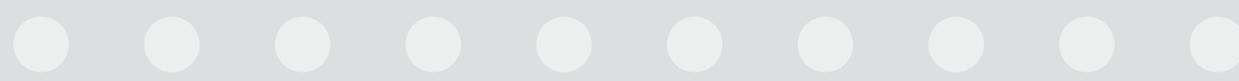
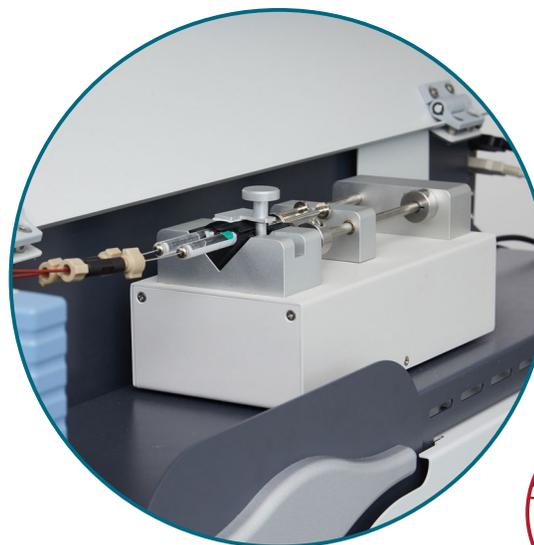
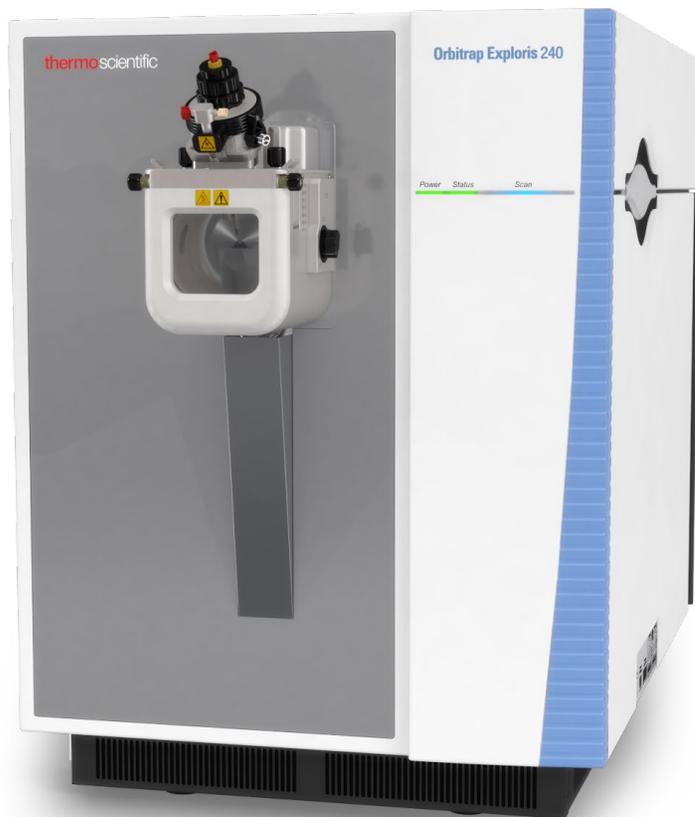
A stylized graphic of a white eye with a red iris and a red pupil, set against a dark teal background that resembles a profile of a head. A red horizontal bar is located below the eye.

Orbitrap power now for isotope ratios

A horizontal row of ten white circles of varying sizes, decreasing in size from left to right, serving as a decorative separator.

Intramolecular isotopic information is important as it can provide a better understanding of the processes of molecule formation and provide new geochemical proxies for understanding the world around us. The powerful new workflow harnesses Thermo Scientific™ Orbitrap™ high-resolution accurate mass (HRAM) sensitivity and precision to significantly broaden the applications of isotope ratio analysis.



