How Culture Media Can Deliver Value to Your Lab

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Clinical Speaker

Nathan A. Ledeboer, PhD

Nathan A Ledeboer
Professor of Pathology and Vice Chair
Department of Pathology
Medical College of Wisconsin

Medical Director, Microbiology and Molecular Pathology
Wisconsin Diagnostic Laboratories and Froedtert Health

Medical Director, Client Services, Reference Services,
and Specimen Processing
Wisconsin Diagnostic Laboratories
Milwaukee, WI

Technology and the Microbiology Lab

Molecular is growing but so too is culture

Laboratory Section	Market Size	Year over Year Growth
Immunoassays	$17.5 B	~6%
Point of Care	$15.4 B	~8%
Chemistry	$7.7 B	~6%
Molecular	$7.2 B	~11%
Hematology	$5.8 B	~2%
Microbiology	$3.4 B	~6%

Projected ID and AST Format Changes Through 2025

ID Format Changes			
	2014	2020	2025
Manual	+	+	+
Biochemical	++++	++	+
Mass Spec	+++	++++	++++
Molecular	+	+	++

AST Format Changes			
	2014	2020	2025
Dilution	+	+	+
Diffusion	++	++	+
E-strips	+	+	+
Automated Instrument	+++++	+++++	++++
Molecular	+	+	+

Average percent of specimens using that particular technology scale: 0-15 +, 16-30 ++, 31-45 +++, 46-60 ++++, 61-75 +++++

Media in Susceptibility Testing

Essential AGREEMENT and CATEGORICAL AGREEMENT for Colistin* MICS

Table 2
Essential and categorical agreements for colistin MIC tests for 75 Gram-negative bacteria with MICs on frozen broth microdilution panels as reference

	Organism	*E. coli* and *K. pneumoniae* (*n*=32)	*P. aeruginosa* (*n*=21)	*Acinetobacter* spp. (*n*=22)	All isolates (*n*=75)
	Colistin reference MIC range (mg/L)	0.25–32	0.25–128	0.5–32	0.25–128
% Essential agreement (EA)[a]	Sensititre custom plate[b]	96	100	91	96
	MICRONAUT-S	97	100	91	96
	MICRONAUT MIC-Strip	97	100	100	99
	SensiTest[c]	96	93	71	88
	UMIC[d]	91	75	77	82
	Etest, Oxoid MH	84	62	59	71
	Etest, BBL MH	63	52	4.5	43
	Etest, MHE	75	43	9.1	47
	MTS, Oxoid MH	59	57	41	53
	MTS, BBL MH	75	57	59	65
% Categorical agreement (CA)[e]	Sensititre custom plate	97	95	91	95
	MICRONAUT-S	94	86	86	89
	MICRONAUT MIC-Strip	94	91	86	91
	SensiTest	94	91	82	89
	UMIC	94	91	91	92
	Etest, Oxoid MH	94	71	73	81
	Etest, BBL MH	94	67	68	79
	Etest, MHE	94	76	82	85
	MTS, Oxoid MH	81	71	82	79
	MTS, BBL MH	84	71	68	76
Number of major errors (ME)[f]	Sensititre custom plate	1	1	2	4
	MICRONAUT-S	2	1	3	6
	MICRONAUT MIC-Strip	2	0	3	5
	SensiTest	2	1	4	7
	UMIC	2	1	0	3
	Etest, Oxoid MH	2	0	0	2
	Etest, BBL MH	1	0	0	1
	Etest, MHE	2	0	0	2
	MTS, Oxoid MH	0	0	0	0
	MTS, BBL MH	0	0	0	0
Number of very major errors (VME)[g]	Sensititre custom plate	0	0	0	0
	MICRONAUT-S	0	2	0	2
	MICRONAUT MIC-Strip	0	2	0	2
	SensiTest	0	1	0	1
	UMIC	0	1	2	3
	Etest, Oxoid MH	0	6	6	12
	Etest, BBL MH	1	7	7	15
	Etest, MHE	0	5	4	9
	MTS, Oxoid MH	6	6	4	16
	MTS, BBL MH	5	6	7	18

[a] MICs being within ± 1 dilution of reference MICs.
[b] Because of truncations in the MIC dilutions, the total number of tests for calculation of EA was 28 for *E. coli*/*K. pneumoniae* and 19 for *P. aeruginosa*.
[c] Because of truncations in the MIC dilutions, the total number of tests for calculation of EA was 26 for *E. coli*/*K. pneumoniae*, 15 for *P. aeruginosa* and 17 for *Acinetobacter* spp.
[d] Because of truncations in the MIC dilutions, the total number of tests for calculation of EA was 20 for *P. aeruginosa*.
[e] Test results with correct susceptibility categorization.
[f] Resistant with test method, susceptible with reference method = false resistant.
[g] Susceptible with test method, resistant with reference method = false susceptible.

