Clinical Chemistry

MALDI-TOF Mass Spectrometry: Transformative Proteomics for Clinical Microbiology

Article:
R.Patel.
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Guest:
Dr. Robin Patel is Professor of Medicine and Professor of Microbiology, and Chair of the Division of Clinical Microbiology at the Mayo Clinic in Rochester, Minnesota.

Bob Barrett: This is the podcast from *Clinical Chemistry.* I am Bob Barrett.

Mass spectrometry has revolutionized many areas of clinical chemistry, but this technology is not just limited to chemistry. Introduction of MALDI-TOF mass spectrometry into the clinical microbiology laboratory has markedly altered workflow allowing bacterial and fungal colonies to be accurately, rapidly, and inexpensively identified.

In the February 2013 issue of *Clinical Chemistry,* Dr. Robin Patel published a perspective article on how mass spectrometry is transforming clinical microbiology.

Dr. Patel is Professor of both Medicine and of Microbiology and Chair of the Division of Clinical Microbiology at the Mayo Clinic in Rochester, Minnesota. She is our guest in this podcast.

Dr. Patel, what are the implications of mass spectrometry for today's clinical microbiology laboratory?

Dr. Robin Patel: Traditional identification of bacteria involves examination of colony characteristics, staining, and conducting biochemical tests. Use of manual biochemical assays such as catalase and oxidase provides a rapid turnaround time, but identifies a limited number of organism type.

Automated phenotypic systems identify a broader range of organisms, but suffer from prolonged turnaround time and relatively expensive consumables.

Furthermore, the user often requires a priori knowledge of the organism type been tested, such as that an organism is a gram-negative bacilli.

Introduction of MALDI-TOF mass spectrometry into the clinical microbiology laboratory allows bacterial and fungal

colonies to be accurately, rapidly, and inexpensively identified, without a priori knowledge of organism type.

Bob Barrett: Well that's the positive side but are there limitations to this technology?

Dr. Robin Patel: Yes, one limitation of this technology is that it does not provide antimicrobial susceptibility result. Strategies are in development, but struggle with the lack of comprehensive susceptibility results and require different testing and analysis methods than those used for bacterial identification.

Also the technology does not, with rare exception, apply to direct testing of clinical specimen. Organisms must first be grown in culture.

Bob Barrett: So what's the bottom line, Doctor? Is this something that all clinical microbiology laboratories should adopt?

Dr. Robin Patel: In my opinion MALDI-TOF mass spectrometry is a quantum leap forward for identification of cultured bacteria and fungi in the clinical microbiology laboratory. Rapid and accurate identification of bacteria and fungi using MALDI-TOF mass spectrometry is incontrovertibly beneficial to clinical laboratory and lower expenses, approximately 25 cents in supplies and reagents per isolate tested--several folds lower than traditional automated biochemical based identification--are advantageous to the laboratory as well as to patients.

Bob Barrett: Are there other types of mass spectrometry used in the clinical microbiology laboratory?

Dr. Robin Patel: Yes, one example with which we are actively working is polymerase chain reaction, or PCR, electrospray ionization mass spectrometry, which is used to measure the base composition of DNA amplified using PCR. Because this technology involves upfront PCR testing, it has the sensitivity needed for direct testing of patient specimens. This technology is however completely different than MALDI-TOF mass spectrometry.

Bob Barrett: Is there anything new you can tell us beyond what you've had published?

Dr. Robin Patel: We have a manuscript under review showing that this technology can be used to identify anaerobic bacteria. This is an advance, because in recent years in my laboratory, for example, most anaerobic bacteria have been identified using 16S ribosomal RNA gene sequencing. MALDI-TOF mass spectrometry is faster and cheaper than sequencing.

Bob Barrett: Well, finally Doctor, let's look ahead. Where is the field of the clinical microbiology laboratory headed?

Dr. Robin Patel: Clinical microbiology is in the midst of a revolution. Today we have relatively mature molecular diagnostics, many of which are evolving to panel molecular testing. Now we have MALDI-TOF mass spectrometry. In the future I anticipate increased automation as well as increased focus on clinical usefulness and cost-effectiveness of diagnostics.

Bob Barrett: Dr. Robin Patel is Professor of Medicine and Professor of Microbiology, and Chair of the Division of Clinical Microbiology at the Mayo Clinic in Rochester, Minnesota. She's been our guest in this podcast from *Clinical Chemistry.*

I am Bob Barrett, thanks for listening.