The Clinical Microbiology Lab of the Future

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Ohio POC Webinar: March 14, 2024

Host: Pat Carl, MLS, (ASCP)CM

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TXST NEXT

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Watch my TEDx Video

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Disclosures

Dr. Rohde is University Distinguished Regents' Professor and Chair, MLS Program, Texas State University and has no disclosures or conflicts.

Technology, equipment, and assays are only used for education and are not an endorsement.

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Overview

The current landscape for clinical microbiology is rapidly changing. Where are we now? Where are we headed? What are the possibilities?

In this webinar, I will discuss the current working clinical microbiology environment within the medical laboratory science and public health laboratory. Within this discussion, the role of the clinical microbiology laboratory in stewardship, as well as future opportunities and new advances [technology / methodology / personnel requirements] will be shared.

Agenda

Where are we now? Where are we headed? What are the possibilities?

Current landscape of medical laboratory science - Microbiology

The role of the clinical microbiology laboratory in stewardship

Future opportunities and new advances

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Learning Objectives

After completing this webinar, the participant will be able to:

1. Describe the current clinical microbiology environment, within the medical laboratory and public health laboratory, of the 21st century.

2. Define the role of the clinical microbiology in overall medical laboratory stewardship.

3. List and define the future opportunities and advances in technology, methodology, and personnel requirements.

Current State of Microbiology

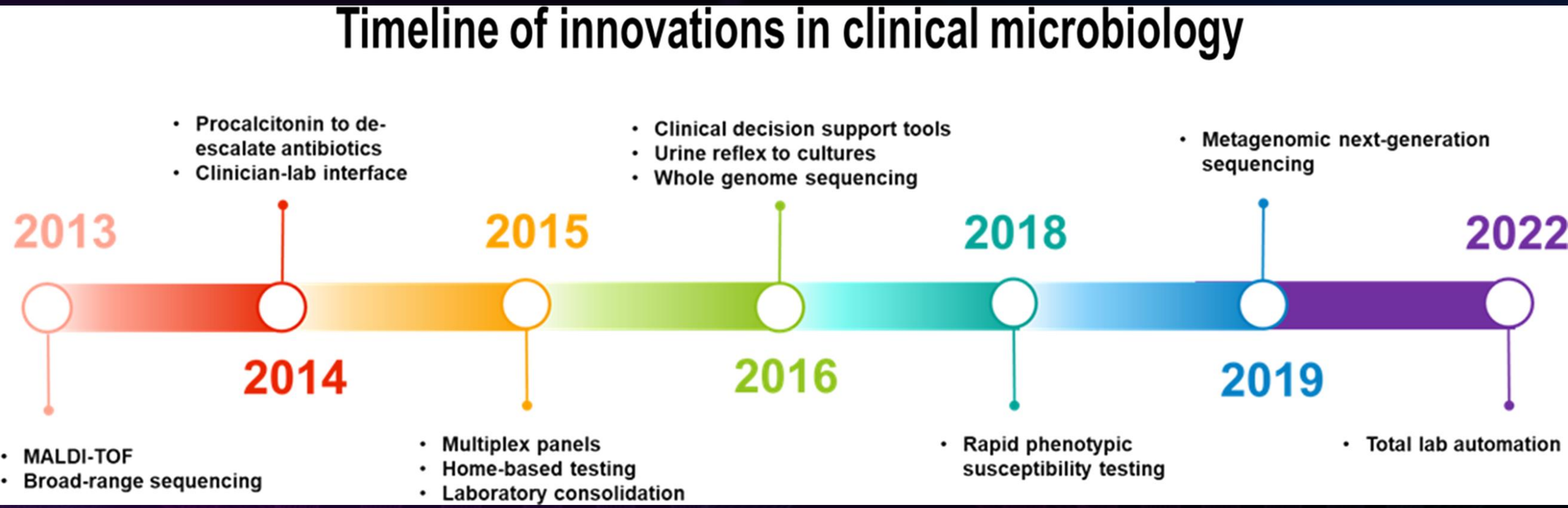


Figure 1. Timeline demonstrating the top innovations over the last 10 years. Though some technologies were developed prior to 2013, these dates reflect their emergence in mainstream clinical microbiology.

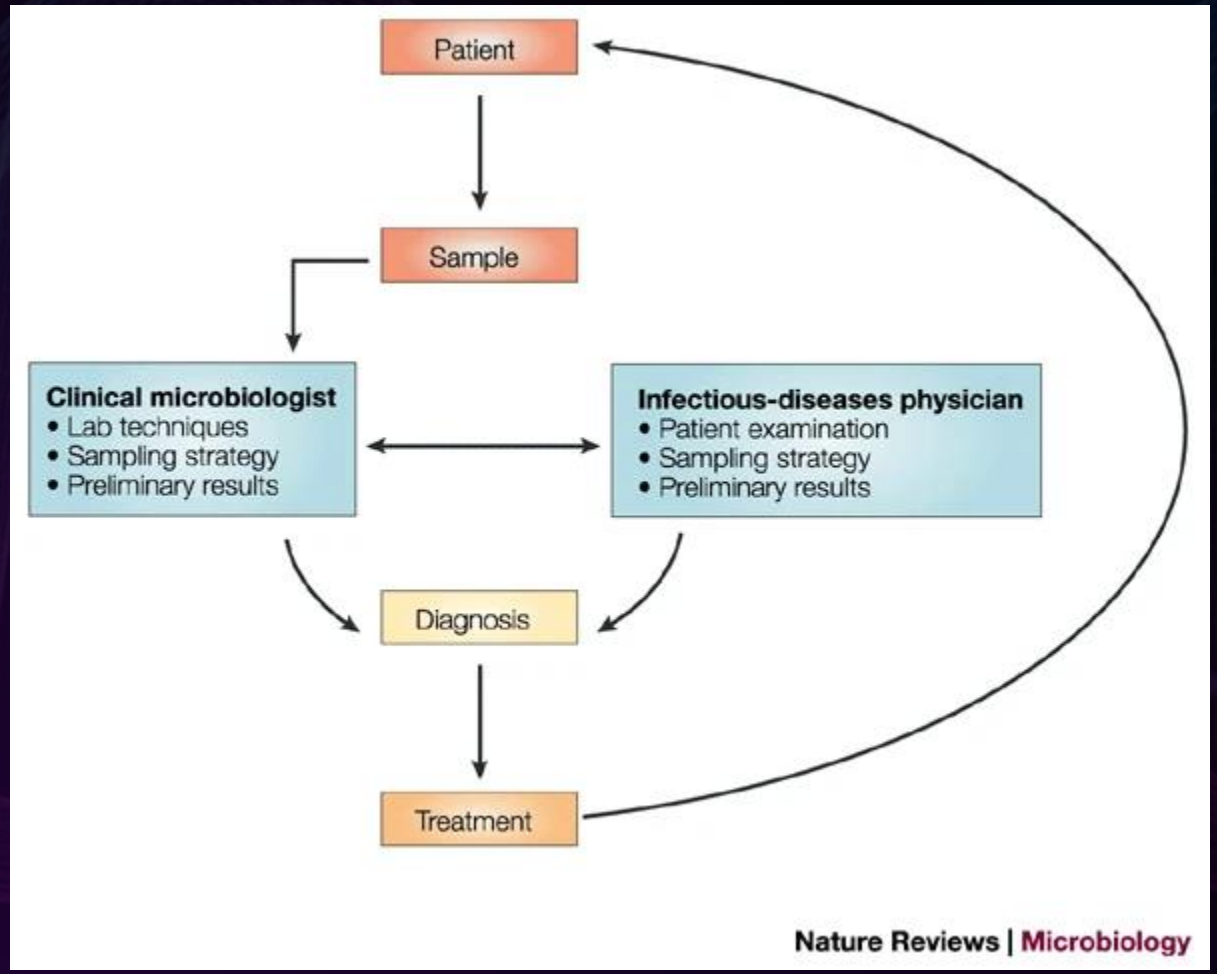
A decade of clinical microbiology: top 10 advances in 10 years: what every infection preventionist and antimicrobial steward should know. Antimicrobial Stewardship & Healthcare Epidemiology, Volume 4, Issue 1. Jan 25, 2024.