Matuschek et al. 2018. CMI. 24:865-870

*For Research Use Only. Not for diagnostic use

TigeCycline and the Penems

Table 1 – Comparison of interpretative results and MIC50 and MIC90 for antimicrobial agents and susceptibility testing methods.

Antimicrobial and method	N° (%) of KPC-producing *Enterobacter* spp. isolates			MIC (μg/mL)	
	Susceptible	Intermediate	Resistant	50	90
Polymyxin B					
Broth microdilution[a]	36 (90)	1 (2.5)	3 (7.5)	0.5	1
Etest®[d]	NA	NA	NA	NA	NA
Vitek 2® automated system[d]	NA	NA	NA	NA	NA
Disc diffusion[c]	39 (97.5)	0 (0)	1 (2.5)	NA[d]	NA[d]
Tigecycline					
Broth microdilution[a]	1 (2.5)	2 (5)	37 (92.5)	4	8
Etest®[a]	8 (20)	26 (65)	6 (15)	1.5	4
Vitek 2® automated system[a]	5 (12.5)	8 (20)	27 (67.5)	4	≥8
Disc diffusion[a]	11 (27.5)	25 (62.5)	4 (10)	NA[d]	NA[d]
Ertapenem					
Broth microdilution[a]	0 (0)	1 (2.5)	39 (97.5)	32	256
Etest®[d]	NA	NA	NA	NA	NA
Vitek 2® automated system[a]	0 (0)	1 (2.5)	39 (97.5)	≥8	≥8
Disc diffusion[a]	0 (0)	0 (0)	40 (100)	NA[d]	NA[d]
Imipenem					
Broth microdilution[b]	4 (10)	2 (5)	34 (85)	16	64
Etest®[d]	NA	NA	NA	NA	NA
Vitek 2® automated system[b]	4 (10)	3 (7.5)	33 (82.5)	≥16	≥16
Disc diffusion[b]	0 (0)	2 (5)	38 (95)	NA[d]	NA[d]
Meropenem					
Broth microdilution[b]	10 (25)	0 (0)	30 (75)	8	32
Etest®[d]	NA	NA	NA	NA	NA
Vitek 2® automated system[b]	10 (25)	0 (0)	30 (75)	8	≥16
Disc diffusion[b]	0 (0)	2 (5)	38 (95)	NA[d]	NA[d]

Note: For the interpretation of antimicrobial susceptibility testing, was used recommendation of the Agência Nacional de Vigilância Sanitária (ANVISA), in Technical Note N° 01/2010.

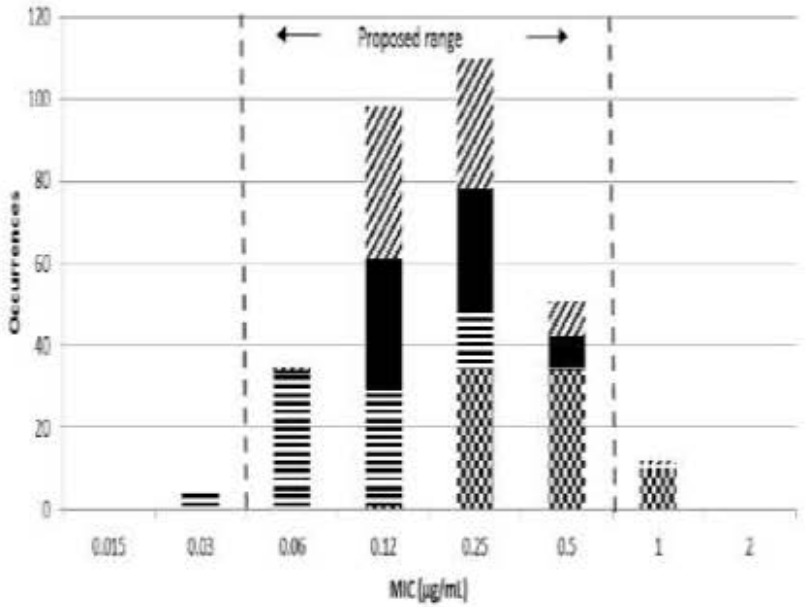
[a] EUCAST breakpoints.
[b] CLSI breakpoints.
[c] Breakpoints for *Pseudomonas aeruginosa*.
[d] NA, not applicable.

