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# Emerging biomedical applications of miniature mass spectrometry

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The meticulous, careful study of minute compounds in both simple and complex mixtures has traditionally relied on conventional mass spectrometry (MS); however, MS technology can be bulky and present a substantial learning curve for new operators. Miniature mass spectrometers, however, have provided an alternative, especially for biomedical applications.



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Physicians using portable MS instruments can obtain rapid disease-specific results, such as during surgery, allowing for quicker and more high-quality patient care. Research on miniature mass

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spectrometers have made way for more efficient miniaturized MS tools, some of which will be presented at this year's Pittcon Conference, March 5-9, Chicago.

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Benchtop MS instruments have been condensed and made practical for use at the bedside, and some miniature mass spectrometers have been developed for handheld use in the clinical and laboratory setting. Driving the further development of miniature MS has useful applicability in other fields, like firefighting and food safety inspections.

Miniaturizing the size of spectrometers has its limitations, however, since these tools can hinder MS performance in some cases. The vacuum, for example, is one of the biggest challenges for MS miniaturization due to its naturally large size and weight.

## Miniature MS in surgery

Surgery has been a growing realm for exploring the uses of miniature mass spectrometers, particularly in oncology-related procedures. Research has also shown that miniature MS can also be helpful for guidance in surgical resection, a common curative method for patients with pancreatic cancer.

A Purdue University and Brigham and Women's Hospital study led by Robert Graham Cooks, a featured speaker at Pittcon 2017, reports that desorption electrospray ionization (DESI) can be a helpful ionization technique in miniature MS during brain surgery. DESI works by creating molecular maps-to-tissue sections, allowing for the identification of disease state within tested tissue without requiring large sample sizes.

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## Ionization methods in miniature MS

DESI can be tested directly on biological tissue. Additionally, charge droplets are utilized for ionizing analyte molecules in a small sample during DESI. High DC voltage electrospray and sheath gas are also used to produce a high-

velocity-charged droplet. This tool tested brain tissue to determine the grade and type of cancer in brain surgery patients.

Essentially, using tools like these could be helpful for guiding surgical decisions, such as deciding when to remove diseased tissue. DESI has been used in miniature MS for real-time diagnosis of pancreatic cancer.

Paper spray (PS) ionization, another ionization technique commonly used in MS and miniature MS for highly complex structures to be discussed by Larry Warfield at Pittcon 2017, uses electrospray to generate ions to a paper substrate.

Paper is a decent material for sample storage in PS and is commonly used for chromatographic separation. PS is a simplified, speedy technique that is appealing to researchers who have small samples and who need a quick, effective method for drug monitoring.

Low-temperature plasma (LTP) ionization is another ionization method used in mass spectrometry that has been used to analyze ingredients in seed oils, identify agrochemicals, and detect explosives on surfaces. LTP is an ambient ionization technique, using active species that are generated in a low-power plasma.

Doing this, researchers desorb and ionize analytes in untreated samples. Various elements, including nitrogen, argon, and helium, are transferred through an alternating electric field, and a device extracts the plasma species out of a discharge region to sample compounds.

Daniel Austin, a researcher at Brigham Young University and speaker at Pittcon 2017, has led the way in miniature MS studies. His research has demonstrated the continual advancement of miniature MS in all aspects of the life sciences. Austin has produced mass analyzers as well as miniaturized ion traps using lithographically patterned plates.

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[Click here to read "Miniature Mass Spectrometry Instruments for Biomedical Applications" from Pittcon](#)

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# The future of MS

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The future applications of miniature MS

continue to be explored, and many researchers give hints into its many prevalent uses in the biomedical field. Chemical analysis in pharmaceuticals, forensics applications, agrochemical evaluation, and surgical guidance are a few of the most common avenues through which miniature MS will be applied more frequently. Physicians and non-professionals will also be more likely to utilize miniature MS technology as a quick, cost-effective solution for patient analysis.

Portable, handheld MS may even gain a greater foothold in everyday medical practice and research. J. Michael Ramsey of the University of North Carolina (UNC) at Chapel Hill will be discussing handheld analyzers in his talk at Pittcon 2017. His session will include the exploration of portable MS technology for the quantification of low-concentrated compounds in low- and high-pressure conditions. His additional Pittcon 2017 talk will also discuss the use of miniature MS tools in electrophoresis applications and the recent developments in miniaturizing ion trap MS systems.

Even the United States space program has seen rising interest in the use of miniature MS; the study of planetary atmospheres and their composition represent one of the many areas of research where miniature mass spectrometers can be used. In fact, previous studies have shown the successful deployment of miniature MS instruments on the Mars Viking Lander. The study of human breath in space to evaluate the effects of microgravity on respiratory function in humans is a potential example of where miniature MS can be used in the near future.

Portability, ease-of-use, and high-sensitive analysis represent a few of the many reasons why miniature MS tools are becoming more mainstream in research and everyday scientific applications. At Pittcon 2017, speakers from every spectrum of MS research will be presenting their data on the newest MS tools, miniaturization methods, and the research regarding MS analysis.

Also, companies like Hamamatsu, Thermo Fisher Scientific, and Bruker will be onsite at the expo to demonstrate the latest

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miniature mass spectrometers to attendees. To read more about miniature MS and to learn more about Pittcon 2017, its 150+ sessions, and how you can attend, click here to download the Miniature Mass Spectrometry Instruments for Biomedical Applications eBook from Pittcon.org.

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## References:

- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4121790/>
- <http://scholarsarchive.byu.edu/cgi/viewcontent.cgi?article=3775&context=etd>
- <http://pubs.acs.org/doi/abs/10.1021/acs.analchem.5b03070?journalCode=ancham>
- <http://www.sciencedirect.com/science/article/pii/S1044030501002495>

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**Pittcon**



**Address**

300 Penn Center Boulevard, Suite 332  
Pittsburgh  
PA, 15235-5503  
United States

**Phone:** 1 800-825-3221

**Email:** info@pittcon.org



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