Table 1. Overview of the top ten innovations in clinical microbiology over the past decade, highlighting their applications, key benefits, and associated challenges

	Innovation area	Applications	Key benefits	Challenges/Limitations
Preanalytic	Clinical decision support tools	Best-practice alerts Guidelines and algorithms Indication selection using guided test ordering Change in order sets	Drive appropriate test selection Prevent overutilization of tests in low-impact situations	Decreased testing when actually indicated Alert fatigue leading to clinicians overriding alerts Provider and IT pushback
	Host Pathogen Response	Inflammatory markers (Procalcitonin) Urinalysis Reflex to Culture	Antibiotic discontinuation Diagnostic stewardship	Specificity and Reproducibility Utilization management Integration with microbiology
Analytic	Sequencing	Broad range PCR, targeted NGS Metagenomic sequencing Whole genome sequencing	Identification of organisms directly from clinical specimens, even when culture negative High species level resolution for organism identification Determine strain relatedness for epidemiological purposes	Sensitivity and specificity dependent on preanalytic factors Results can be difficult to interpret when commensal organisms or contaminants are identified Unknown how to report and act upon WGS data in real-time Does not provide phenotypic susceptibility data
	Multiplex panels	Syndromic-based testing	Antibiotic stewardship Avoid decision fatigue	Positive results not always clinically relevant Expense
	Rapid susceptibility testing	Novel methods of rapid susceptibility testing	Guides early selection and use of optimal antibiotics	Requires adjudication of discrepancies between rapid AST and finalized traditional AST results
	MALDI TOF MS	Bacterial, fungal identification from isolates	Improved accuracy Shorter turnaround time	Capital costs Over-reporting
	Home testing	Rapid home-based antigen tests	Convenience Privacy Access	Test performance and result interpretation Potential cost per test Quality control of the testing components Linkage to care and inclusion in the EMR Tracking of any results that are of concern for public health
Post analytic	Clinician-lab interface	Framing Cascade reporting Selective reporting Result review and feedback	Guides appropriate decision-making following test results Automates stewardship interventions and education	Limiting clinician's input leading to missed diagnosis
Other	Laboratory consolidation	Acquisition by commercial laboratories Centralized/localized testing within a health system Total laboratory automation	Increased cost savings and efficiency Concentration of resources/expertise/technology within a network to provide access to highest quality across the system Uniform adherence to stewardship best practices and guidelines	Increased turnaround time for results to remote sites Logistical challenges, such as specimen stability Risk for financial considerations to drive decisions at the expense of patient safety or quality

A decade of clinical microbiology: top 10 advances in 10 years: what every infection preventionist and antimicrobial steward should know. Antimicrobial Stewardship & Healthcare Epidemiology, Volume 4, Issue 1. Jan 25, 2024.

Current State of Microbiology



https://www.nature.com/articles/nrmicro820

Current State of Microbiology

- Workforce shortages / staffing issues – impacting all areas of the medical laboratory
  - Great Resignation
  - Quiet Quitting
- Consolidation of microbiology and blood banking
- Clinical placement issue for academic programs

Peter Gilligan &
Rodney E. Rohde

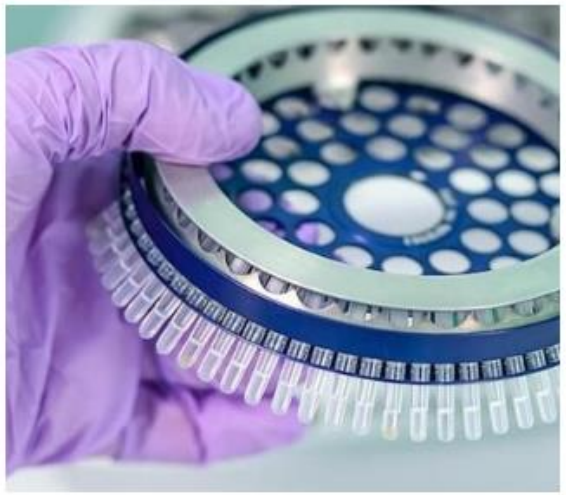
The Clinical Microbiology Lab of the Future
https://asm.org/Articles/2021/November/Clinical-and-Public-Health-Laboratories-Need-You

AMERICAN SOCIETY FOR MICROBIOLOGY

Clinical and Public Health Laboratories Need You

Nov. 9, 2021 SHARE THIS

During the fourth surge in the COVID-19 pandemic, it has been widely reported that moral injury to health care workers was a key factor in a wave of early retirements. Even before the pandemic, demographic shifts, due in large measure to retirements among baby boomers, resulted in significant vacancy rates in clinical and public health laboratories. This problem has only grown worse during the pandemic. A survey of medical microbiology laboratory directors who are members of ClinMicroNet, conducted in mid-Oct. 2021, showed that out of 515 clinical microbiology positions, 75 (or 15%) were currently vacant. More disturbing was the revelation that 56 of those 75 positions had been vacant for more than 60 days, placing great strain on laboratory staff in many health care systems. In several of those labs, all vacant positions remained unfilled even after 60 days.



Clinical Laboratory Professional Holding PCR Tubes
Source: https://www.pxfuel.com/en/free-photo-qhmlp

Understaffing places a significant burden on the laboratory personnel who are retained. The attention to detail that is required to perform complex tasks for long (seemingly

Related Content

The Changing Needs of the Public Health Lab

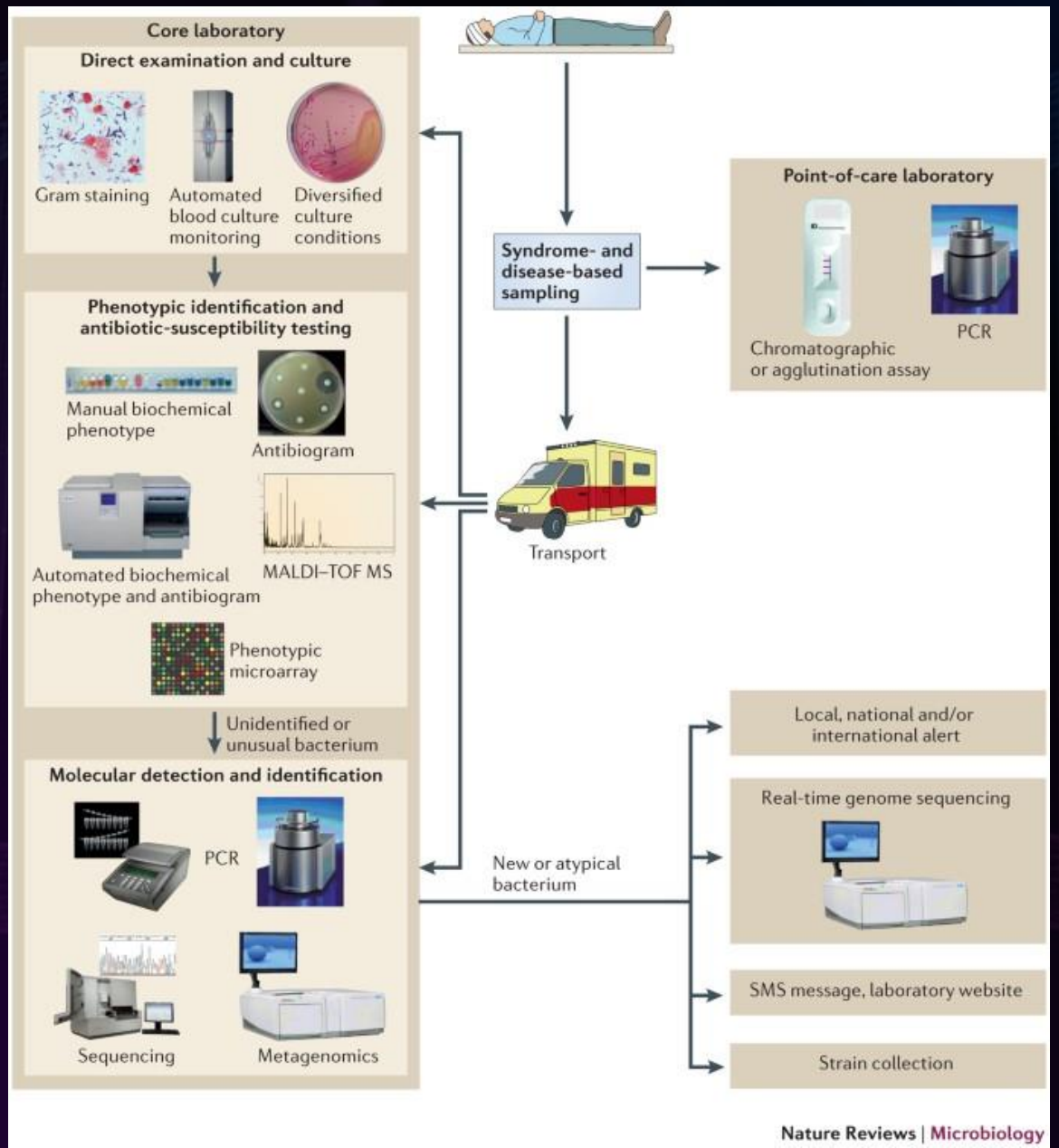
Communicating in a Clinical or Public Health Micro Lab

Clinical and Public Health Microbiology Mentors

Current State of Microbiology

- Typical sampling / culture
- Phenotypic identification / Antibiotic susceptibility
- Molecular detection & identification
- Point of Care [POC]
- Need for Reference Expertise / Send outs

Current State of Microbiology



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https://www.nature.com/articles/nrmicro3068

Current State of Microbiology

- Automation ongoing
- Widespread use of NGS in clinical microbiology
  - Metagenomics on the rise / impact
- Big data in clinical microbiology [AI, expertise in bioinformatics, etc.]
- Promoting investment in the clinical laboratory [often considered a cost-center]

Diagnostic Management Teams
Led by a DCLS or PhD microbiologist

Using Laboratory Medicine to Support Direct Patient Care

Oct. 4, 2021 SHARE THIS

AMERICAN SOCIETY FOR MICROBIOLOGY

Laboratory testing has evolved considerably over the centuries, particularly in the last few decades, with advancements of substantially complex laboratory methodologies and sophisticated instrumentation interfaced with computers and laboratory information systems. As laboratory services have expanded, so too has the need to improve patient care. Evidence-based and patient-centered care requires more direct patient contact by laboratory professionals with front line roles in healthcare teams consisting of physicians, nurses, pharmacists and other healthcare professionals.