Rechenchoski DZ et al. 2017. BJM. 509-514

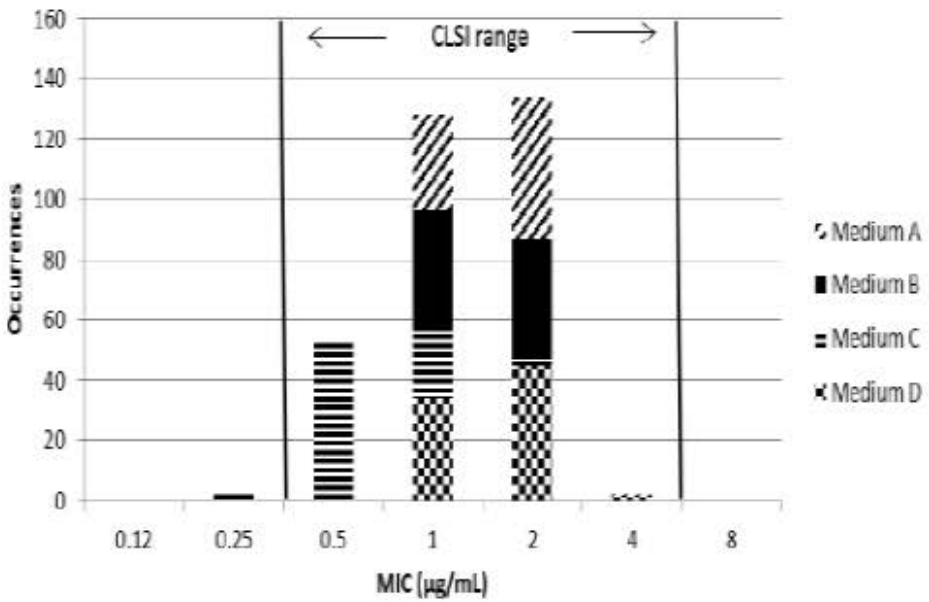
New Drugs and Media – One Extreme EXample

P. aeruginosa ATCC 27853

ID-CAMHB



CAMHB



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Media and the Future

Media is critical to automation

Ideal results can be obtained when automation and media are paired

Partnering with your vendor and optimizing your media with your instrumentation is essential to automation success and can lead to gains in economic and clinical value

- Redeploy skilled personnel for optimal productivity- throughput capacity matches 2-3 FTE

When introducing a new dish into your automation system adjustments to the equipment are necessary to optimize functionality

