Identification of cancer markers by MALDI TOF Imaging

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Recent developments in **mass spectrometry** have introduced clinical proteomics to the forefront of diseases diagnosis, offering reliable, **robust and efficient analytical method** for biomarker discovery and monitoring

MALDI-TOF Imaging has the potential to revolutionize cancer diagnostics by facilitating biomarker discovery, enabling tissue imaging and quantifying biomarker levels
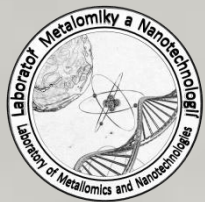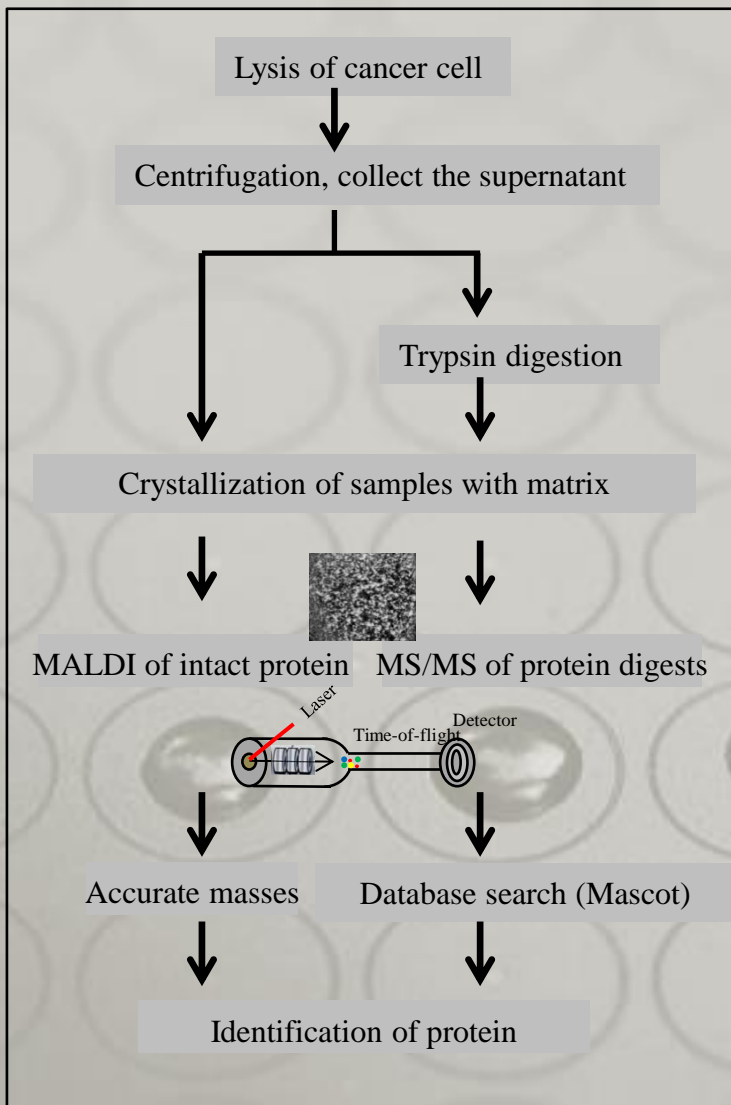
Methodology

Methodology for MALDI-TOF/TOF

Lysis of cancer cell

Centrifugation, collect the supernatant

Trypsin digestion

Crystallization of samples with matrix

MALDI of intact protein   MS/MS of protein digests

Laser

Time-of-flight   Detector

Accurate masses   Database search (Mascot)

