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Mass Spectrometry & Purification Techniques

Short Communication

Visualizing Food Components by Application of Mass Spectrometry Imaging

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ABSTRACT

Food is necessary for survival, health maintenance, and the elicitation of positive emotions such as pleasure. The presence of various compounds in foods is one of the factors that drives us to such behaviour. There are numerous methods for analysing these molecules in foods; however, conventional techniques, such as mass spectrometry combined with high-performance liquid chromatography or gas chromatography, make it difficult to analyse the spatial distribution of these compounds. MSI (Mass Spectrometry Imaging) is a two-dimensional ionisation technology that detects compounds in tissue sections without the need for extraction, purification, separation, or labelling.

Keywords: Spectrometry; Purification; Separation; Labelling

DESCRIPTION

There are numerous methods for ionising analytes. Secondary ion mass spectrometry, matrix-assisted laser desorption/ ionization, and desorption electrospray ionisation are some of the techniques used. MSI technologies of this type can provide spatial information on the location of a specific analyte in food. Over the last decade, the number of studies utilising MSI technologies in food science has increased [1] .This provides an overview of some recent MSI applications in food science and related fields. MSI will become one of the most promising technologies for visualising the distribution of food components and identifying food-related factors based on their molecular weights in the future to improve quality, quality assurance, food safety, nutritional analysis, and the location of administered food factors [2].

IONISATION METHODS

Matrix assisted laser desorption ionization

MALDI imaging analyzes and detects various biomolecules directly from tissue sections. Tissue sections are covered with a matrix. The matrix is usually a weak organic acid that absorbs UV light, such as sinapic acid and cyano4-hydroxycinnamic acid (aCHC). This matrix helps extract target molecules from tissue samples, form analytically doped crystals, and absorb laser energy to ionize target molecules. In MALDI, a laser is applied to the matrix layer to absorb energy and evaporate the analyte, and finally move the MALDI stage to the x/y axis to examine the position of each sample. In addition, the matrix acts as both a proton donor and a receptor, ionizing the analyte in both positive and negative modes. In MALDI imaging, the laser irradiates only the matrix layer and does not impair the shape of the tissue, allowing histological histological examination[3].

Desorption electrospray ionization

Unlike SIMS and MALDI, DESI operates under ambient pressure conditions. It uses both electrospray ionization and desorption ionization methods [4]. In DESI, the electrospray is generated by the flow of solvent and the application of nebulizer gas and high voltage potential, resulting in a jet of charged microdroplets. These microdroplets are directed from the sample site under the spray to a surface that is simultaneously extracted, desorbed, and ionized. Ion formation occurs by ion release or evaporation of neutral solvent molecules.

Novel ionisation methods

Given that ionization under atmospheric pressure conditions is suitable for routine analysis and is easy to maintain, research efforts to develop atmospheric pressure plasma ionization sources are increasing. Among these, dielectric barrier discharges

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and microplasma jets have been studied with promising results. The ease of ionization using a portable plasma source (usually operating with helium) can be fully complemented by a portable mass spectrometer. For brevity, the following other ionization methods are described the Laser Ablation Electrospray Ionization (LAESI), Probe Electrospray Ionization (PESI), and Laser Electrospray Mass Analysis (LEMS) are omitted. They are also popular in MSI and have been successfully applied to biological samples [5,6].

CONCLUSION

This provided an overview of mass spectrometry-based imaging techniques and their proven potential applications in food science. There are few options for desorption and ionization methods, and the type of food matrix to be analyzed must be carefully identified and selected. Spatial distribution of plant metabolites, dietary supplements, toxins, and macromolecules such as proteins, peptides, and lipids are some of the hot topics. The limited research available suggests promising options for food scientists, but there are certainly many applications and advances that can be envisioned for the future. Significant progress towards improving MSI equipment should make the use of MSI widely accepted by food researchers to better understand the molecular basis of spatial and spatiotemporal differences in food. is. The new knowledge generated from the application of MSI can drive innovations, especially for the accurate extraction and efficient sorting of plant materials or grains.

REFERENCES

1. Niehaus M, Soltwisch J, Belov ME, Dreisewerd K. Transmission-mode MALDI-2 mass spectrometry imaging of cells and tissues at subcellular resolution. Nat Methods. 2011; 16(4): 925-931.
2. Balluff B, Hopf C, Porta ST, Grabsch H. Batch Effects in MALDI Mass Spectrometry Imaging. J Am Soc Mass Spectrom. 2021; 32(3): 628-635.
3. Race AM, Bunch J. Optimisation of colour schemes to accurately display mass spectrometry imaging data based on human colour perception. Anal Bioanal Chem. 2015; 407(4): 2047-2054.
4. Palmer A. FDR-controlled metabolite annotation for high-resolution imaging mass spectrometry. Nat Methods. 2016; 14(5): 57-60.
5. Hayakawa E, Fujimura Y, Miura D. MSIdV: A versatile tool to visualize biological indices from mass spectrometry imaging data. Bioinformatics. 2016; 32(2): 3852-3854.
6. Guo S, Wang Y, Zhou D, Li Z. Significantly increased monounsaturated lipids relative to polyunsaturated lipids in six types of cancer microenvironment are observed by mass spectrometry imaging. Sci Rep. 2014; 45(4): 5892-5959.