How Automation can improve how we use media

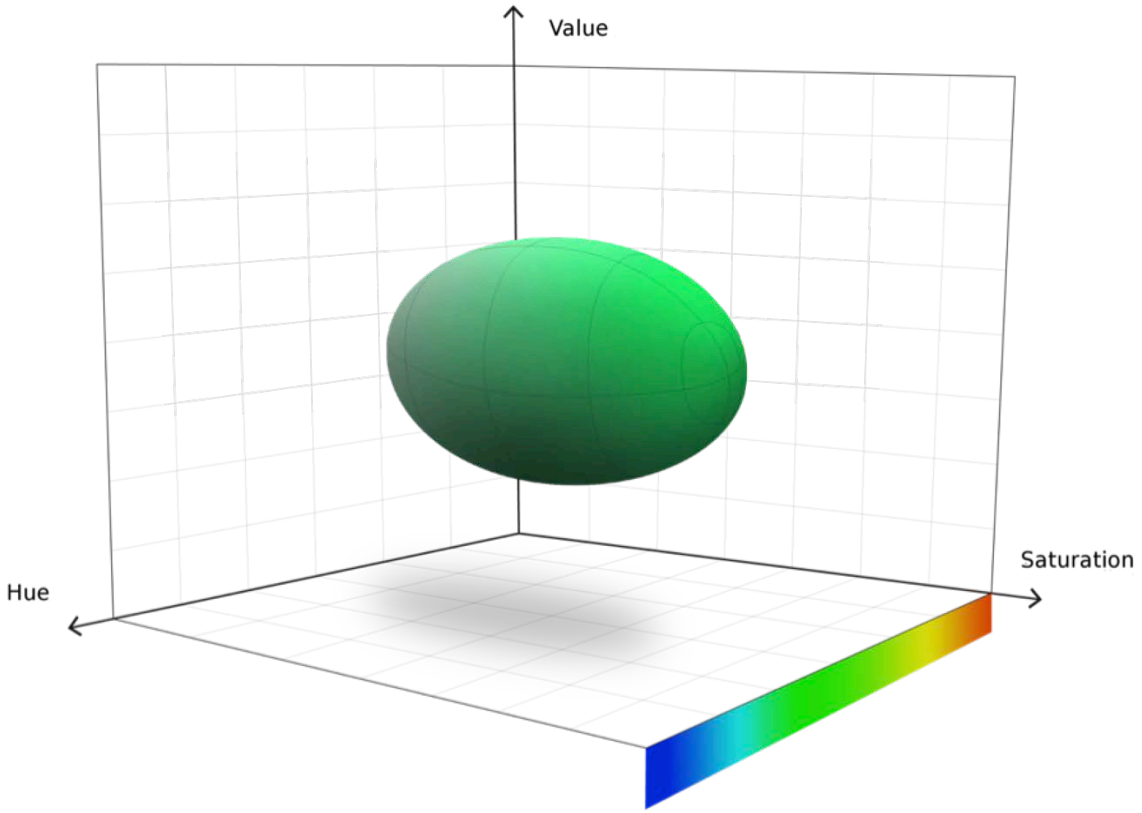
TABLE 2 Differences and percentages of change in the recovery of uropathogens reported in urine cultures pre- and post-TLA[a]

Organism	No. of times organism reported per 1,000 urine cultures		% change	*P* value
	Pre-TLA	Post-TLA		
Escherichia coli	79.4	101.2	+27	<0.0001
Klebsiella spp.	22.9	24.0	+5	0.24
Streptococcus agalactiae	22.2	36.7	+66	<0.0001
Aerococcus urinae	2.2	4.4	+103	<0.0001
Staphylococcus saprophyticus	1.0	2.3	+126	<0.0001
Neisseria gonorrhoeae	0.2	1.0	+371	<0.0001
Actinotignum schaalii	0.1	0.13	+33	0.77
Streptococcus pneumoniae	0.02	0.1	+312	0.27
Alloscardovia omnicolens	0.0	0.06	NA	0.30

[a]TLA, total laboratory automation; NA, not applicable.

LainhartW, BurnhamC-AD.2018. Enhanced recovery of fastidious organisms from urine culture in the setting of total laboratory automation.JClinMicrobiol56:e00546-18. https://doi.org/10.1128/JCM.00546-18.

AI, Image Differential and Colonies



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Media Matters to All!

Discrepant analysis of Manual Negative/Automation Positive Plates				
Discrepant Category	MN/AP[a]	Automation Positive 2nd Manual Positive	Residual Matrix/Yeast	Borderline Colors
Total number of plates	10,348	499	8,234	1,616
Colorex VRE	8996	432	7684	881
Remel VRE	1352	67	550	735
[a] Manual Negative/Automation Positive				

Faron *et al.* 2016

AI Can improve the sensitivity of culture

- 486 vaginal/rectal swabs
- All swabs were initially incubated in LIM for 18-24h at 35-37 degrees C
- Compared WASPLab segregation software to CLS read and BD MAX
- Chromogenic Strepto B agar w/AI Enhanced Image Analysis:
  - detected 6 additional positive cultures that were missed by technologist manual digital image culture reading

	Total Positive	True Positive	False Positive	False Negative	True Negative	Sensitivity	Specificity	PPPV	NPV
Tech Read	86	84	2	10	390	89.36%	99.49%	97.67%	97.50%
Software Read	221	90	131	4	261	95.74%	66.58%	40.72%	98.49%
BD MAX	94	90	4	4	388	95.74%	98.98%	95.74%	98.98%

Timm et al, ASM Abstract. 2019

Transitioning Media Vendors

My Lab Has Decided to Switch Vendors, What do I do now?

What are the key steps to a successful lab conversion?

