

Targeted MS imaging: quick, direct and detailed molecular spatial information



Mass spectrometry imaging (MSI) is valuable for understanding:



Disease pathology

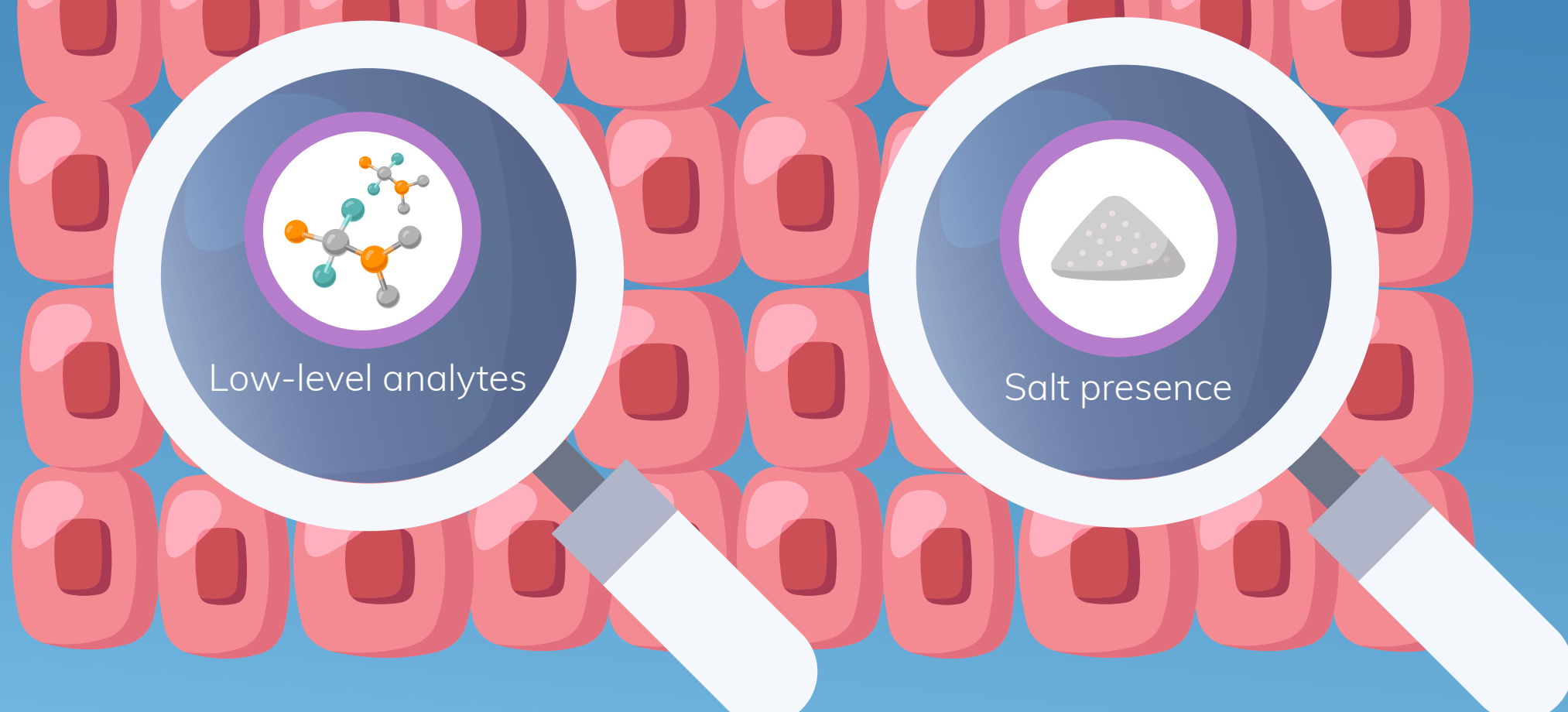


Biological processes



Drug distribution

- However, some factors including the complexity of tissues, the presence of salt and low-level analytes can interfere with the accuracy and sensitivity of MSI, especially at therapeutic levels.



Addressing detection challenges

To address detection challenges and advance MSI, targeted MS imaging has incorporated the desirable features of two established technologies, leveraging the DESI XS and the Xevo™ TQ Absolute XR.