Thermo Scientific™ Orbitrap Exploris™ Isotope Solutions offer a dedicated workflow for delivering isotope ratio data based on Orbitrap MS technology, that includes:

- Thermo Scientific™ Orbitrap Exploris™ 120/240/480 MS
- Data collection and evaluation package for Isotope Ratio MS
- Dual Syringe Inlet (Dual Inlet Methodology)

For automation and higher throughput, the Thermo Scientific™ Vanquish™ Neo UHPLC System can be coupled to Orbitrap Exploris Isotope Solutions.

Deeper, more comprehensive studies

Innovative Orbitrap-based isotopologue analysis gives you access to additional dimensions of high-quality isotope ratio information.

Unprecedented analytical capabilities

- **Isotope ratios at natural abundance**

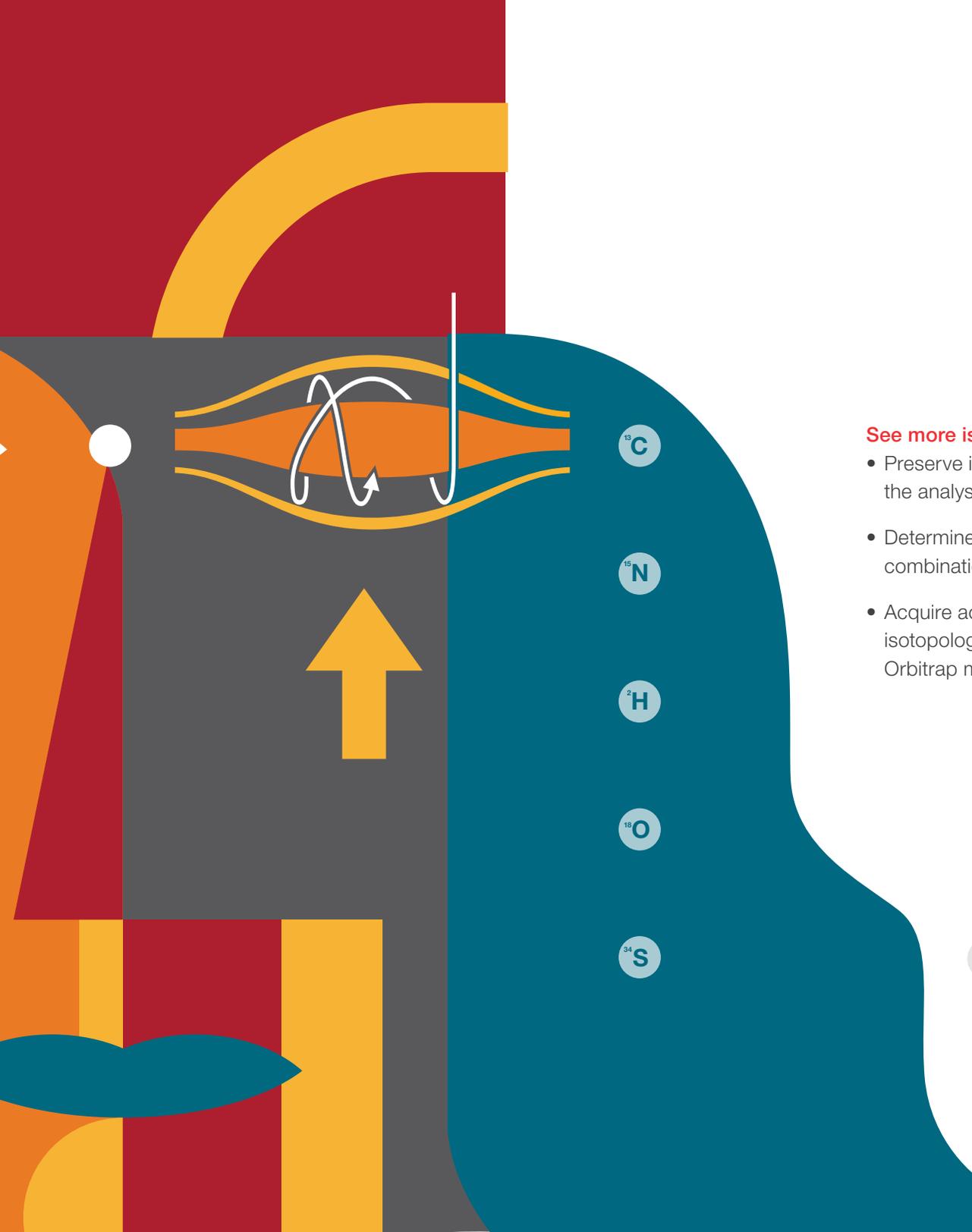
Make direct measurements of individual analytes in liquid samples, with simultaneous acquisition of all major and some minor isotopologues, enabling abundance determination of ^{13}C , ^{15}N , ^{18}O , ^{17}O , ^2H , ^{34}S , ^{33}S , ^{36}S , and more.