Identification of protein

Stepwise scheme for rapid identification of biomarker in cancer cells by **MALDI-TOF/TOF-MS**. **1**. Lysis with appropriate buffer – optional by the protocol used **2.** Centrifugation at 25,000 g, 4°C for 20 minutes. **3.** Mixture of same volumes of supernatant and trypsin (0.1 mg/mL at 50 mM ammonium bicarbonate). Digestion in thermoblock for 2 hours at 45°C, pH > 8. Digestion stopped at pH < 4 by addition of acetic acid. **4.** 1-2 µl of sample/matrix mixture (1:1) deposited on MALDI plate and dried at room temperature (dried-droplet method). **5.** Analysis by MALDI-TOF/TOF mass spectrometer in linear and reflector mode. **6-7.** Masses of biomarker digests are used for database search – peptide mass fingerprinting (PMF). Biomarkers are identified using database search results.
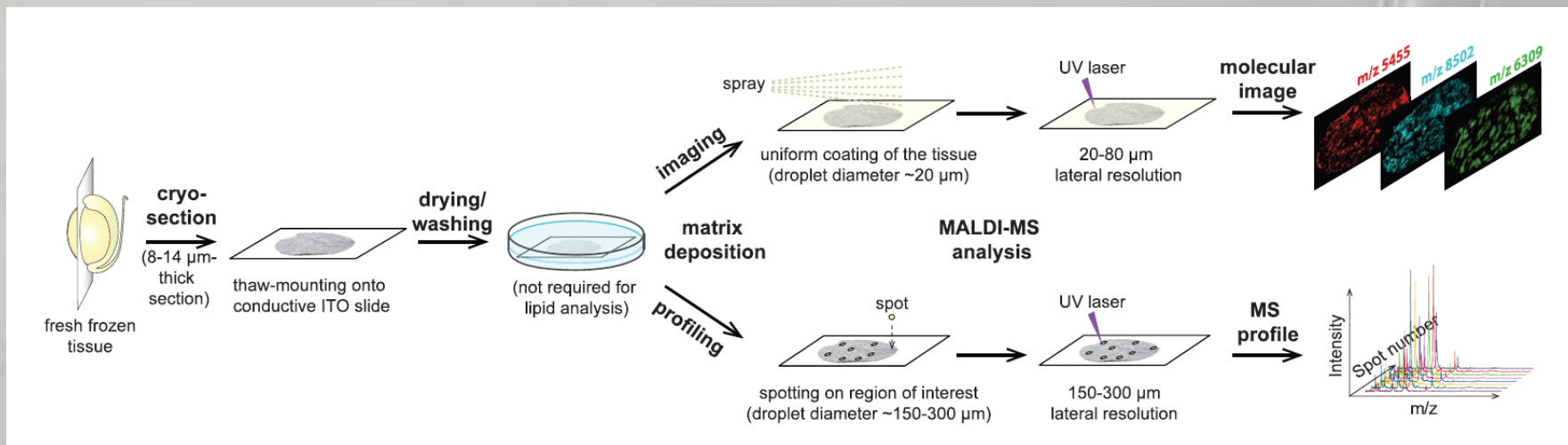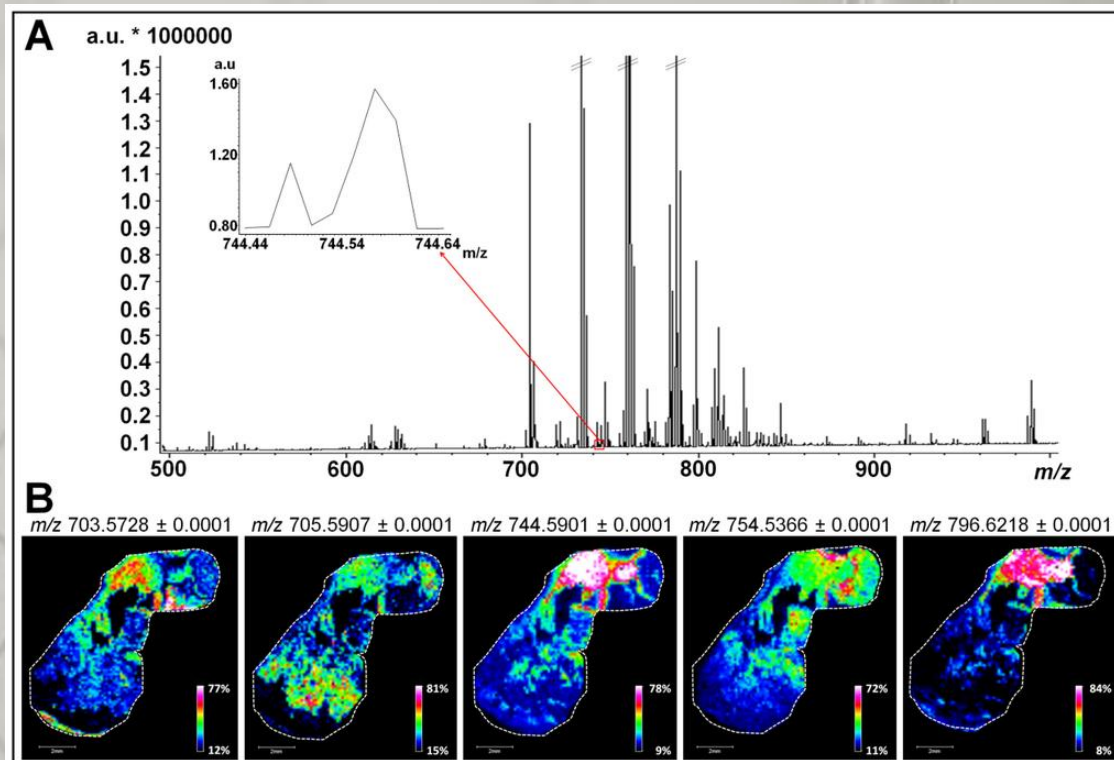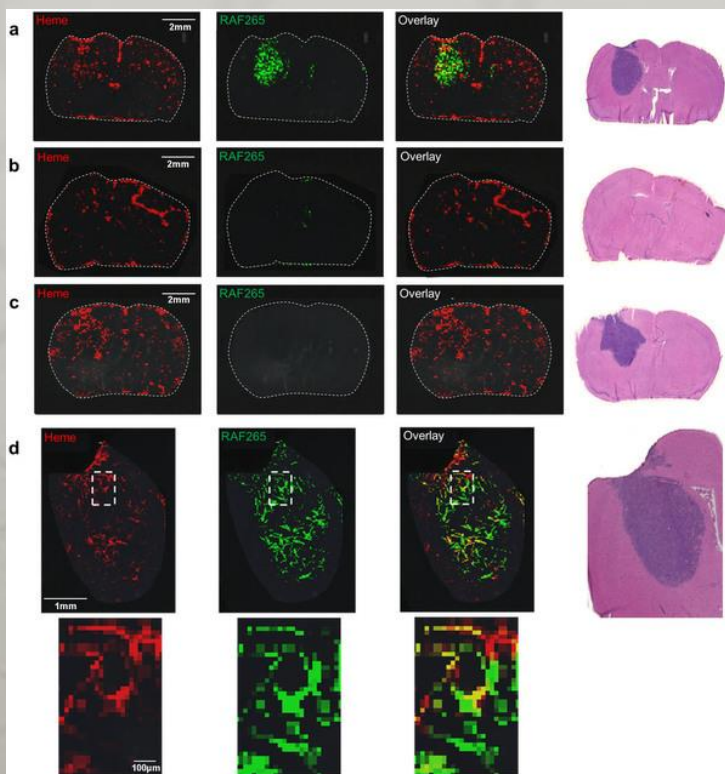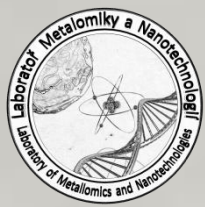
Methodology for MALDI-TOF imaging