Laboratory Medicine in the 21st Century

In ancient times, laboratory testing was performed directly by the patient's physician, most often by examining the most available body fluid: urine. Uroscopy was the examination of the patient's urine sample in a bladder shaped flask compared to a urine chart. This also involved tasting for sweetness to determine glucose content. Today, more than 13 billion tests on various specimen types (blood, urine, other body fluids, tissue samples) are performed in the U.S. each year, with approximately two-thirds of all medical decisions directly or indirectly affected by laboratory testing. Medical laboratory professionals perform complex techniques and manage highly sophisticated laboratory automation and state of the art instrumentation.

Medical laboratory technicians (MLT) hold a 2-year associate degree in medical laboratory science or a related field. Medical laboratory scientists (MLS), also referred to as clinical laboratory scientists (CLS) and previously referred to as medical technologists (MT), hold a Bachelor of Science (BS) in medical laboratory science or related science. Most medical laboratory science curriculum

Dr. Rodney E. Rohde discusses a morphological and specific staining reaction of a bacterial species with

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https://asm.org/Articles/2021/October/Using-Laboratory-Medicine-to-Support-Direct-Patien

Current State of Microbiology

- Rapid susceptibility testing – What breakpoints is your lab using?
- Molecular diagnostics for fungal, viral, parasitic infections where appropriate versus culture
- Diagnostic stewardship, Choosing Wisely, etc.
- Impact of the DCLS on stewardship, patient quality and cost savings

Current State of Microbiology

Preventing diagnostic errors by uniting the clinical laboratory with direct patient care

Doctoral programs are preparing experts to lead diagnostic management teams at hospitals, with promising early results

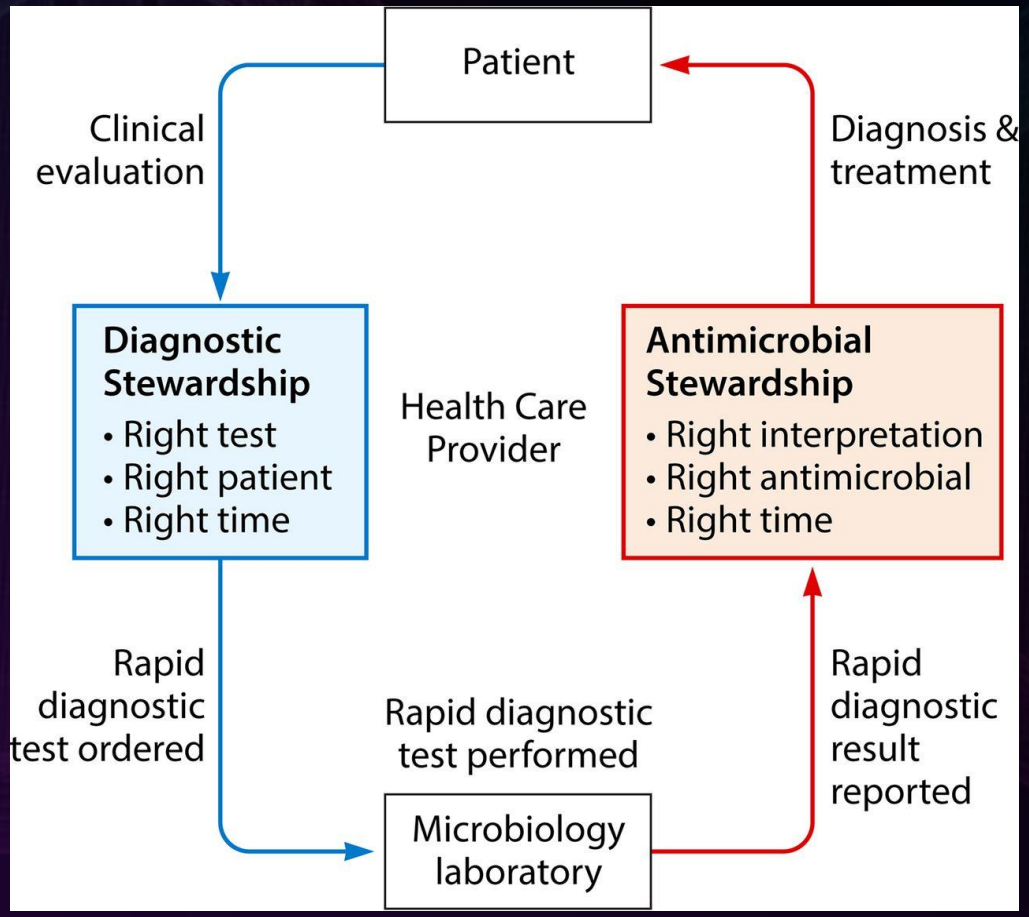
By Michael Laposata, MD, PhD, and Rodney E. Rohde, PhD April 18, 2019 12 mins

Elsevier Connect

Dr. Brandy Gunsolus, who leads the Diagnostic Management Team at Augusta University Medical Center in Georgia, reviews a complicated fluorescence scope pattern with Jennifer Pine, a medical laboratory scientist in immunology. (Photo by Isaac Green)

The Clinical Microbiology Lab of the Future
https://www.elsevier.com/connect/preventing-diagnostic-errors-by-uniting-the-clinical-laboratory-with-direct-patient-care

The Future is NOW - Antimicrobial and Diagnostic Stewardship



J Clin Microbiol. 2017 Mar; 55(3): 715–723.

Microbiologists and Diagnostic Stewardship

Table. Steps at Which Diagnostic Stewardship May Improve Testing for Common Infectious Disease Tests

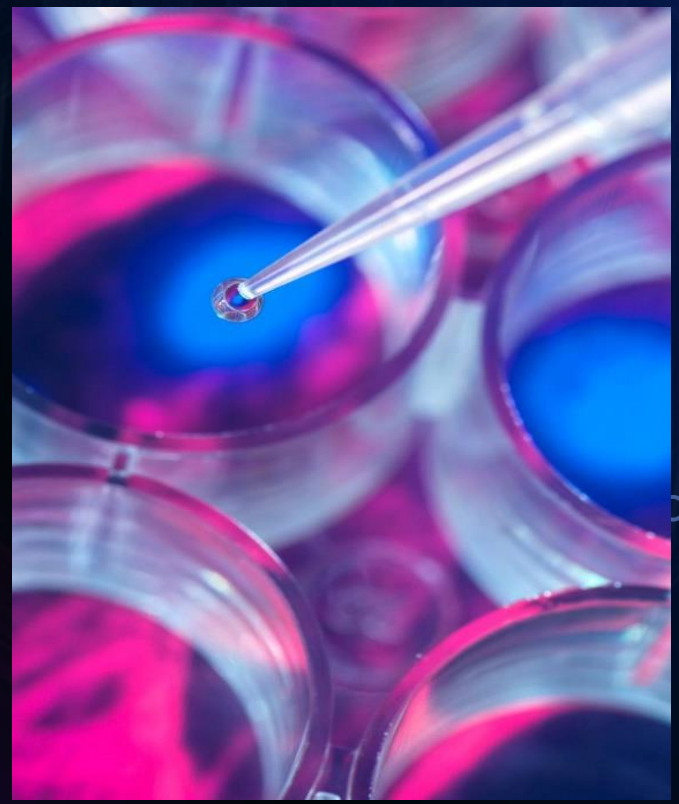
	Ordering (Preanalytic)	Collection (Preanalytic)	Processing (Analytic)	Reporting (Postanalytic)
General principles	Test only if clinical presentation is consistent with the infectious etiology (high pretest probability)	Pay attention to sample collection and transport, to optimize yield and reduce contamination	Use adjunctive laboratory tests to distinguish colonization from infection	Report results in a format that guides appropriate practice
Urine cultures	Test only when symptoms suggest urinary tract infection or, if asymptomatic, concordant with guidelines (eg, urologic surgery, pregnancy)	Use aseptic technique—midstream clean catch after periurethral cleansing Obtain catheter sample from collection port (not bag), prefer newly inserted catheter	Only perform urine culture if pyuria present	Text interpreting result, eg, "multiple organisms indicating likely contamination"; "no pyuria, culture not performed" Selective reporting of antibiotic susceptibilities—display preferred antibiotics only
Blood cultures	Test only when symptoms of infection present (fever) Avoid repeat cultures unless concern for persistent or endovascular infection	Use aseptic technique—prefer peripheral samples obtained by trained phlebotomists Avoid catheter draws	Consider rapid testing on initial positive results, eg, polymerase chain reaction, PNA-FISH, MALDI-TOF	Text interpreting result, eg, "likely skin contaminant"; "*Staphylococcus aureus*, likely pathogen consider infectious diseases consult" Selective reporting of antibiotic susceptibilities
***Clostridium difficile* testing**	Test only when disease likely (eg, recent antibiotic exposure, >3 loose stools/d, duration >24 h, and no recent laxative use) Avoid tests of cure	Only collect and send loose stool (ie, that conforms to the container)	Consider use of a testing algorithm that includes toxin immunoassay	Text interpreting result, eg, "toxin−/PCR+ indicating possible colonization rather than disease"
Molecular detection panels (ie, "syndromic testing")	Test only when pretest probability moderate to high for ≥2 targets on the panel, and when results will influence management	Use recommended collection and transport conditions to reduce contamination and optimize yield	Follow stringent contamination prevention guidance in the laboratory to avoid false-positive results	Selective suppression of results for tests on panel if other testing approach used in the laboratory (eg, *C difficile* testing on stool pathogen panel) Text interpreting results discussing colonization
Forms of automation	Clinical decision support requiring documentation of symptoms Hard stops for contraindications—eg, laxative use within 48 h of *C difficile* test)	Recording site and method of collection Orders requiring supplementary tests—eg, urinalysis before urine culture	Laboratory support systems performing cascades of tests	Prepopulated reports that can be reviewed and modified by laboratory personnel
Clinician education	Yes	No	No	Yes

Abbreviations: PNA-FISH, peptide nucleic acid–fluorescence in situ hybridization; MALDI-TOF, matrix-assisted laser desorption/ionization time-of-flight.