- **Determination of position specific isotope ratios**

Controlled fragmentation of organic molecular species provides unique position specific isotope information from functional groups

- **Clumped isotopes analysis**

Achieve accurate measurements of isotopologues with multiple rare isotope substitutions



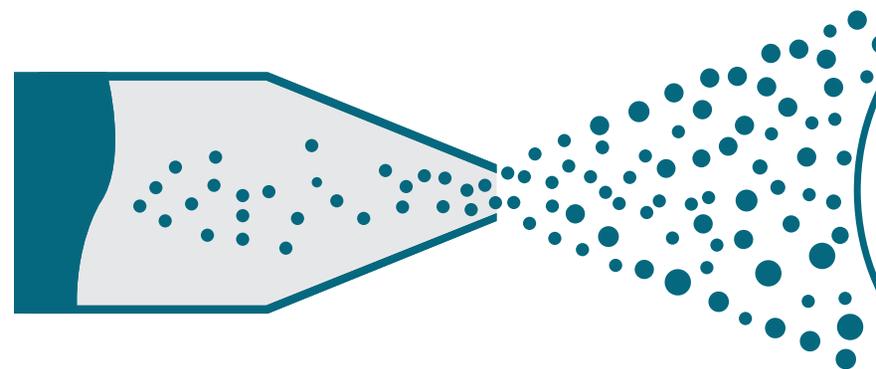
See more isotopologues

- Preserve intramolecular isotopic information throughout the analysis
- Determine previously inaccessible isotopologues by the combination of soft electrospray ionization (ESI) and HRAM
- Acquire accurate isotopic information from minor isotopologues by amplifying their signals using dedicated Orbitrap methodology



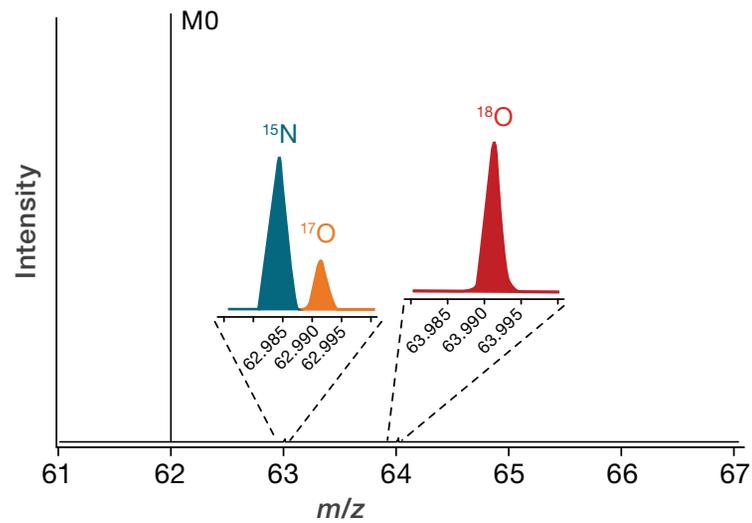
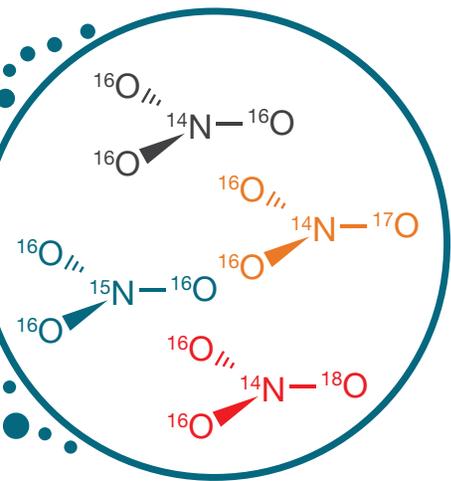
Workflow

