

# Mass Media

JEOL

Mass Spectrometry News

July 2000



## JEOL Electron Monochromator in the News

The JEOL USA, Inc. electron monochromator was featured in a full-page article in the News section of the June 1, 2000 issue of *Analytical Chemistry* ("Science")<sup>1</sup>. An article published in the same issue attracted the attention of the editor, James Riordan, who recognized the potential value of the electron monochromator as an alternative to conventional gas-moderated electron-capture negative ionization (ECNI). The article<sup>2</sup> that attracted his attention was published by researchers at the Colorado School of Mines, the U. S. Army, and JEOL USA, Inc. It describes the application of the electron monochromator to the analysis of whole bacteria and bacterial spores.

## A New Class of Lipid Antigens Identified with a Little Help from the MStation

Researchers from Harvard Medical School, Boston University School of Medicine, and the Medical School at the University of Newcastle Upon Tyne (UK) have reported the discovery of a new class of T-cell antigens<sup>3</sup> in the journal *Nature*. Two previously unknown antigens were recognized by a CD1c-restricted, mycobacteria-specific T-cell line and their structures were identified by using mass spectrometry.

Antigens from *Mycobacterium avium* and *Mycobacterium tuberculosis* were isolated by Prof. D. B. Moody and associates at Harvard and analyzed by Dr. D. C. Young and Prof. C. Costello using negative-ion electrospray ionization on both a triple quadrupole mass spectrometer at Boston University and the JEOL *MStation* double-focusing high-resolution magnetic sector mass spectrometer in the JEOL USA, Inc. laboratory in Peabody, MA.

The triple quadrupole CID data suggested a hexosyl-1-phospholipid with a C<sub>32</sub>H<sub>65</sub> alkyl group on undetermined structure. High-energy linked-scan CID mass spectra obtained on the *MStation* provided detailed fragmentation patterns that were used to identify isoprenoid structures in the alkyl portions of both antigens and to confirm the assignment of the phosphate at the hexose C<sub>1</sub>. Exact-mass measurements obtained with the *MStation* confirmed the elemental composition of the [M-H]<sup>-</sup> species from the *M. avium* antigen as C<sub>36</sub>H<sub>72</sub>O<sub>9</sub>P (measured m/z 679.4911, a deviation of 0.0003 u), and the [M-H]<sup>-</sup> species from the *M. tuberculosis* antigen as C<sub>38</sub>H<sub>76</sub>O<sub>9</sub>P (measured m/z 707.5223, a deviation of 0.0004 u).

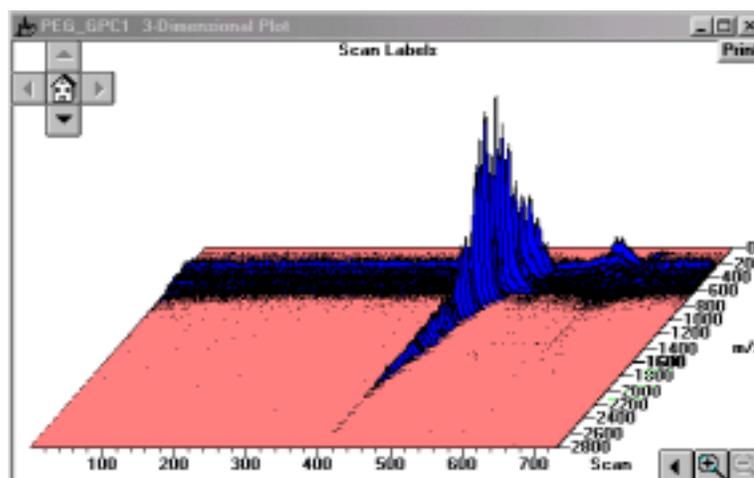
JEOL was pleased to be able to assist in this important effort.

# Other News

## Gel-permeation Chromatography Coupled with Electrospray Ionization MS on the *LCmate*

The vast majority of LC/MS applications that have been reported using electrospray ionization (ESI) have utilized reverse-phase HPLC. However, other forms of chromatography can also be coupled with ESI. Gel-permeation chromatography, a form of size-exclusion chromatography widely used in polymer and oligomer analysis, can be readily coupled with electrospray ionization mass spectrometry<sup>4</sup>.

The *LCmate* was recently used for the analysis of proprietary industrial materials by GPC/MS. An Agilent 1100 liquid chromatograph was used to supply the solvent (THF containing ~10 mM NaI) at a flow rate of 0.87 ml/min. *Waters Styragel™ HR 0.5, HR 1, and HR 2* GPC columns were connected in series<sup>5</sup> and the output was connected without splitting to the JEOL *LCmate* ESI source. To check performance, a poly(ethylene oxide) mixture was injected on-column. Although the individual oligomers were not resolved in the total ion current chromatogram(TIC), the individual mass chromatograms were well separated. The 3D display of the mass chromatograms is particularly striking because components are chromatographically sorted in order of decreasing mass prior to analysis by mass spectrometry.



*Three-dimensional mass chromatogram display for GPC/MS Analysis of a PEG Mixture*

### References

1. "Adding dimensions to MS with electron monochromators", *Anal. Chem.* June 1, 2000, p. 390A
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3. "CD1c-Mediated T-cell recognition of isoprenoid glycolipids in *Mycobacterium tuberculosis* infection", Moody, D. B.; Ulrichs, T.; Mühlecker, W.; Young, D. C.; Gurcha, S. S.; Grant, E.; Rosat, J.-P.; Brenner, M. B.; Costello, C. E.; Besra, G. S.; Porcelli, S. A. *Nature* **404** (2000) 884-888.
4. "Electrospray Ionization Mass Spectrometry Coupled with Size-exclusion Chromatography", Prokai, L.; Simonsick, W. J., Jr. *Rapid. Commun. Mass Spectrom.* **7** (1993) 853-856.
5. JEOL USA, Inc. would like to thank Brian Hautman of Borden Chemicals, Inc. for the loan of the GPC columns and advice on chromatographic conditions.

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JEOL USA, Inc.  
11 Dearborn Road  
Peabody, MA 01960  
Tel: 978-535-5900 Fax: 978-536-2205  
Email: ms@jeol.com www.jeol.com