Figure. General workflow of **MALDI-TOF imaging** mass spectrometry using fresh frozen tissue in biology of reproduction.

(Reprinted with permission from **Lagarrigue et al., 2012**)

Results

Gastric cancer

MALDI-TOF **Imaging** technology could facilitate the discovery of a novel and quantitative prognostic biomarker for Gastric cancer.

Human neutrophil peptides 1–3 as gastric cancer tissue markers measured by MALDI-imaging mass spectrometry: Implications for infiltrated neutrophils as a tumor target

Chun-Chia Cheng[a,b], Jungshan Chang[a,d,e,f], Ling-Yun Chen[g], Ai-Sheng Ho[h], Ker-Jer Huang[i], Shui-Cheng Lee[b], Fu-Der Mai[a,c,d,] and Chun-Chao Chang[j,*]
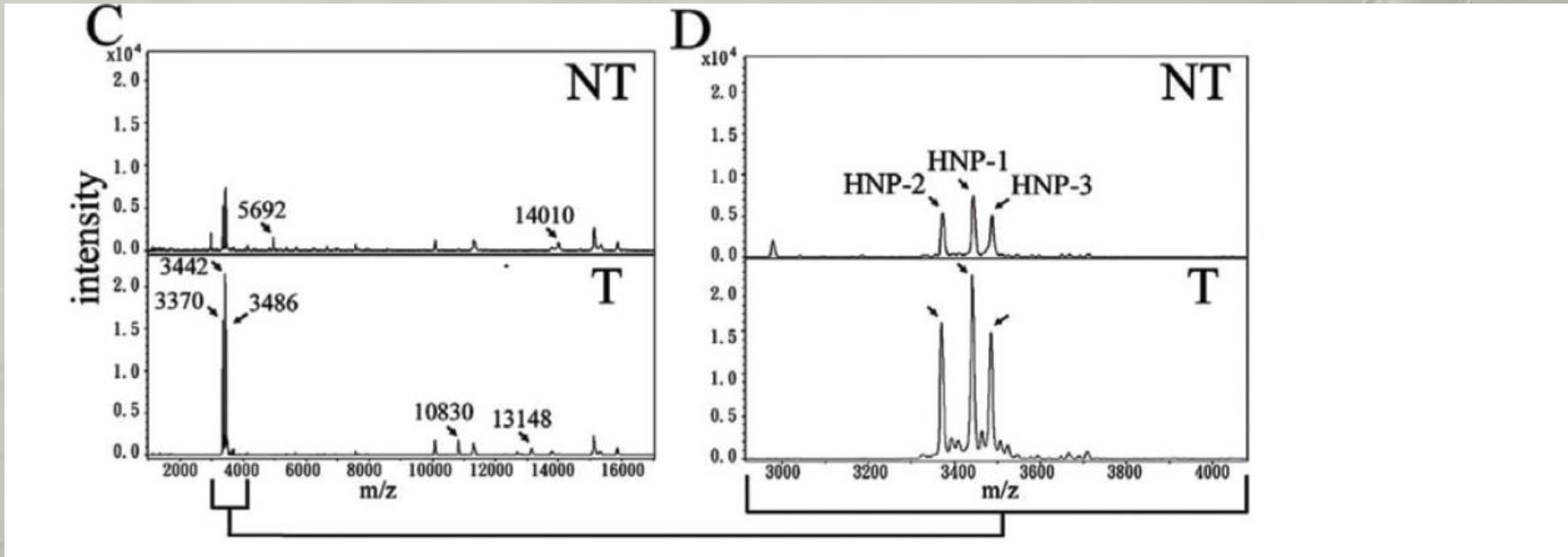
Gastric cancer