Waters' targeted MSI solution with DESI XS on the Xevo™ TQ Absolute XR enables the most rapid and sensitive localization of drugs and their metabolites, providing crucial insights into bio-distribution, tissue penetration and target engagement.



DESI XS:

- Maps small molecules and chemical information directly from various surfaces, including tissue sections



- Provides insights into the spatial distribution of molecules at or near the surface
- Provides information-rich images to help identify components in samples
- Highly effective when used in conjunction with time-of-flight mass spectrometers, ideally suited for untargeted discovery workflows



Tandem Quadrupole MS for targeted Imaging:

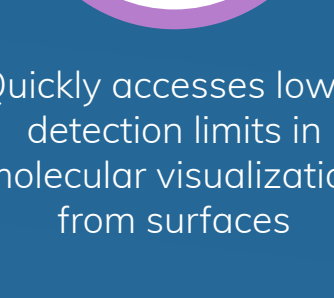
- Known for its sensitivity, speed and quantitative robustness, ideal for targeted applications using multi reaction monitoring (MRM) modes of acquisition



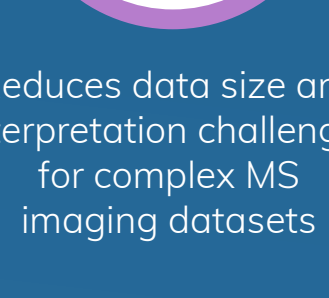
- Widely adopted for drug quantitation in drug development workflows, enabling more informed decision-making throughout the R&D lifecycle

A targeted MS imaging solution

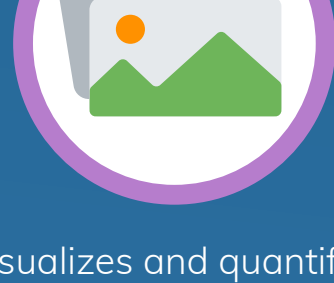
A targeted MS imaging solution with DESI XS and TQ Absolute XR offers a distinctive combination of features:



Quickly accesses lower detection limits in molecular visualization from surfaces



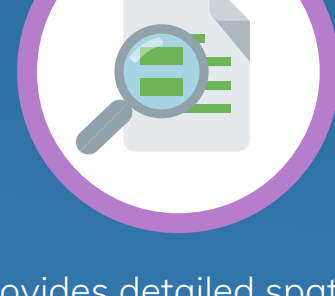
Reduces data size and interpretation challenges for complex MS imaging datasets



Visualizes and quantifies biomarkers, APIs, metabolites at low concentrations



Combines high sensitivity with efficient throughput for large studies



Provides detailed spatial information with minimal sample preparation



Integrates MSI analysis into multi-modal imaging workflows



Enhances quantification using the sensitivity and dynamic range of TQ MS



Meets laboratory sustainability goals with low operational costs compared to other MS systems on the market

Case Study: Neuroimaging

Radiopharmaceuticals — drugs containing radioactive isotopes — are used in medical imaging and treatment, particularly for counting dopamine neurons in neurodegenerative disorders like Parkinson's disease.



The biodistribution of new radiopharmaceuticals must align with that of the target protein.

Confirming this match before radiolabeling can lead to cost-effective, safer and faster drug development.

Radiopharmaceuticals require sensitive visualization methods for tracer dosing, which may not always be achievable with high-resolution mass spectrometry (HRMS) imaging.

Targeted MS imaging		Discovery HRMS	
MRM	TQ	MS	
			Pharmaceutical dose
	X	X	Tracer dose

- This neuroimaging example portrays metabolite and lipid localization in a mouse brain using targeted MRM MS imaging on DESI XS TQ Absolute XR compared to discovery HRMS imaging using MS and tandem MS. The tracer-dosed tissue could not be imaged by discovery HRMS imaging but was easily imaged by targeted MS imaging due to gains in sensitivity and specificity with this targeted approach.

Targeted approaches to enhance efficiency in mass spectrometry imaging

Targeted MS imaging utilizing DESI and Xevo TQ Absolute XR provides optimal, direct and detailed spatial information while minimizing sample preparation requirements, by allowing:



Efficient collection of a broader spectrum of images in a reduced time frame

Data collection within pharmaceutical workflows, including biological replicates

Increased statistical confidence in results over a smaller study summary

Learn more at [Waters.com/TargetedMSI](https://www.waters.com/TargetedMSI)