J Clin Microbiol. 2017 Mar; 55(3): 715–723.

Interventions in the Pre-Analytic Period

Method	Example	
Optimize test utilization	Clinician education	Test menu auditing
LIS & clinical decision support	Benchmarking	Test utilization
Specimen acceptability	Stool for *C. difficile testing*	Gram stain screening for respiratory culture



May be achieved through test utilization and/or diagnostic stewardship committees,[1] laboratory procedural changes according to recommendations[2] and in collaboration with the stewardship team

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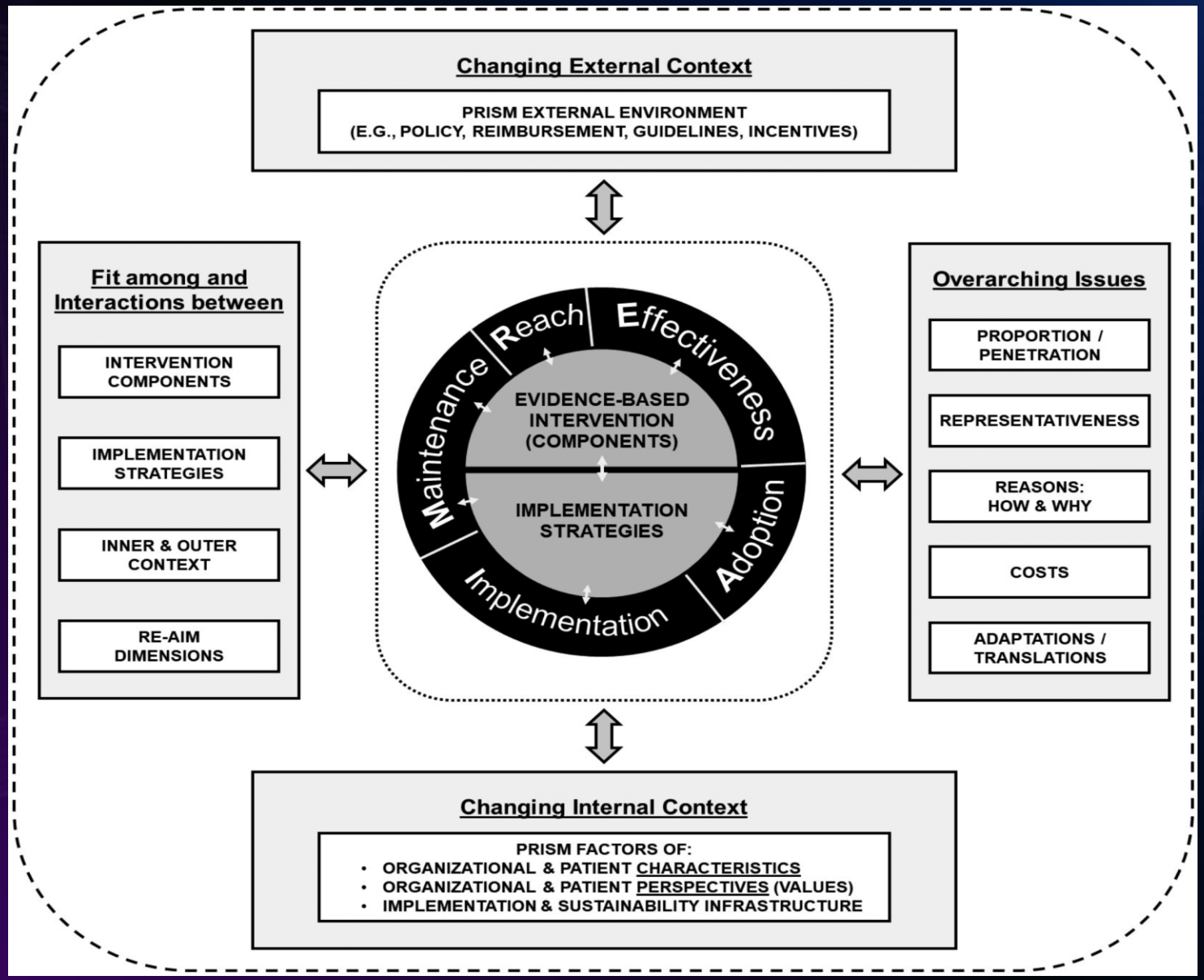
1. Am J Clin Pathol. 2014 May;141(5):718-23
2. Leber AL. Clinical microbiology procedures handbook. John Wiley & Sons; 2020.

Interventions in the Analytic Period

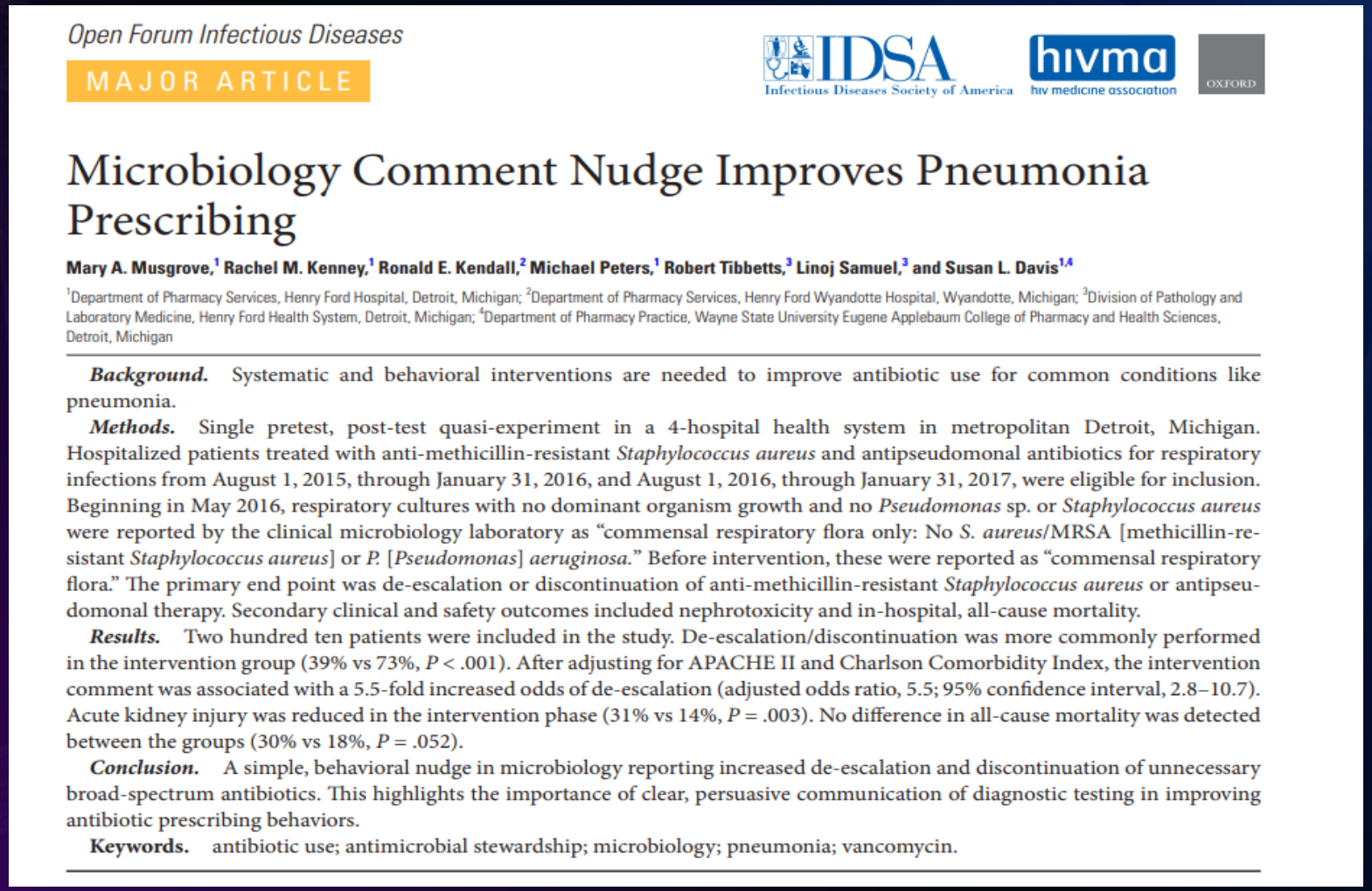
- Assess impact of test implementation, justify use, and support clinical outcomes research
- Consider a dissemination and implementation (D&I) approach!



The Clinical Microbiology Lab of the Future
J Clin Transl Sci. 2021; 5(1): e126.