Cheng et al. showed that human neutrophil peptides HNPs 1-3, which are found to be increased in the gastric cancer tissues, could be used as potential biomarkers, detected by the MALDI-TOF imaging mass spectrometry, implying that elevated neutrophils may be used as a target for tumor treatment.
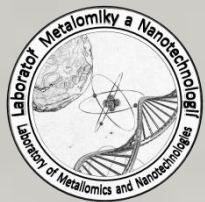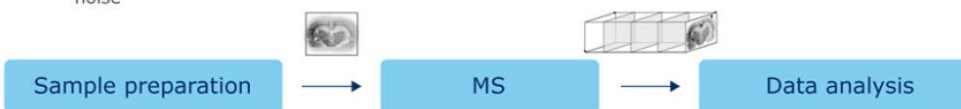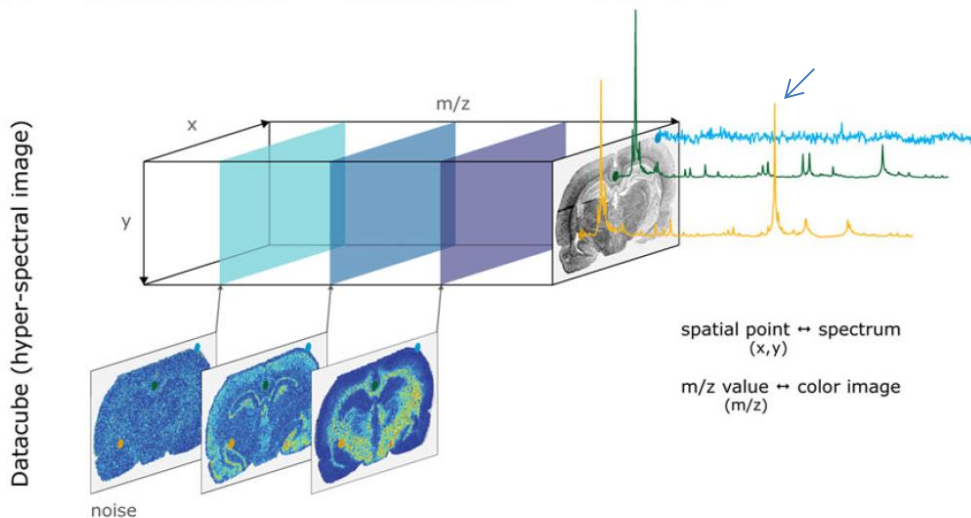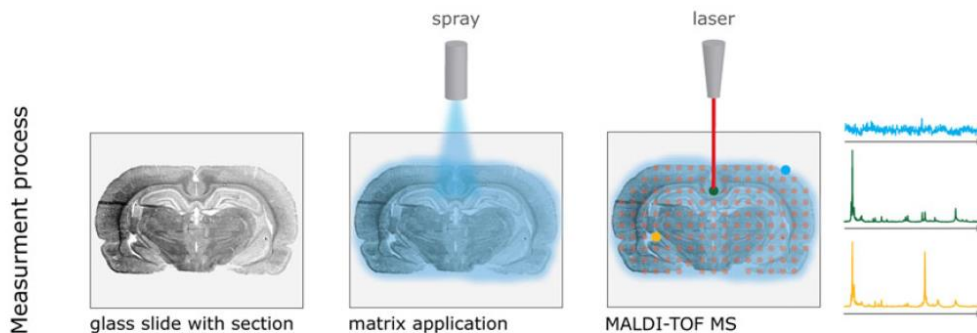
Respiratory system cancer

MALDI-imaging segmentation is a powerful tool for spatial functional proteomic analysis of human larynx carcinoma

Theodore Alexandrov · Michael Becker ·
Orlando Guntinas-Lichius · Günther Ernst ·
Ferdinand von Eggeling

Identification of cancer markers by MALDI TOF Imaging

Bladder cancer

MALDI-TOF Imaging technology could facilitate the discovery of a novel and quantitative prognostic biomarker for bladder cancer.

Proteomic tissue profiling for the improvement of grading of noninvasive papillary urothelial neoplasia

Rena F. Oezdemir [a,1], Nadine T. Gaisa [a,1], Katharina Lindemann-Docter [a], Sonja Gostek [a], Ralf Weiskirchen [b], Maike Ahrens [c], Kristina Schwamborn [d], Christian Stephan [c], David Pfister [e], Axel Heidenreich [e], Ruth Knuechel [a], Corinna Henkel [a,c,*]

