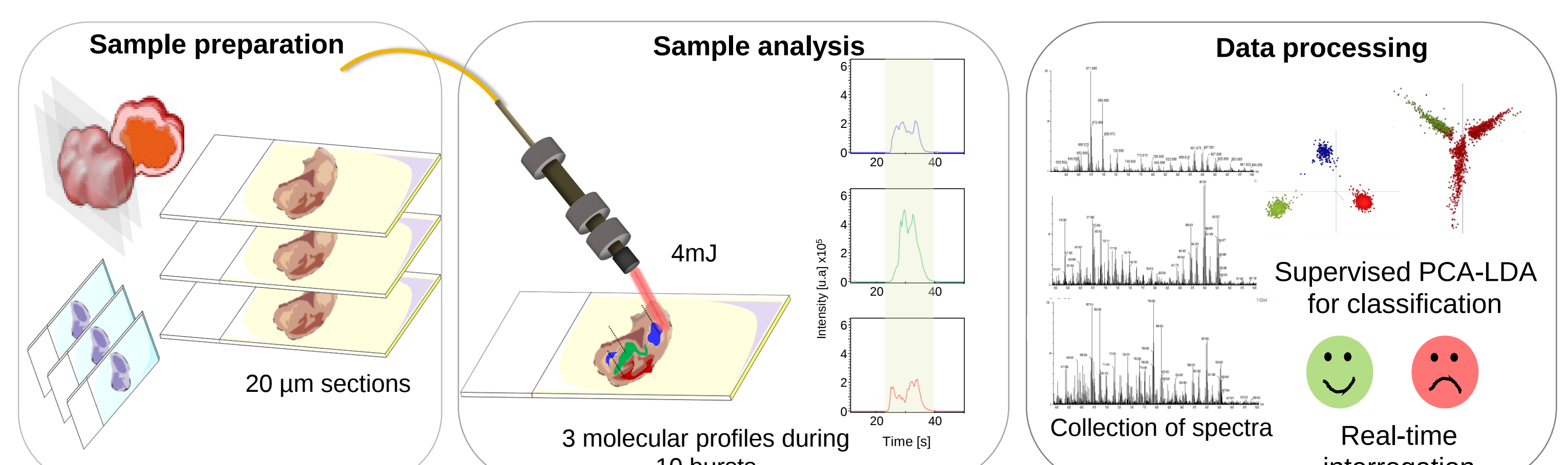


FREGAT national clinico-biological database

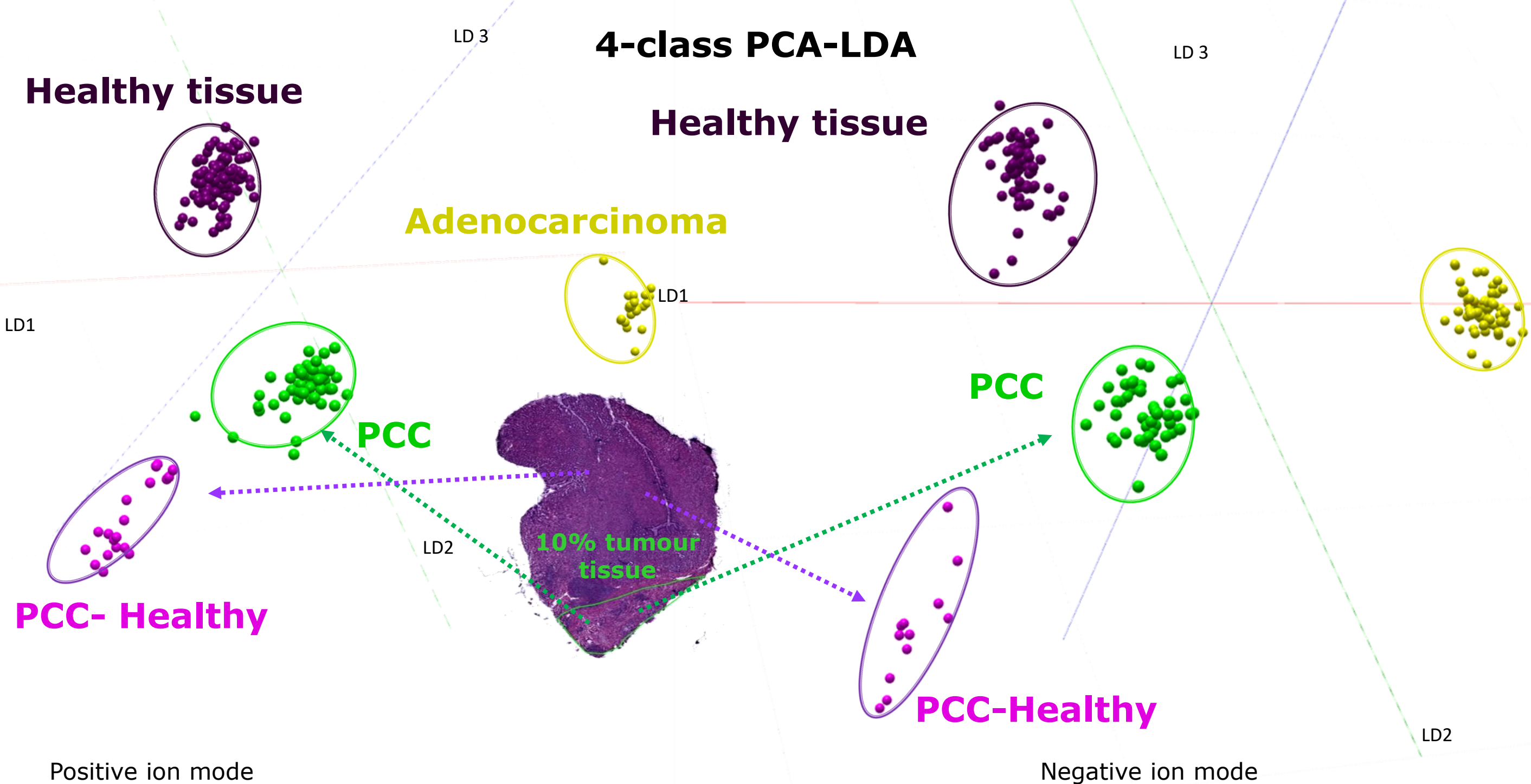
- Clinical, socio-economical, psychological data
- Tumour (fresh-frozen) and serum bank
- 3000 patients already included
- 40% inclusions in Lille, 78 publications, 42 clinical trials



Sample biopsies	# spectra
Healthy	64
Adenocarcinoma	127
PCC	66
PCC-healthy	25
	46
	53
	12
	19

