

## A New Sensor-Controlled Preparation Technique for MALDI Tissue Imaging

Martin Schürenberg<sup>1</sup>; Gongyi Shi<sup>2</sup>; Rolf Müller<sup>1</sup>; Sören O. Deininger<sup>1</sup>; Detlev Suckau<sup>1</sup>

<sup>1</sup>Bruker Daltonik, Bremen, Germany

<sup>2</sup>Bruker Daltonics, Fremont, CA

### Introduction

- Sample prep is crucial for high quality MALDI tissue imaging.
- New method „vibrational vaporization“ applied to various tissues.
- High quality images achieved: **25-70  $\mu\text{m}$  pixel size**.

### Methods

In the new **ImagePrep** preparation device, (Bruker), a matrix aerosol (20 $\mu\text{m}$  droplets) is used under sensor controlled conditions. Standard methods for HCCA matrix (Figs. 3, 5) or sinapinic acid (Figs. 4, 6) preparations were selected.

Electrically conductive microscope slides were used for imaging preps and an **autoflex III smartbeam** was used for 200 Hz spectra acquisition and 10-100  $\mu\text{m}$  laser focus size was employed. FlexImaging 2.0 software was used for image acquisition, matching and analysis (all Bruker).

After MALDI image acquisition, matrix was rinsed off the tissue and standard H&E staining applied and microscopic/ scanned histological images obtained from same section for precise image alignment (see Fig. 3).

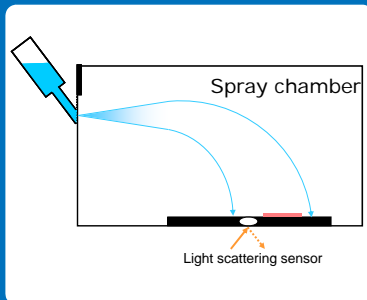


Fig. 2 Schematics of **ImagePrep**. Piezoelectric nebulizer creates spray. Entire preparation (matrix layer thickness, wetness) is sensor controlled.



Fig. 1 **ImagePrep** station for push button matrix application to tissue sections. 20  $\mu\text{m}$  droplet size for high resolution MALDI images.

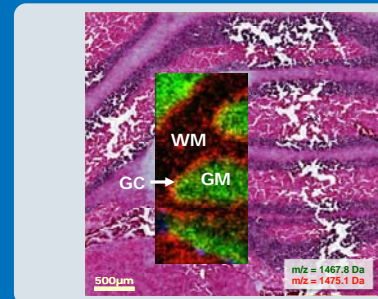


Fig. 3 MALDI tissue image of lipids and H&E stain from same mouse brain section. Histological features clearly resolved and accurately matched at **25  $\mu\text{m}$  image resolution**.

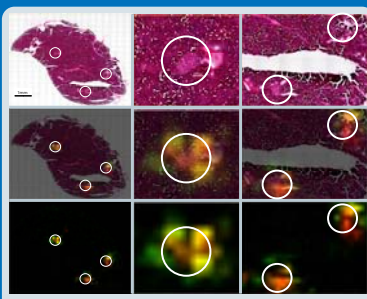


Fig. 4 **70  $\mu\text{m}$  resolution** MALDI image (bottom) of insulin (green) and glucagon (red), co-localizing with islets of Langerhans (circles) in mouse pancreas H&E-stains (top).

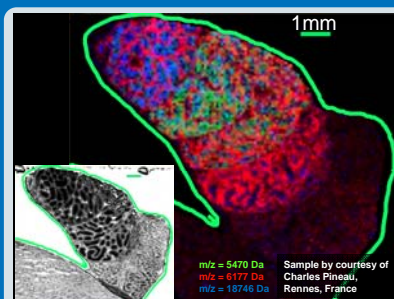


Fig. 5 **70  $\mu\text{m}$  resolution** MALDI image of rat testis. Spermatozoa undergo maturation on their way from lower right to upper left lobuli. Scalebar 1mm

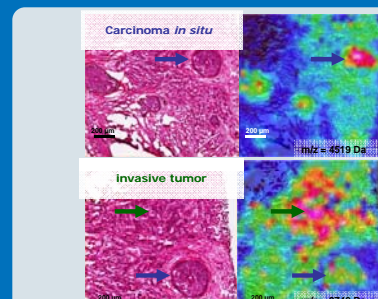


Fig. 6 **Molecular histology** of human breast cancer: MALDI was acquired first and same section was H&E stained (left) for accurate matching of both images. MALDI heat maps to the right.

● **ABRF 2008, Poster V44-M**

### Summary

- **Push button operation** routine for tissue sample preparation.
- **25  $\mu\text{m}$  pixel size** for lipids (Fig. 3) and 50  $\mu\text{m}$  for protein imaging.
- Post-MALDI acquisition H&E staining on **same section** established for accuracy matching of the images.
- **Molecular histology**: precision matching of images enabling for histological work with added molecular dimension.
- Enabling technologies for molecular histology: **ImagePrep smartbeam** same section analysis

### Conclusions

Sample preparation established to move MALDI imaging to **biomarker research and clinical diagnostics**:

- Automated, reproducible and robust: push button MALDI tissue prep.
- **Molecular histology** enabled by high resolution and post-MALDI histostaining on same section.