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[b] Institute of Clinical Chemistry and Pathobiochemistry RWTH Aachen University Hospital, Aachen, Germany
[c] Medizinisches Proteom-Center, Ruhr-University Bochum, Germany
[d] Department of Biochemistry, Vanderbilt University, Nashville, USA
[e] Department of Urology, RWTH Aachen University Hospital, Aachen, Germany
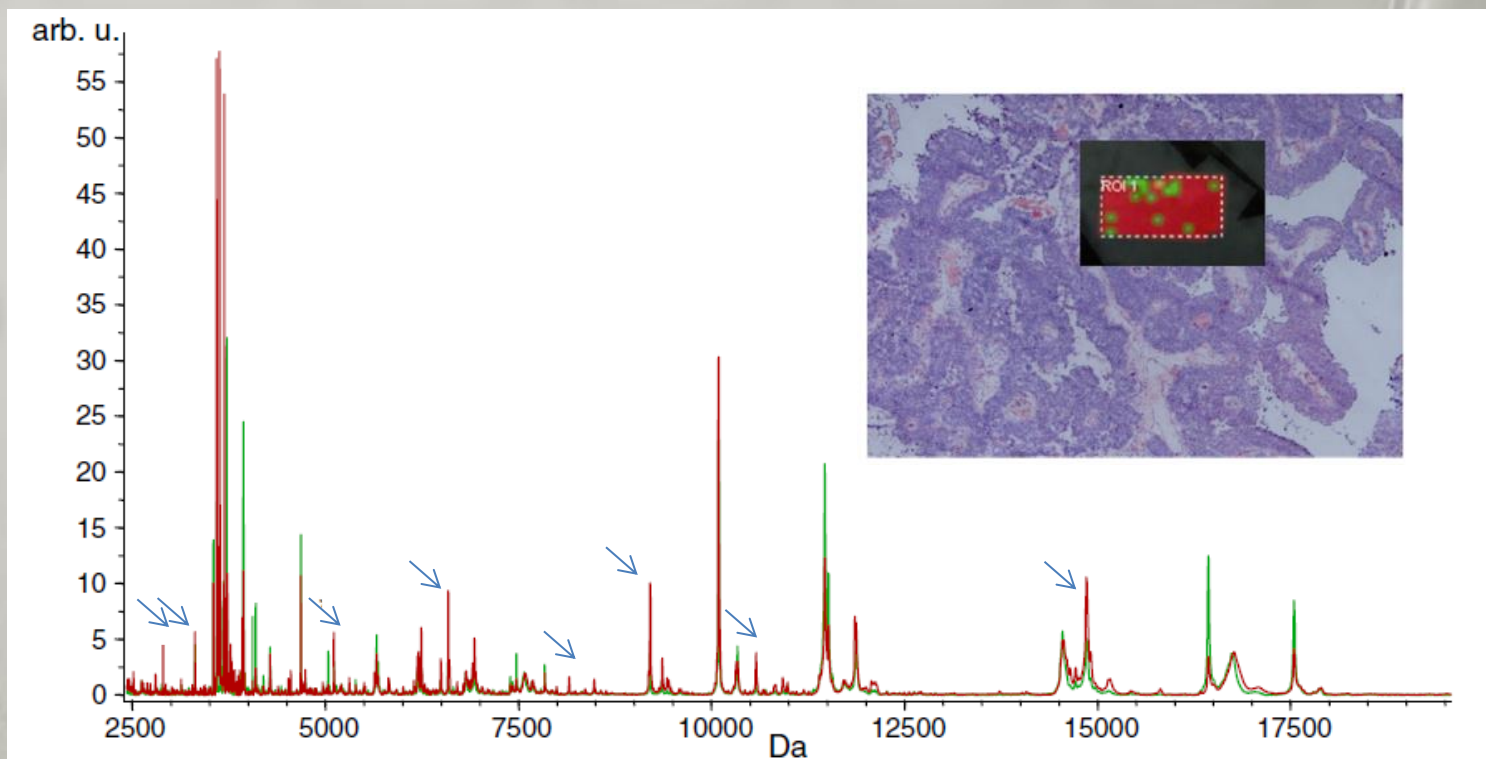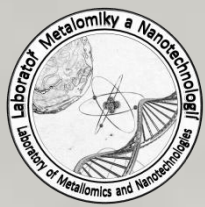
Bladder cancer

Figure. Relative peak intensity versus mass to charge ratio (m/z) ranging from 2500 to 18,000 Da of an overall sum spectrum of pTaG1 (green) and pTaG3 (red) bladder cancer is shown.

Different stages of cancer: G1, G2 and G3

Ovarian cancer

MALDI-TOF imaging technology could facilitate the discovery of a novel and quantitative prognostic biomarker for ovarian cancer.

The C-terminal fragment of the immunoproteasome PA28S (Reg alpha) as an early diagnosis and tumor-relapse biomarker: evidence from mass spectrometry profiling

