

Ionization method development

The objective of the project is to develop novel ionization methods for the in-situ, preferably in-vivo mass spectrometric analysis of biological tissues. Our strategy is to utilize already existing surgical dissection technology as a basis for ionization. Since most of instrumental dissection methods (ranging from electrosurgery to ultrasonic surgery) are based on rapid disintegration of tissue, these processes always involve some degree of gaseous ion formation. First member of these ionization methods, which utilize electrosurgical instrumentation for ionization, was termed Rapid Evaporative Ionization Mass Spectrometry (REIMS), implicating the underlying mechanism of ionization. These ionization methods are analogous to sonic spray or thermospray (off-filament) ionization and readily produce gaseous ions from tissues. Due to droplet-based mechanisms of these methods, the produced ions belong predominantly to various lipid constituents, especially to phospholipids. Since these ionization methods cannot apply any static DC potential onto sample (for safety reasons) they yield positive and negative ions in a parallel fashion. We develop analogous laboratory instrumentation for the investigation of ion formation processes, and also for mass spectrometric imaging.