Interventions in the Post-Analytic Period

- "Nudging"
- Retains clinician autonomy
- Has impact on clinician behavior
- Can be determined through collaboration between ID team and microbiology lab



Open Forum Infectious Diseases

MAJOR ARTICLE

Microbiology Comment Nudge Improves Pneumonia Prescribing

Mary A. Musgrove,[1] Rachel M. Kenney,[1] Ronald E. Kendall,[2] Michael Peters,[1] Robert Tibbetts,[3] Linoj Samuel,[3] and Susan L. Davis[1,4]

[1]Department of Pharmacy Services, Henry Ford Hospital, Detroit, Michigan; [2]Department of Pharmacy Services, Henry Ford Wyandotte Hospital, Wyandotte, Michigan; [3]Division of Pathology and Laboratory Medicine, Henry Ford Health System, Detroit, Michigan; [4]Department of Pharmacy Practice, Wayne State University Eugene Applebaum College of Pharmacy and Health Sciences, Detroit, Michigan

Background. Systematic and behavioral interventions are needed to improve antibiotic use for common conditions like pneumonia.

Methods. Single pretest, post-test quasi-experiment in a 4-hospital health system in metropolitan Detroit, Michigan. Hospitalized patients treated with anti-methicillin-resistant *Staphylococcus aureus* and antipseudomonal antibiotics for respiratory infections from August 1, 2015, through January 31, 2016, and August 1, 2016, through January 31, 2017, were eligible for inclusion. Beginning in May 2016, respiratory cultures with no dominant organism growth and no *Pseudomonas* sp. or *Staphylococcus aureus* were reported by the clinical microbiology laboratory as "commensal respiratory flora only: No *S. aureus*/MRSA [methicillin-resistant *Staphylococcus aureus*] or *P.* [*Pseudomonas*] *aeruginosa*." Before intervention, these were reported as "commensal respiratory flora." The primary end point was de-escalation or discontinuation of anti-methicillin-resistant *Staphylococcus aureus* or antipseudomonal therapy. Secondary clinical and safety outcomes included nephrotoxicity and in-hospital, all-cause mortality.

Results. Two hundred ten patients were included in the study. De-escalation/discontinuation was more commonly performed in the intervention group (39% vs 73%, $P < .001$). After adjusting for APACHE II and Charlson Comorbidity Index, the intervention comment was associated with a 5.5-fold increased odds of de-escalation (adjusted odds ratio, 5.5; 95% confidence interval, 2.8–10.7). Acute kidney injury was reduced in the intervention phase (31% vs 14%, $P = .003$). No difference in all-cause mortality was detected between the groups (30% vs 18%, $P = .052$).

Conclusion. A simple, behavioral nudge in microbiology reporting increased de-escalation and discontinuation of unnecessary broad-spectrum antibiotics. This highlights the importance of clear, persuasive communication of diagnostic testing in improving antibiotic prescribing behaviors.

Keywords. antibiotic use; antimicrobial stewardship; microbiology; pneumonia; vancomycin.

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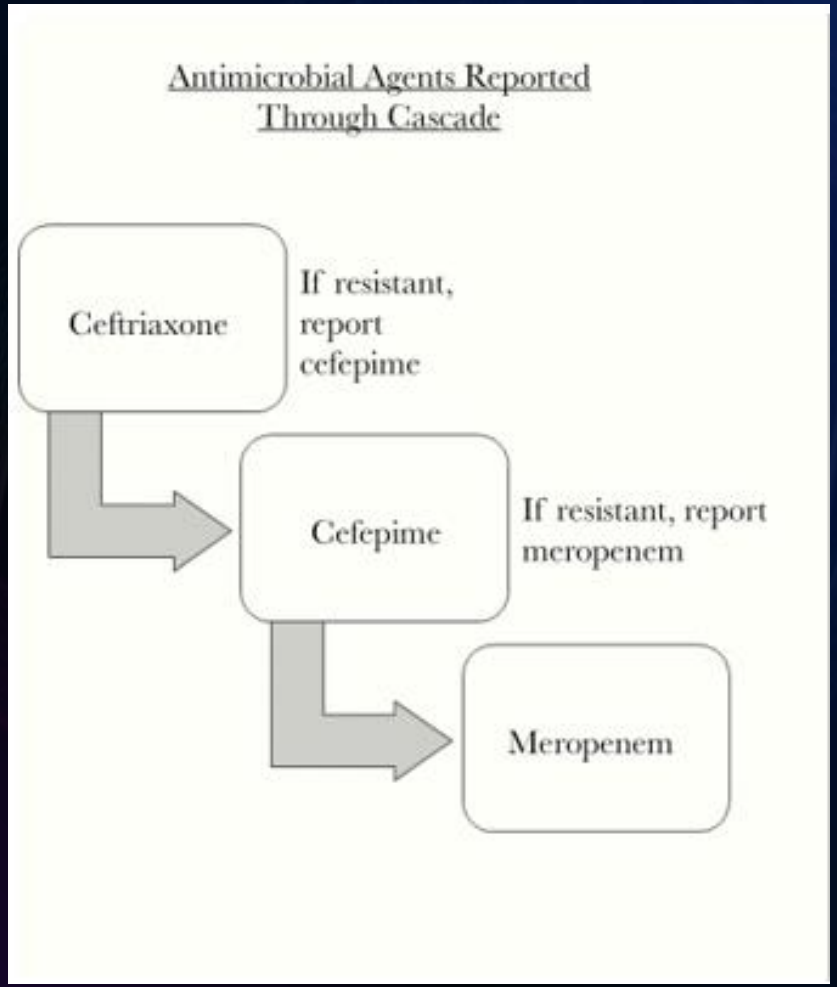
Open Forum Infect Dis. 2018 Jul; 5(7): ofy162. Published online 2018 Jul 10. doi: 10.1093/ofid/ofy162

Interventions in the Post-Analytic Period

University of Cinicinnati: Multidisciplinary AST committee: ID physicians, PharmDs, microbiologist

Pre/post cascade reporting intervention for *Escherichia* spp and *Klebsiella* spp

- Mean days of therapy (DOT) for cefepime decreased from 1.2 – 0.8 days
- Mean DOT of ceftriaxone increased from 0.864 days to 0.962 days
- No significant differences were detected in other antibiotics including ertapenem and meropenem
- Average LOS in the study population decreased from 14 days to approx. 11 days from baseline to post-cascade reporting



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Vissichelli NC. Infect Control Hosp Epidemiol. 2022 Feb;43(2):199-204

Interventions in the Post-Analytic Period

Accurate susceptibility testing: breakpoint updates

- Lab needs to understand clinical need and appropriateness
- Clinicians need to understand what the lab is using, what can be validated or verified, feasibility

Antibiogram

- Multidisciplinary team interpretation and revision needed
- Moehring et al (2015): Only 10% of labs were fully compliant with antibiogram recommendations (CLSI)

Infection Prevention Support

- ESBL and carbapenemase confirmation
- What is needed for epidemiology, what is needed for clinical care?

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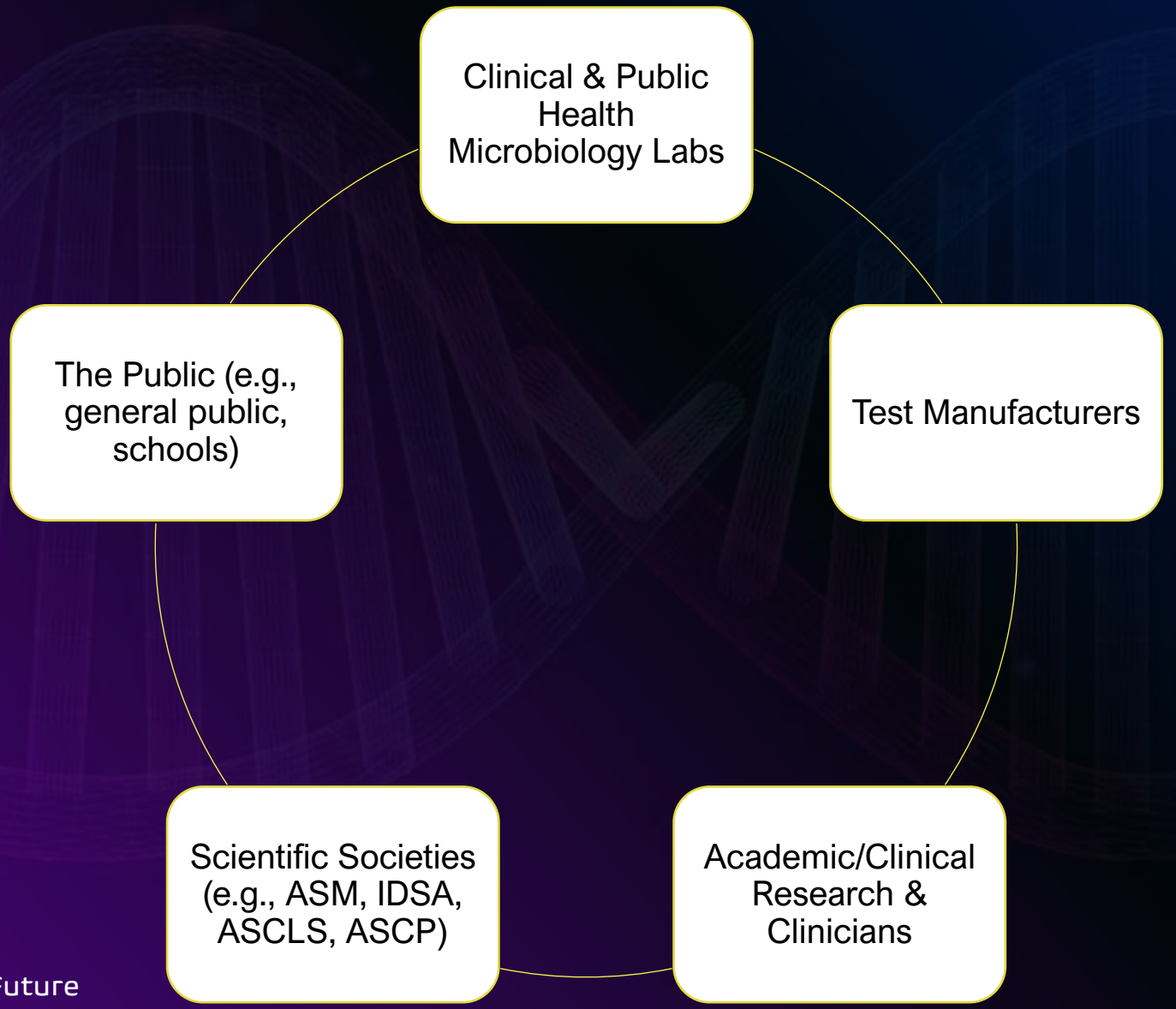
J Clin Microbiol. 2015 Sep; 53(9): 2977–2982