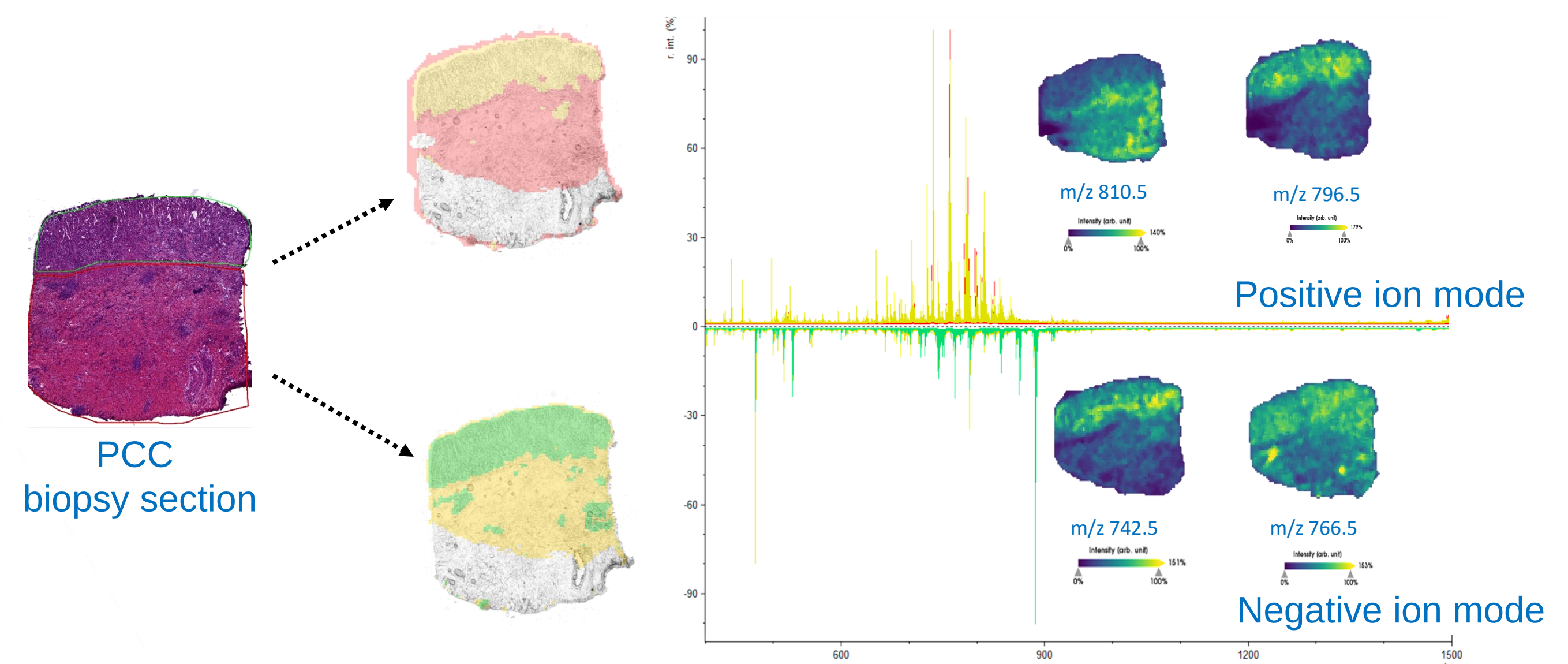


PCC DATABANK CREATION



➔ Based on the molecular profile, we can determine the nature of the biopsies.

CROSS-VALIDATION WITH MALDI-MSI



➔ The cross-validation support our SpiderMass results and shows a heterogeneity of tissue.

CONCLUSIONS

- SpiderMass can molecularly distinguish between adenocarcinoma and PCC biopsies. More biopsies need to be analyzed to create a robust databank.
- We can cross-validate the most discriminant lipid features with MALDI-MSI
- In the future, the SpiderMass diagnosis will be tested in peroperative conditions and compared to the pathologist diagnosis.

Check out our papers:

1. Fatou B, Saudemont P, Leblanc E, Vinatier D, Mesdag V, Wisztorski M, Focza C, Salz M, Ziskind M, Fournier I. *In vivo* Real-Time Mass Spectrometry for Guided Surgery Application. Scientific Reports. 18 mai 2016;6:25919.
2. Saudemont P, Quanico J, Robin Y-M, Baud A, Balog J, Fatou B, Tierny D, Quentin P, Minier K, Pottier M, Focza C, Ziskind M, Takats Z, Salz M, Fournier I. Real-Time Molecular Diagnosis of Tumors Using Water-Assisted Laser Desorption/Ionization Mass Spectrometry Technology. Cancer Cell. 12 nov 2018;34(5):840-851.e4.
3. Ogrinc N, Saudemont P, Balog J, Robin Y-M, Gimeno J-P, Pascal Q, Tierny D, Takats Z, Salz M, Fournier I. Water assisted laser desorption/ionization mass spectrometry for minimally invasive *in vivo* and real-time surface analysis using SpiderMass. Nature Protocols (2019)

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