Orbitrap Exploris Isotope Solutions workflow comprises a dedicated sample introduction concept, distinctive method setup and a data evaluation framework to convert isotopologue intensities to accurate isotope ratios



Sample introduction

- Utilizing ESI for direct introduction of polar molecules from solutions—no time-consuming chemical derivatization or conversion
- Advanced Quad Technology mass range selection for removal of matrix interferences



➡ $R = ^{15}\text{N}/M_0$

➡ $R = ^{17}\text{O}/M_0$

➡ $R = ^{18}\text{O}/M_0$

MS methodology

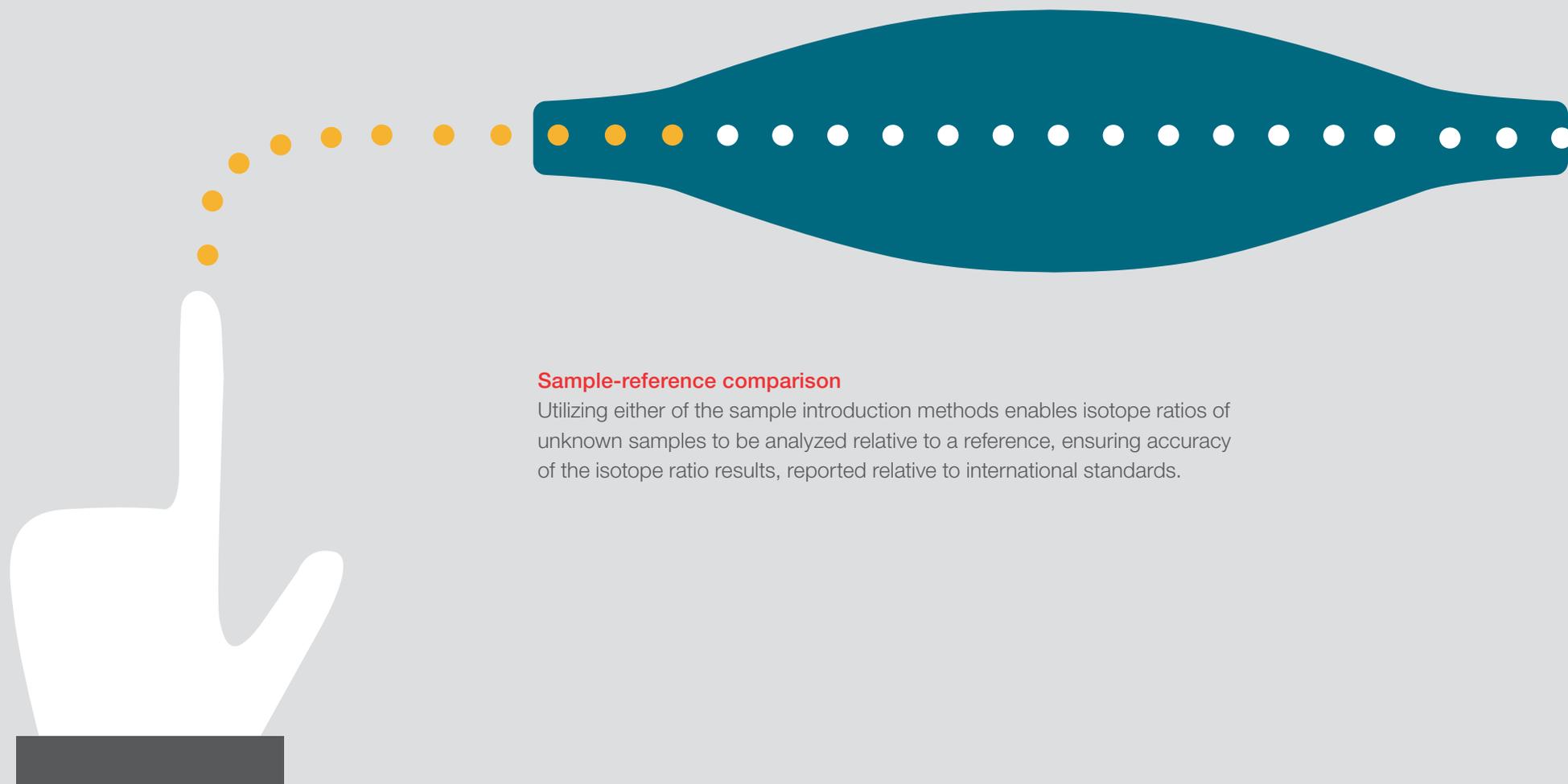
- Separation and identification of isotopologues using Orbitrap MS HRAM technology