Communication Between Agencies

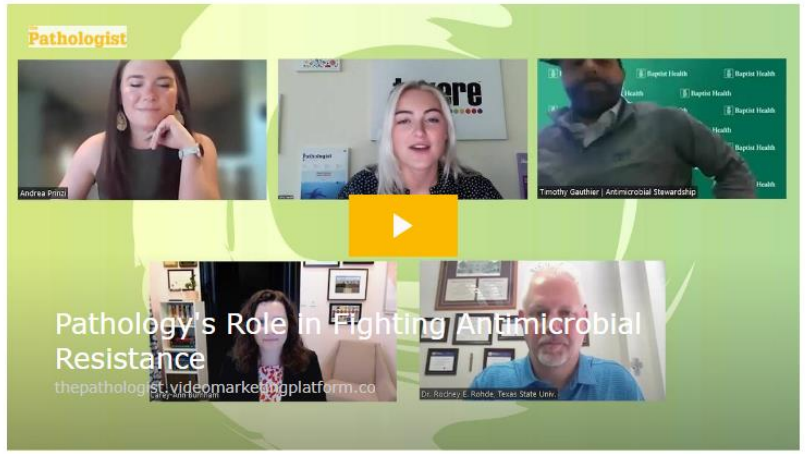


Science Communication: Our ROLE

Pathology's Role in Fighting Antimicrobial Resistance

A roundtable on the lab's role in fighting drug resistance featuring Carey-Ann Burnham, Rodney E. Rohde, Timothy Gauthier, and Andrea Prinzi

Liv Gaskill | 08/08/2022 | Discussion



TXST College of Health Professions
@txsthealth

Drug Resistant Fungal Infections Growing Worldwide - Dr. @RodneyRohde, TXST Regents' Professor and Chair of our Clinical Laboratory Science Program, discusses what a fungus is and why they are becoming more resistant to drugs. Check out the video:

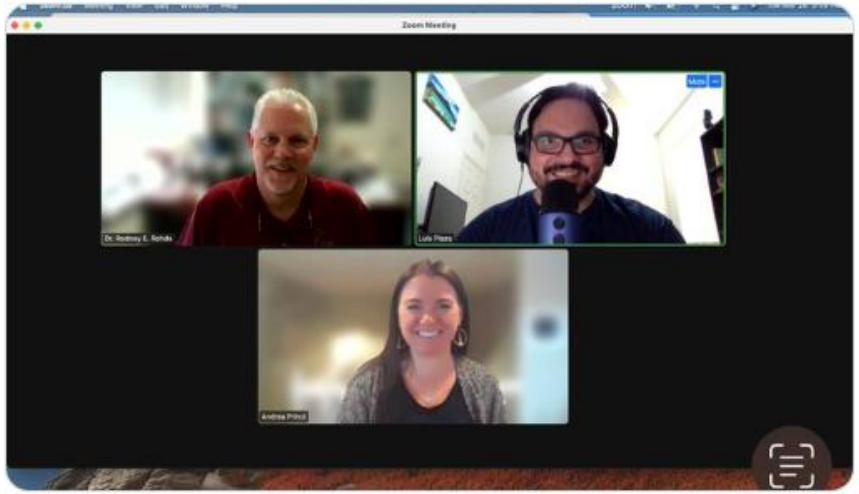
youtube.com
Drug Resistant Fungal Infections Growing Worldwide
Dr. Rodney Rohde, Texas State University's Clinical Laboratory Science Regents' Professor and Chair, ...

10:33 AM · Apr 4, 2023 · **399** Views

Letstalkmicro
@Letstalkmicro1

Always great talking to @RodneyRohde and @andreaprinzi . Stay tuned. Thank you both .

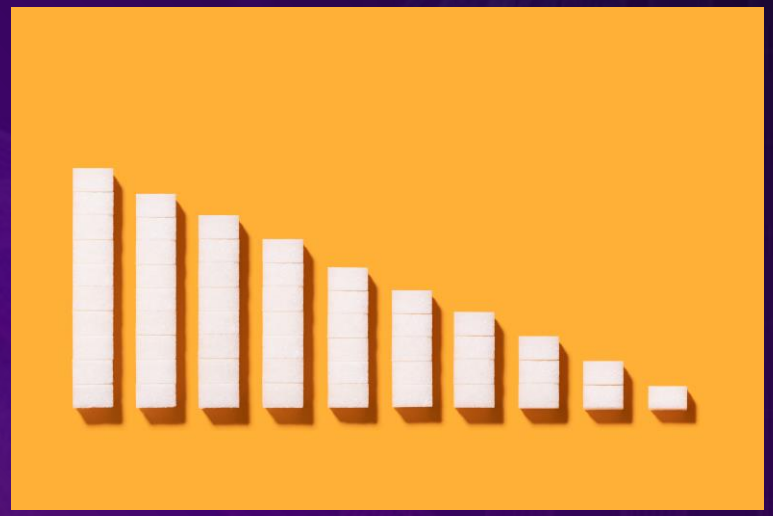
#microbiology #Trending #MedTwitter #IDTwitter #medlabsci #podcast



5:09 PM · Mar 28, 2023 · **1,412** Views

Microbiologists, #MedicalLaboratory, & #Pathologists have a ROLE in communicating "what we do" & why it is critical for Quality patient care and #healthcare outcomes!

Role of the Lab in AMR



Surveillance and reporting

Antimicrobial susceptibility testing breakpoint updates

Rapid and accurate diagnostic testing

Role of the Lab in AMR

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https://infectioncontrol.tips/2022/04/27/antimicrobial-resistance-a-review-of-a-broad-spectrum-problem-and-future-needs/

Role of the Lab in Infection Prevention

Clinical microbiology methods directly impact infection prevention work in the hospital setting.

- Identify clusters or trends from daily lab reports
- Surveillance and reporting
- Infection prevention interventions

Role of the Lab in Infection Prevention

Clinical Infectious Diseases

MAJOR ARTICLE

IDSA Infectious Diseases Society of America · hivma hiv medicine association · OXFORD

Whole-Genome Sequencing Surveillance and Machine Learning of the Electronic Health Record for Enhanced Healthcare Outbreak Detection

Alexander J. Sundermann,[1,2,3] Jieshi Chen,[4] Praveen Kumar,[5] Ashley M. Ayres,[6] Shu-Ting Cho,[2] Chinelo Ezeonwuka,[1,2] Marissa P. Griffith,[1,2] James K. Miller,[4] Mustapha M. Mustapha,[1,2] A. William Pasculle,[7] Melissa I. Saul,[8] Kathleen A. Shutt,[1,2] Vatsala Srinivasa,[1,2] Kady Waggle,[1,2] Daniel J. Snyder,[9] Vaughn S. Cooper,[9] Daria Van Tyne,[2] Graham M. Snyder,[2,6] Jane W. Marsh,[1,2] Artur Dubrawski,[4] Mark S. Roberts,[5,8] and Lee H. Harrison,[1,2,3]

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lin Infect Dis. 2022 Aug 31;75(3):476-482. doi: 10.1093/cid/ciab946.