1. **Prepare your laboratory**
    1. Recognize impact of and involve the lab techs in the upcoming change
    2. Validation procedures & Techniques
    3. Check ordering systems
2. **Train your staff**
    1. Colonies/hemolysis presentation differences in media
    2. Conduct broad Verification study

My Lab Has Decided to Switch Vendors, What do I do now?

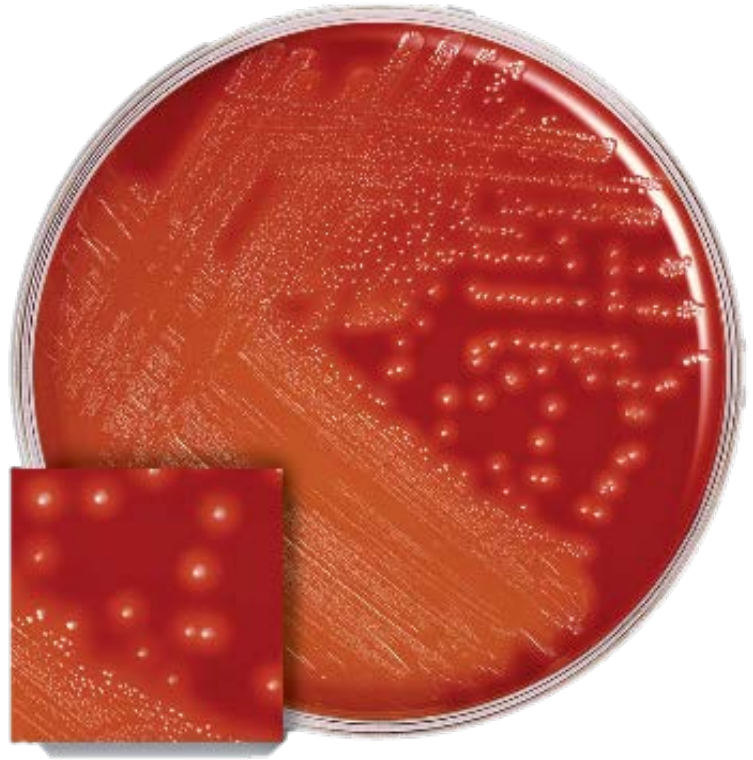
What are the key steps to a successful lab conversion?

1. **Know what to expect with new media**
    1. Evaluation & Validation
    2. Media differences
    3. Proper handling and storage
    4. Adjustments for automation

Evaluation Expectations

Hemolysis

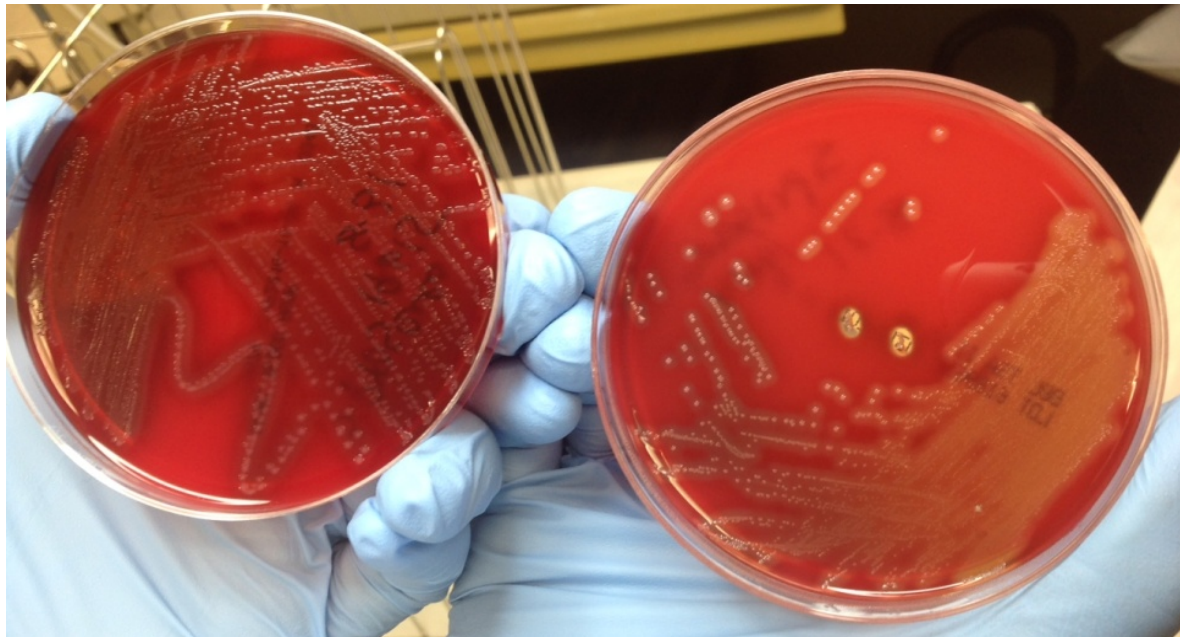
- Plate formulation can have a significant impact on the hemolysis that you expect
- Users may see less dramatic effect, but that does not interfere with results or workflow
- Consequently, the ability to do follow up testing on discrete colonies could be improved