Isotope ratios (R)

- Data extraction of the ion counts of the compounds isotopologues, measured as intact molecular ions
- Calculation of isotope ratios (R)

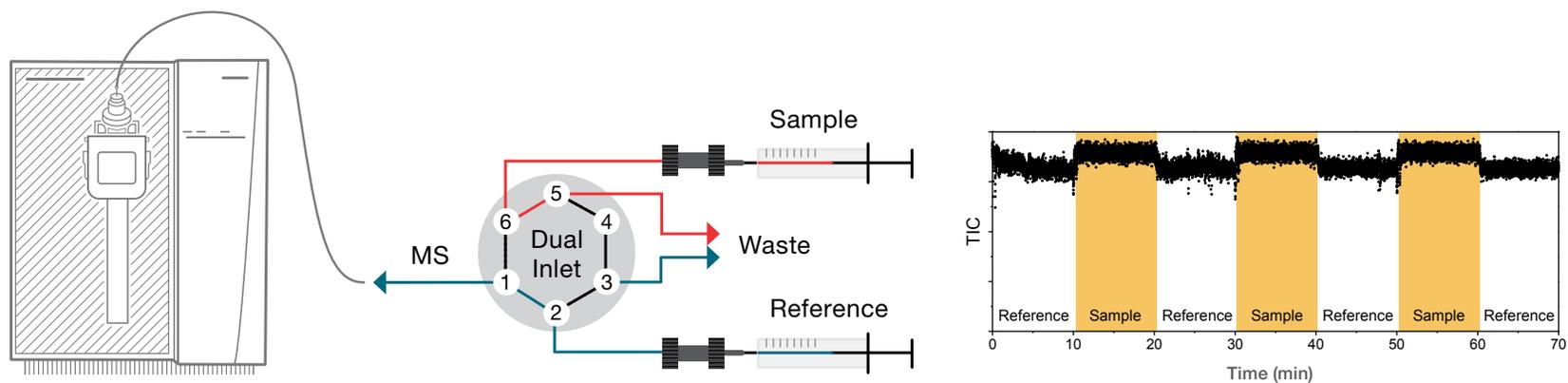
Inside the Orbitrap methodology for isotope ratios

Orbitrap Exploris Isotope Solutions support two sample introduction methods: Dual Syringe Inlet system and automated In-flow Injection approach.

