

Chemical Analysis by Sessile Droplet Microfluidic Devices and Surface Sampling Probe Mass Spectrometry

"Is this tissue safe for implantation?"; "Have drugs been taken up at targeted sites for treatment?"; "Is this food or water safe to consume?". These are just a few questions that can be answered by mass spectrometry (MS). MS allows determining the weight on a molecular scale to identify chemical and biochemical species in complex samples, even at low concentrations. As a highly versatile detection method, MS is indispensable in clinical chemistry, environmental science, microbiology, and toxicology. However, mass spectrometers are costly and require well-trained personnel to operate, which limits the accessibility of MS to large facilities. Sample preparation and injection are major bottlenecks for analysis.

The liquid-micro junction-surface sampling probe (LMJ-SSP) is a revolutionary high-throughput sample introductory system for MS that allows for fast sample introduction and real-time monitoring. Liquid flows upwards between two open-ended concentric tubes until it reaches the end, where due to the liquid's surface tension, a liquid dome is formed, which is then drawn into the central tube that leads to the MS. Anything placed into the liquid dome is delivered to the MS within seconds. The LMJ-SSP was used to distinguish neoplastic tissue from non-neoplastic parenchyma rapidly. The technology was non-destructive and automated, enabling perioperative applications superior to existing destructive or time-consuming MS acquisition.