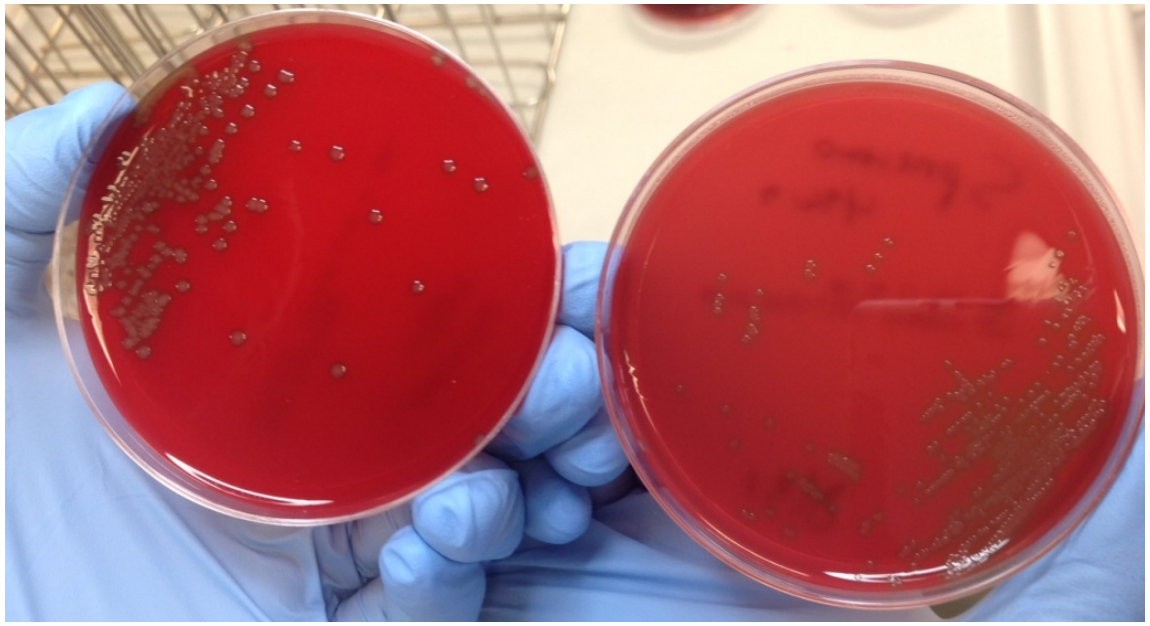


Evaluation Expectations

Streptococcus pyogenes ATCC 19614	
Thermo Scientific: flat gray, looks like water droplet	BD: small, round, whitish clear

Streptococcus pneumoniae ATCC 49619	
Thermo Scientific: watery, alpha	BD: growth of S. pneumo.