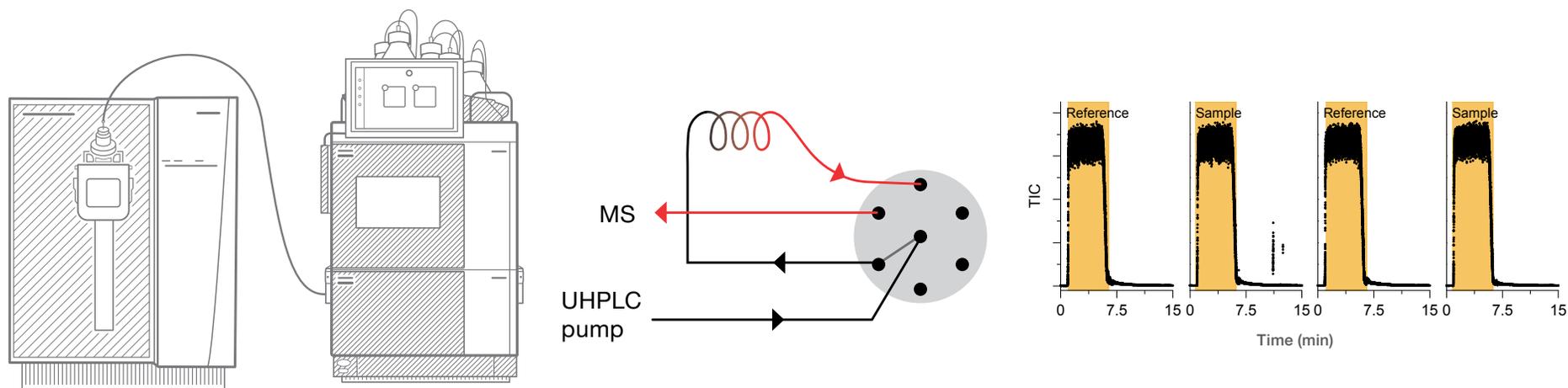


Sample-reference comparison

Utilizing either of the sample introduction methods enables isotope ratios of unknown samples to be analyzed relative to a reference, ensuring accuracy of the isotope ratio results, reported relative to international standards.



Dual Syringe Inlet system utilizing the diverter valve option of the Orbitrap Exploris MS



Automated In-flow Injection approach based on the Vanquish Neo UHPLC System

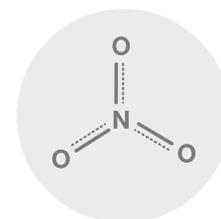
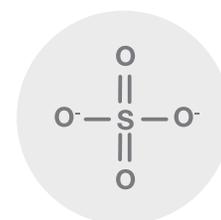
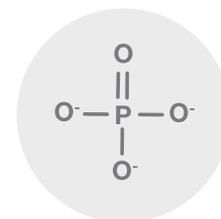
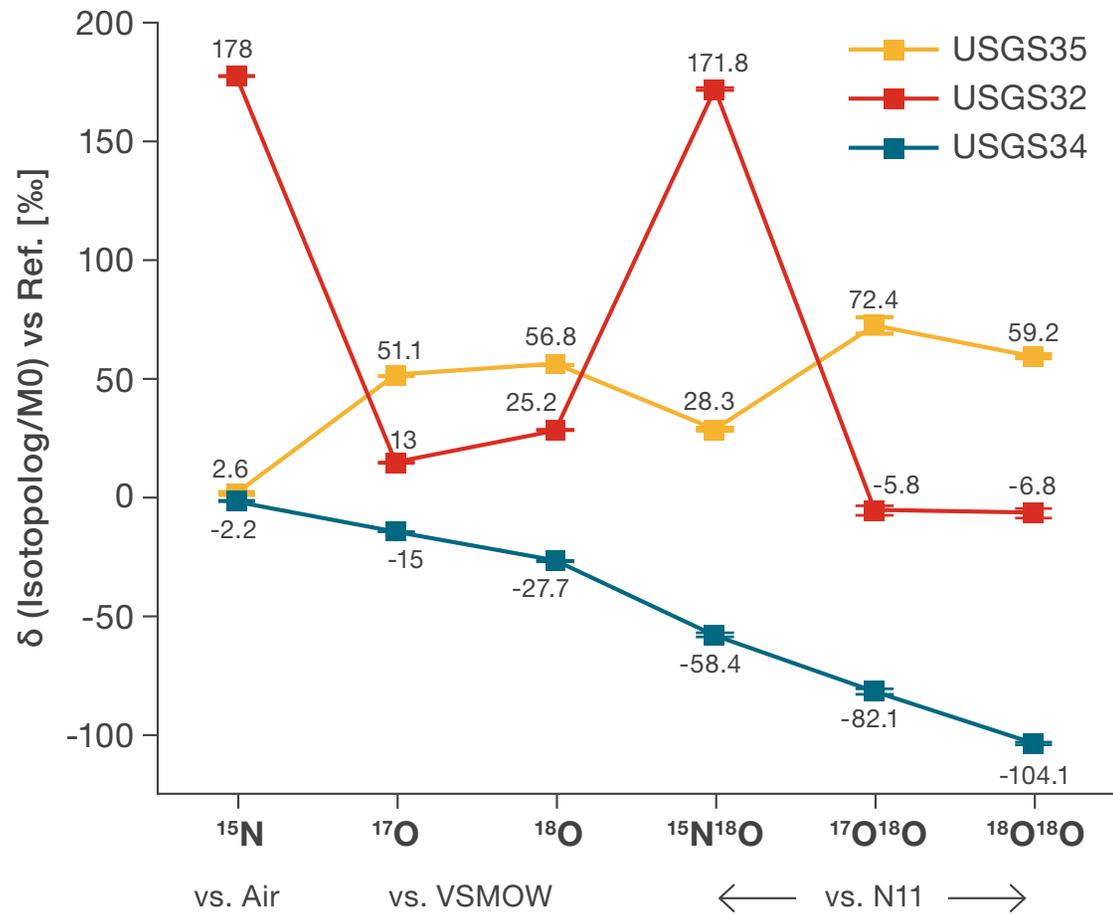
Breakthrough scientific insights