Rémi Longuespée · Charlotte Boyon · Céline Castellier · Amélie Jacquet · Annie Desmons · Olivier Kerdraon · Denis Vinatier · Isabelle Fournier · Robert Day · Michel Salzet
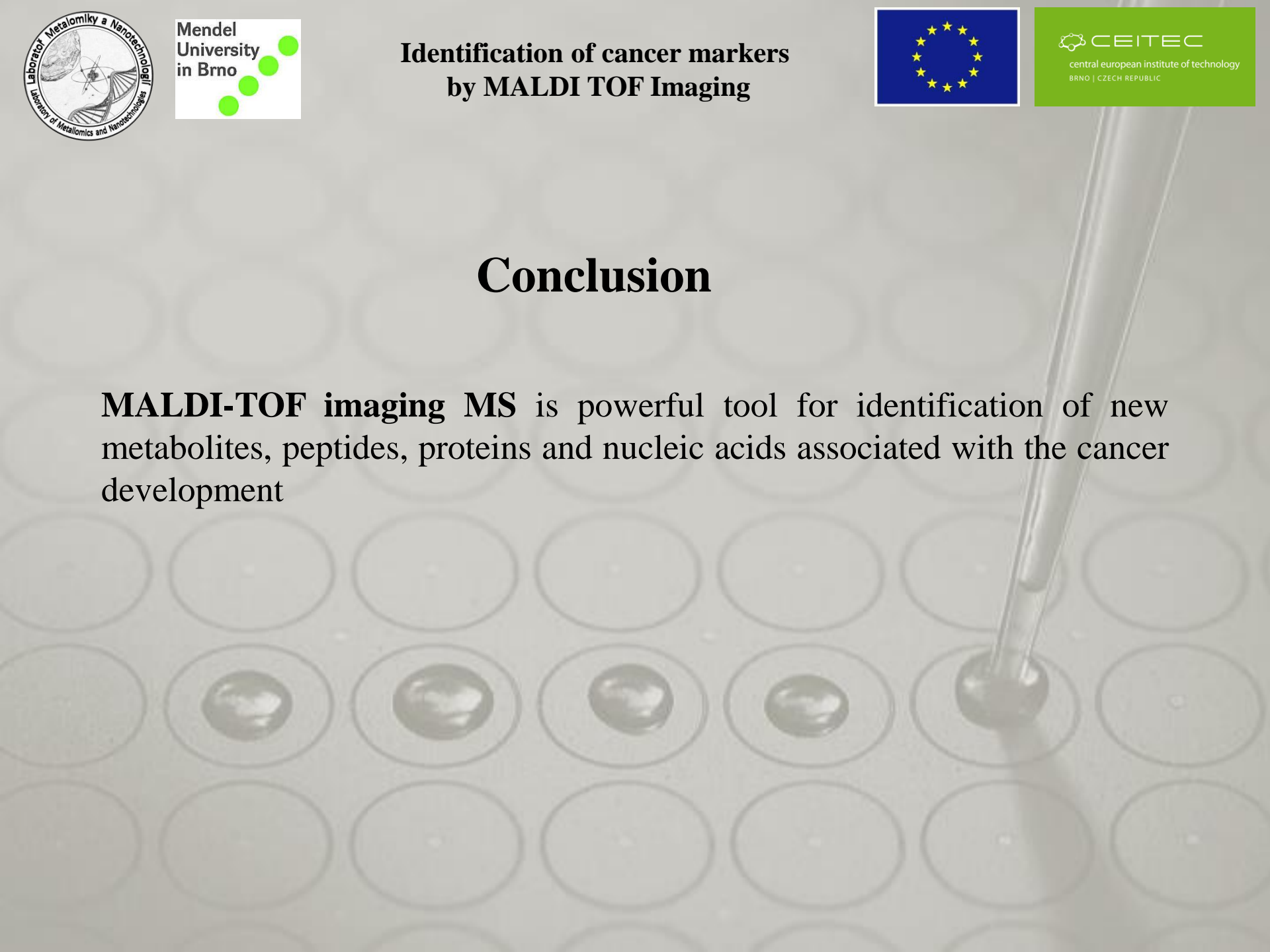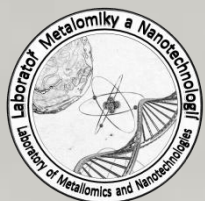
Ovarian cancer