Role of the Lab in Public Health

CDC Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

Search

National Wastewater Surveillance System (NWSS)

NWSS NATIONAL WASTEWATER™ SURVEILLANCE SYSTEM

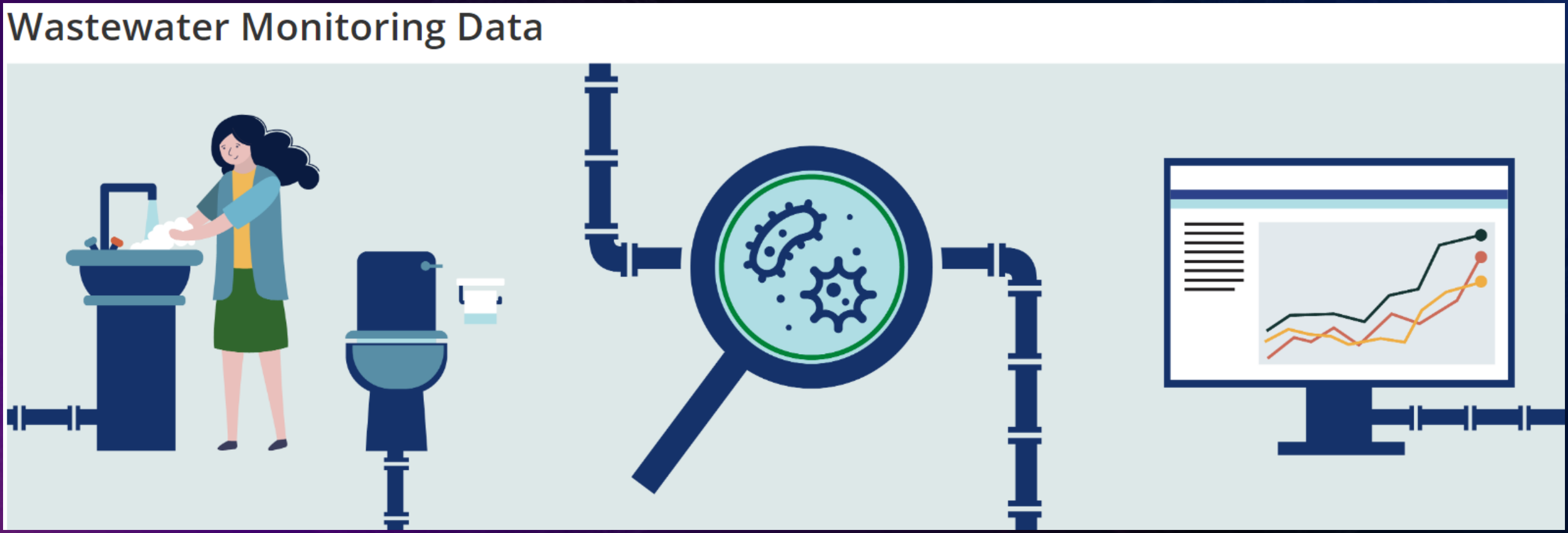
Updated February 28, 2024
Print

Wastewater (sewage) can be tested to detect traces of infectious diseases circulating in a community, even if people don't have symptoms. You can use these data as an early warning that levels of infections may be increasing or decreasing in your community.

About CDC's Wastewater Program (NWSS)

How Wastewater Monitoring Works

Role of the Lab in Public Health



The Clinical Microbiology Lab of the Future
https://www.cdc.gov/nwss/index.html

Role of the Lab in Public Health

CDC's National Wastewater Surveillance System (NWSS) program collects and displays wastewater data from communities across the United States.

COVID-19 | MPOX

HIGH

Nationally, the wastewater viral activity level for COVID-19 is currently **high**.

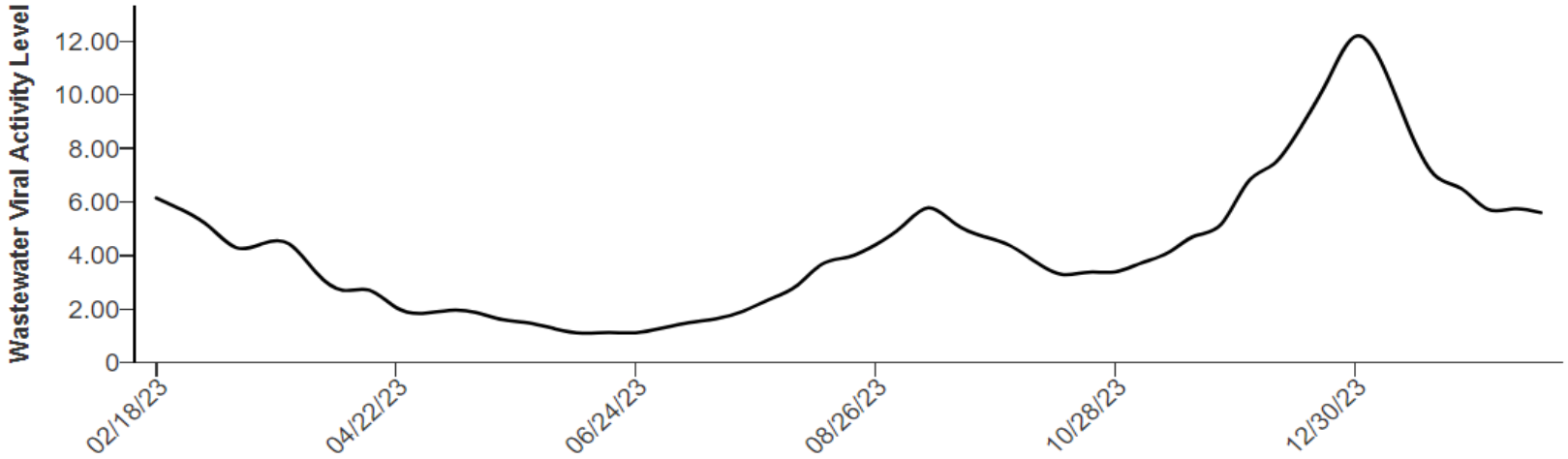
Very High | High | Moderate | Low | Minimal

See the data

National Trend

Make a selection from the filters to change the visualization information.

1 Year



See the data

Role of the Lab in Public Health

COVID-19 | **MPOX**

Most communities are reporting **no detection** of mpox in wastewater.

Consistent detection 1 site (0%)

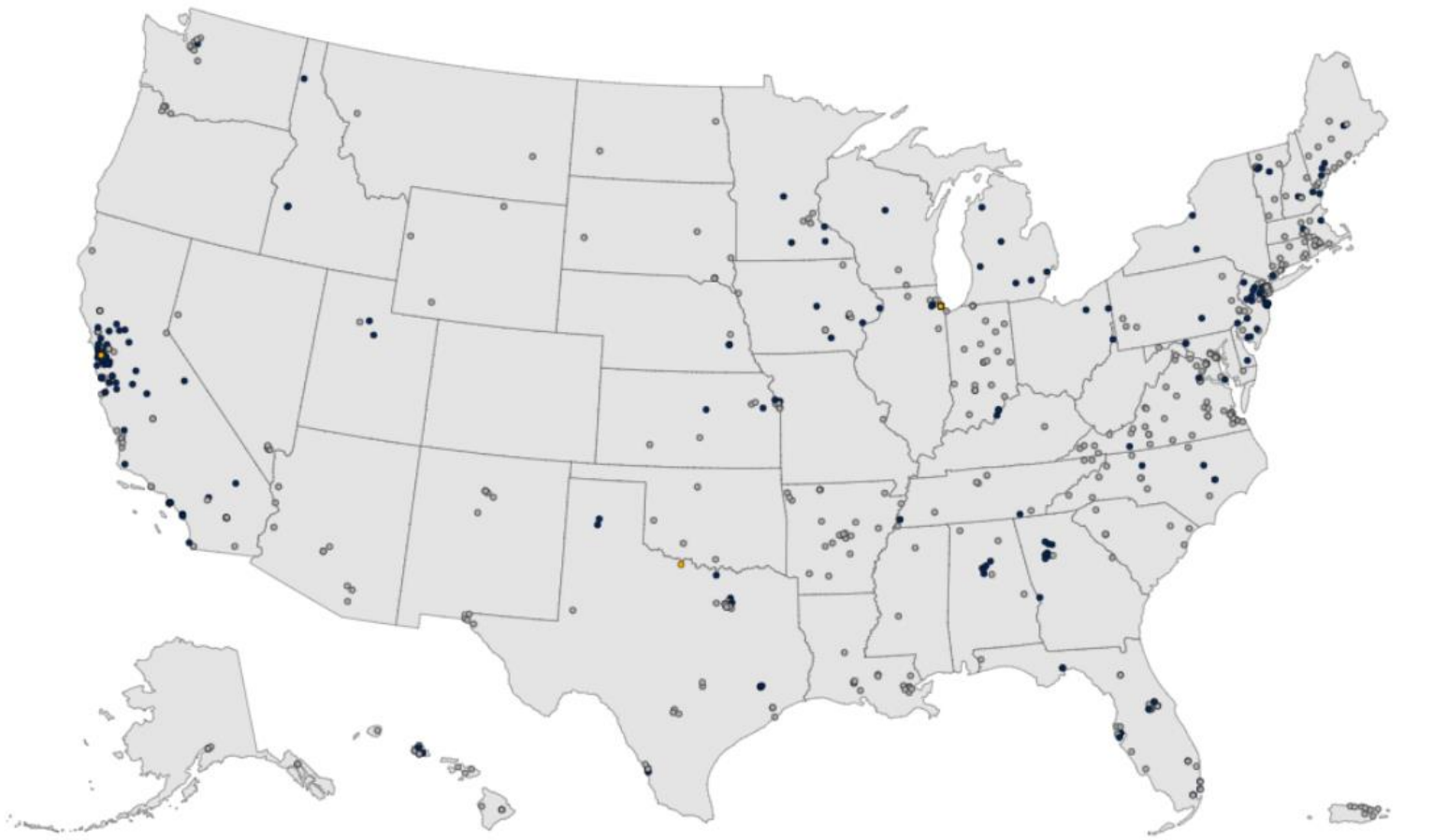
Intermittent detection 1 site (0%)

No detection 281 sites (39%)

No recent data 445 sites (61%)

See the data

Mpox virus detection in wastewater in the past 4 weeks, United States



The Clinical Microbiology Lab of the Future
https://www.cdc.gov/nwss/index.html

New Technology: Lab as an Advisor?