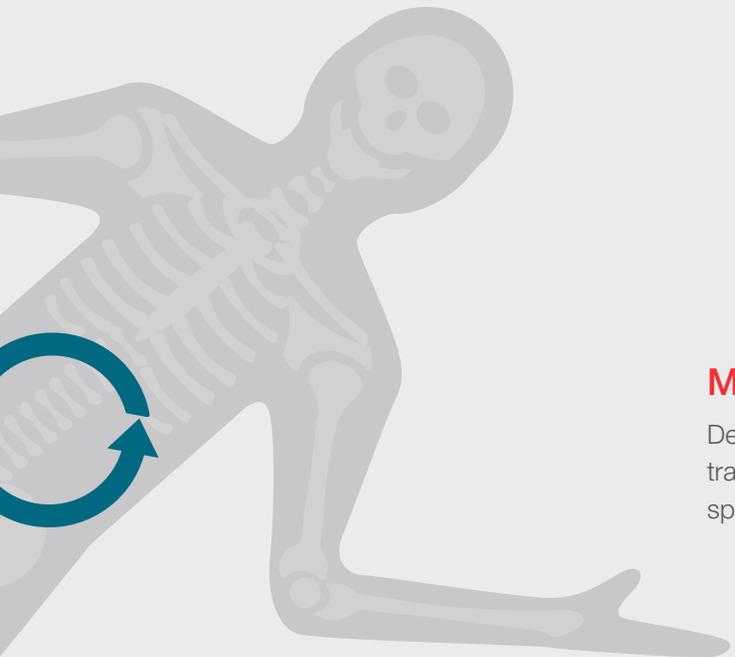
Orbitrap Exploris Isotope Solutions enables investigation of unexplored dimensions of molecular isotopologue ratios in areas such as geology, ecology, metabolism research and forensics.

Biogeochemistry research

Investigation of biogeochemical cycles using multiple isotopologues of CNSOH bearing species (e.g. nitrate, sulfate, phosphate, acetate and other simple organics)





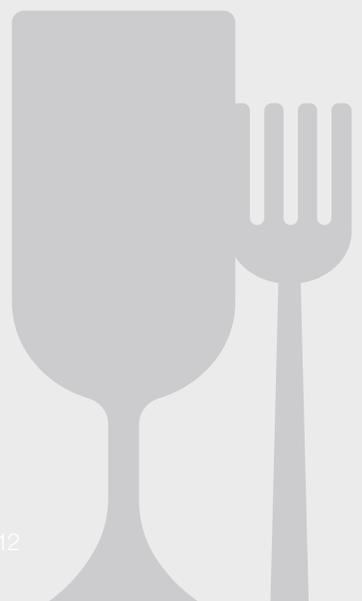


Metabolism and physiology studies

Deconvolution of complex metabolic pathways by tracing metabolite transformations (e.g. position specific isotope analysis of amino acids)