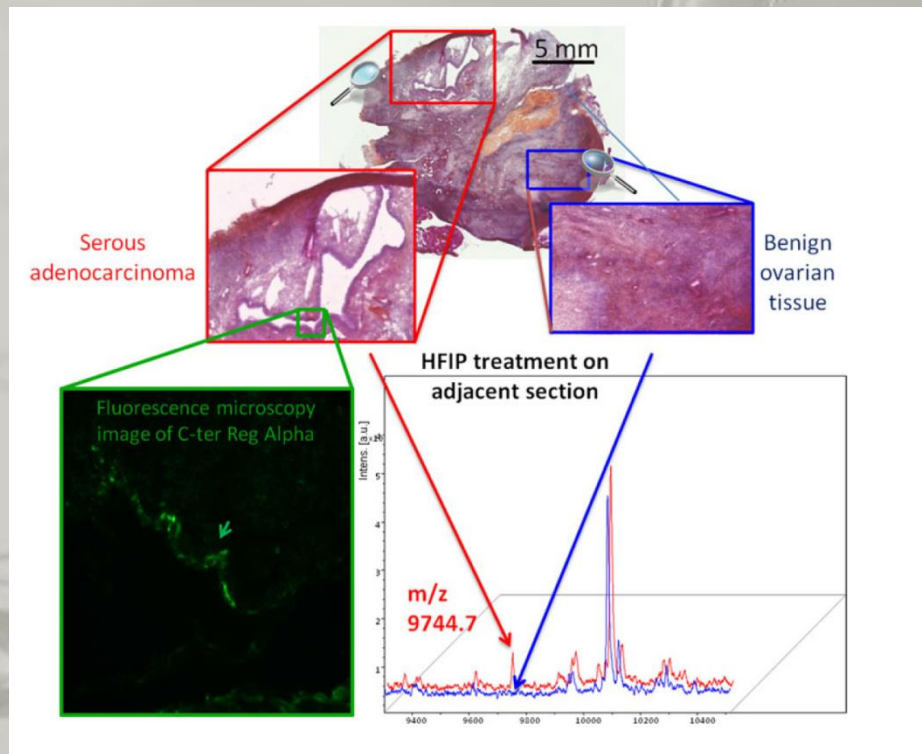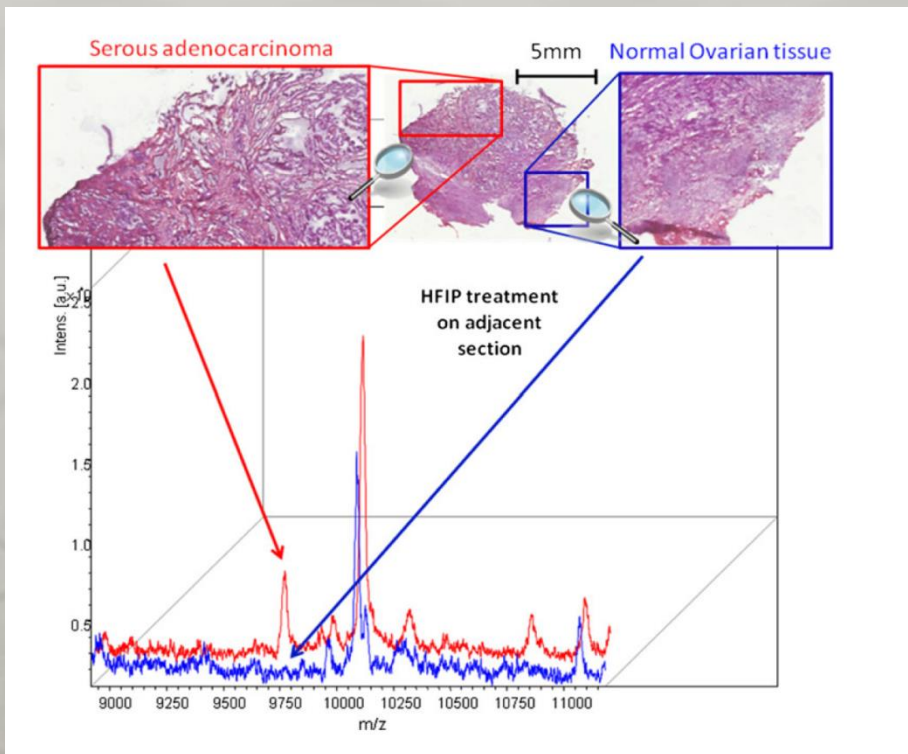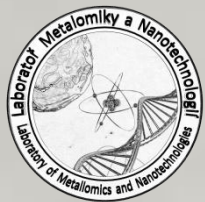
Conclusion

MALDI-TOF imaging MS is powerful tool for identification of new metabolites, peptides, proteins and nucleic acids associated with the cancer development

Thank you for your attention
Děkuji za vaši pozornost