Demonstrating impact and value of new tests

- With new technology, likely increase in need for diagnostic stewardship across all phases

Advanced training for laboratorians

- DCLS, Ph.D
- Consider how this fits into public health, academic centers, industry

Collaborative research and quality improvement

Education

Communication

New Technology: Lab as an Advisor?

- **Automation is increasingly being used** in many clinical laboratory disciplines, including clinical chemistry, molecular biology, immunology, and hematology.

- **Advances in technology and more centralized laboratory models have led to the development of Full Laboratory Automation (FLA) systems.** These systems streamline workflows, optimize incubation conditions, improve sample tracking, and reduce errors and injuries.

- Automated specimen processors can inoculate liquid-based specimens onto solid agar media or broth media**, reducing variability from manual plate streaking, minimizing cross-contamination, and reducing costs and time associated with specimen processing**.

New Technology: Lab as an Advisor?

- Automated systems, like Copan's WASPLab®, transport plates to an incubator with the appropriate atmospheric conditions, optimizing incubation conditions and enhancing bacterial growth.

- FLA Artificial Intelligence (AI) software, like Copan's PhenoMATRIX®, allows laboratory staff to read and interpret digital images of plates and mark which colonies require further work up. PhenoMATRIX®, by Copan, uses algorithms to detect organisms of interest and can segregate cultures according to their growth, color, and morphology.

- Advances in machine learning and AI are expected to bring further developments to clinical microbiology laboratories.

The Clinical Microbiology Lab of the Future
https://www.copanusa.com/blogs/embracing-the-future-of-clinical-microbiology-a-deep-dive-into-laboratory-automation/

New Technology: Lab as an Advisor?

- Automation is becoming a staple in many clinical laboratory disciplines, including clinical chemistry, molecular biology, immunology, and hematology.

- However, achieving “total” automation in clinical microbiology has been considered challenging due to factors such as the diversity of microbiological specimen collection sites, the complexity of their containers, the need to test for a large number of pathogens, and the high cost of automation relative to low specimen volumes.

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New Technology: Lab as an Advisor?

- Despite these challenges, advances in technology and more centralized laboratory models have led to the development of Full Laboratory Automation (FLA) systems.

- These systems have been implemented in many labs worldwide, offering the potential to streamline workflows, optimize incubation conditions, improve the ability to track samples, and reduce errors and repetitive stress injuries.

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New Technology: Lab as an Advisor?

- Two major commercially available systems are Kiestra by BD and WASPLab® by Copan. These systems automate specimen processing, reducing variability from manual plate streaking, minimizing cross-contamination, and reducing costs and time associated with specimen processing.

- Once specimen processing is complete, these automated systems transport plates on a conveyor belt to an incubator with the appropriate atmospheric conditions. This process optimizes incubation conditions and enhances bacterial growth, including the emergence of rarely recovered and fastidious organisms.

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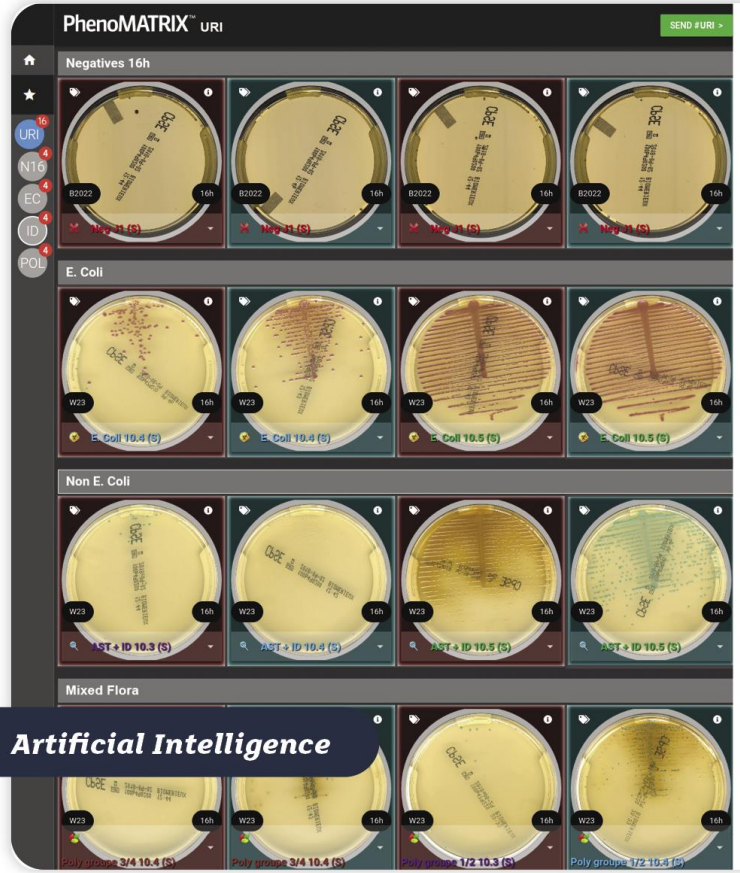
New Technology: Lab as an Advisor?



Automated Reading, Interpretation & Segregation of Bacterial Cultures

- Create custom filters to group plates in a folder-style interface, based on the laboratory rules
- Plates are grouped by colony count –no growth, growth, mixed growth, etc. according to laboratory workup needs
- Results are sorted using the custom filters and may be sent to LIS with a single click of a button[a]
- Sorts your plates images according to laboratory rules and LIS data

Copan

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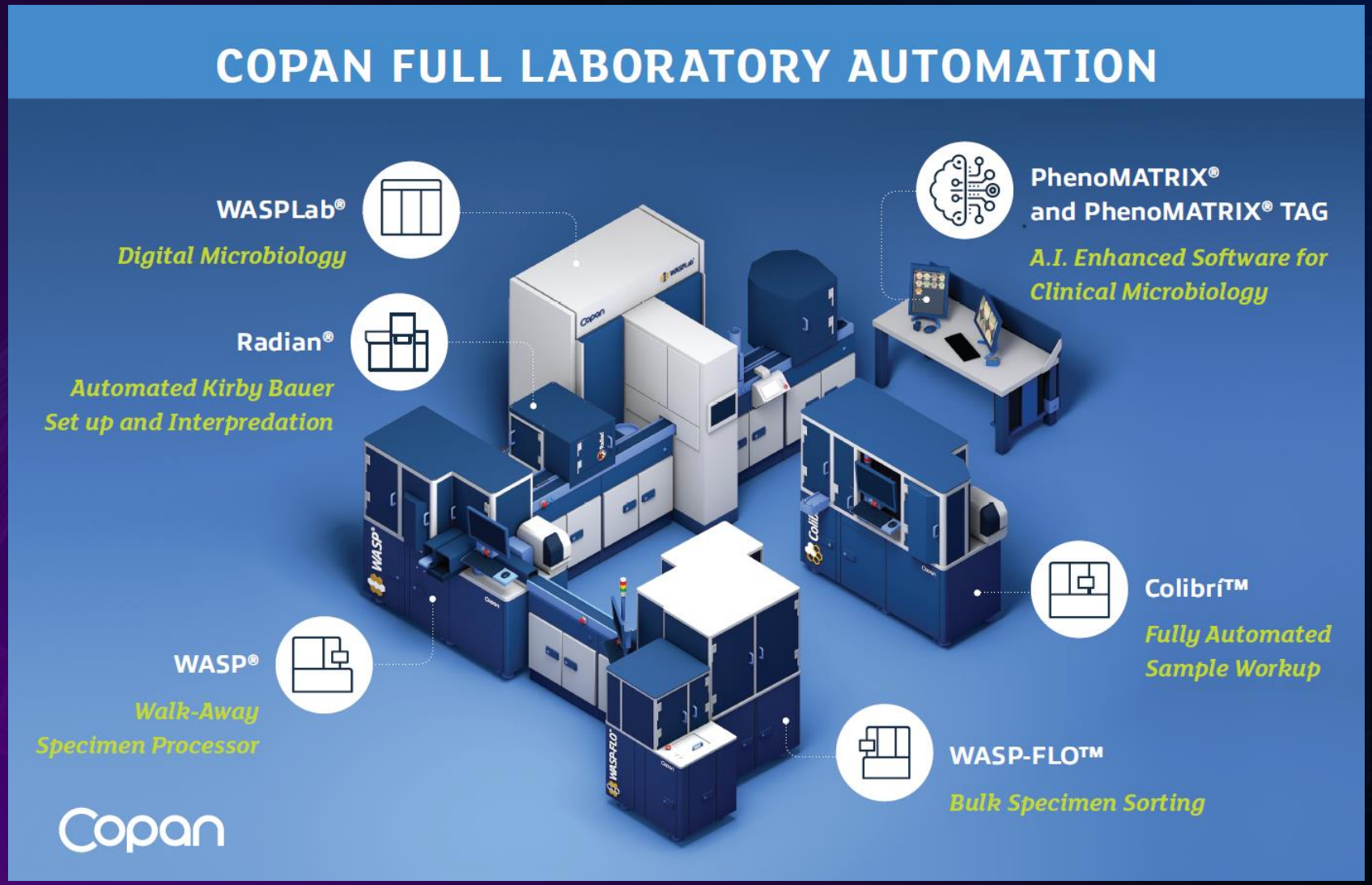
New Technology: Lab as an Advisor?



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Thank you! Questions?

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