A world of



Food authenticity

Verification of food and beverage authenticity using isotope ratios of multiple elements and position specific isotope analysis (e.g. geographic origin of vanillin)





Geology, climatology, and archaeology

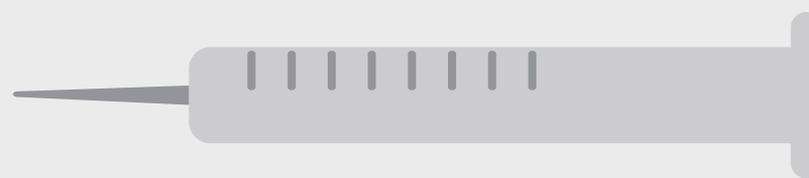
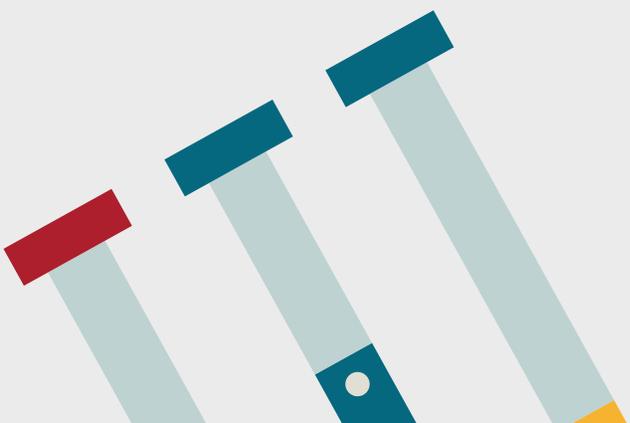
Study of redox states in the geological past (e.g. different oxygen reservoirs in geological records, presence of microbial activity, atmospheric conditions, atmosphere hydrosphere interactions)

possibilities

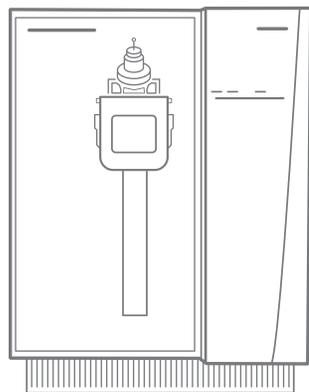


Doping control

Identifying the use of performance enhancing drugs

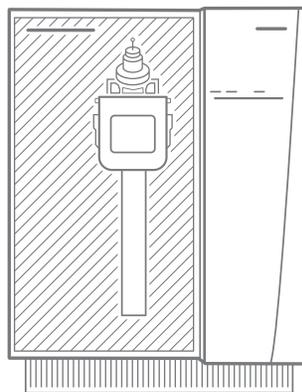


Orbitrap Exploris Isotope Solutions



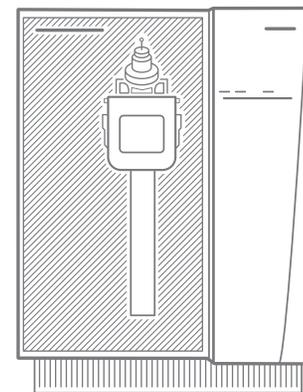
Orbitrap Exploris 120 MS

The ultimate workhorse for isotope ratio analysis of oxyanions and small organic molecules (<100 m/z).



Orbitrap Exploris 240 MS

The instrument of choice for isotope ratio analysis of oxyanions and medium sized organic molecules (<200 m/z).



Orbitrap Exploris 480 MS

For customers wanting to push the boundaries of isotope research of oxyanions and large organic molecules such as metabolites (<250 m/z).

Learn more at thermofisher.com/orbitrap-for-isotopes

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