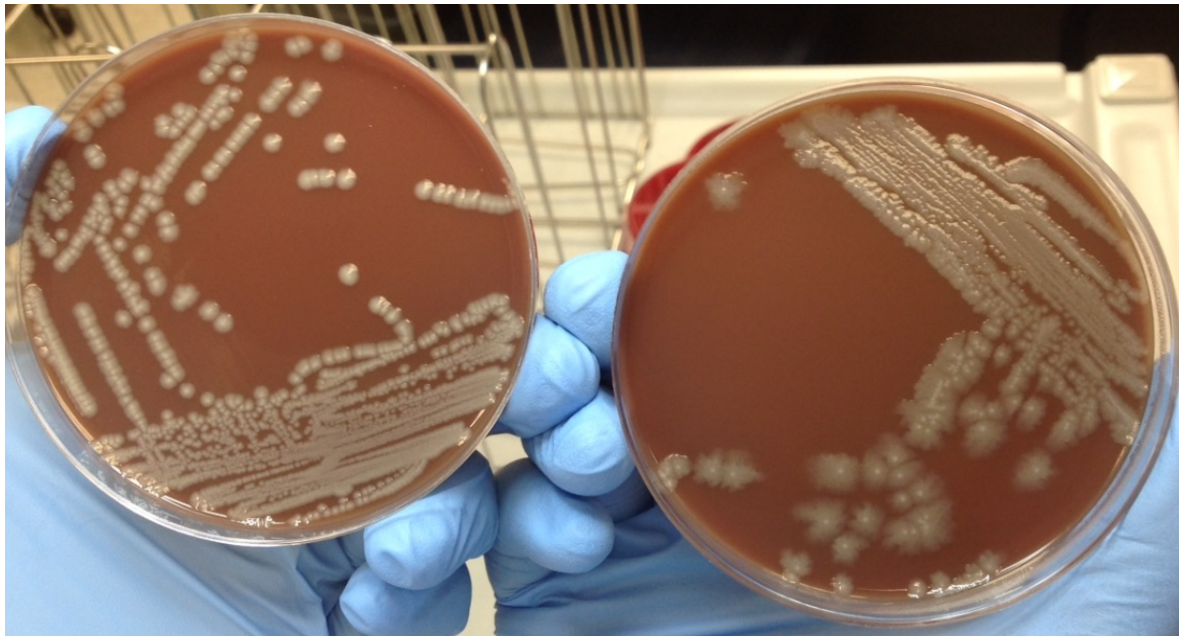




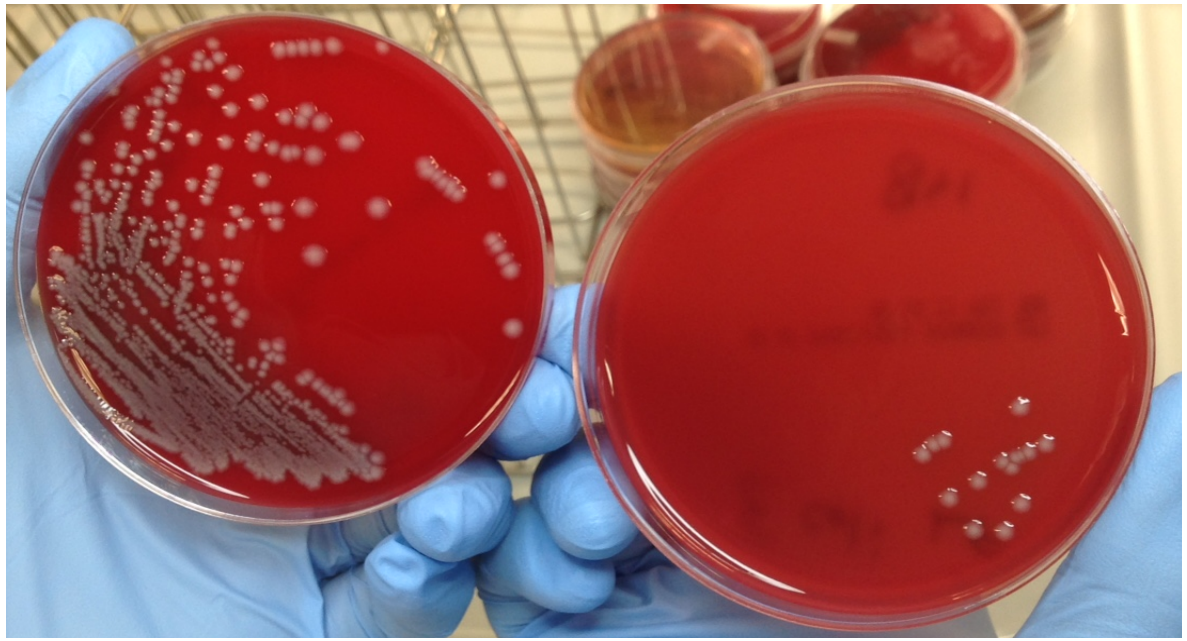
Shared with permission from Poudre Valley Hospital, BD to Remel media comparison tests

Evaluation Expectations

Escherichia coli ATCC 25922	
Remel: round, demarcated edges, isolated colonies	BD: Spready, fried egg appearance



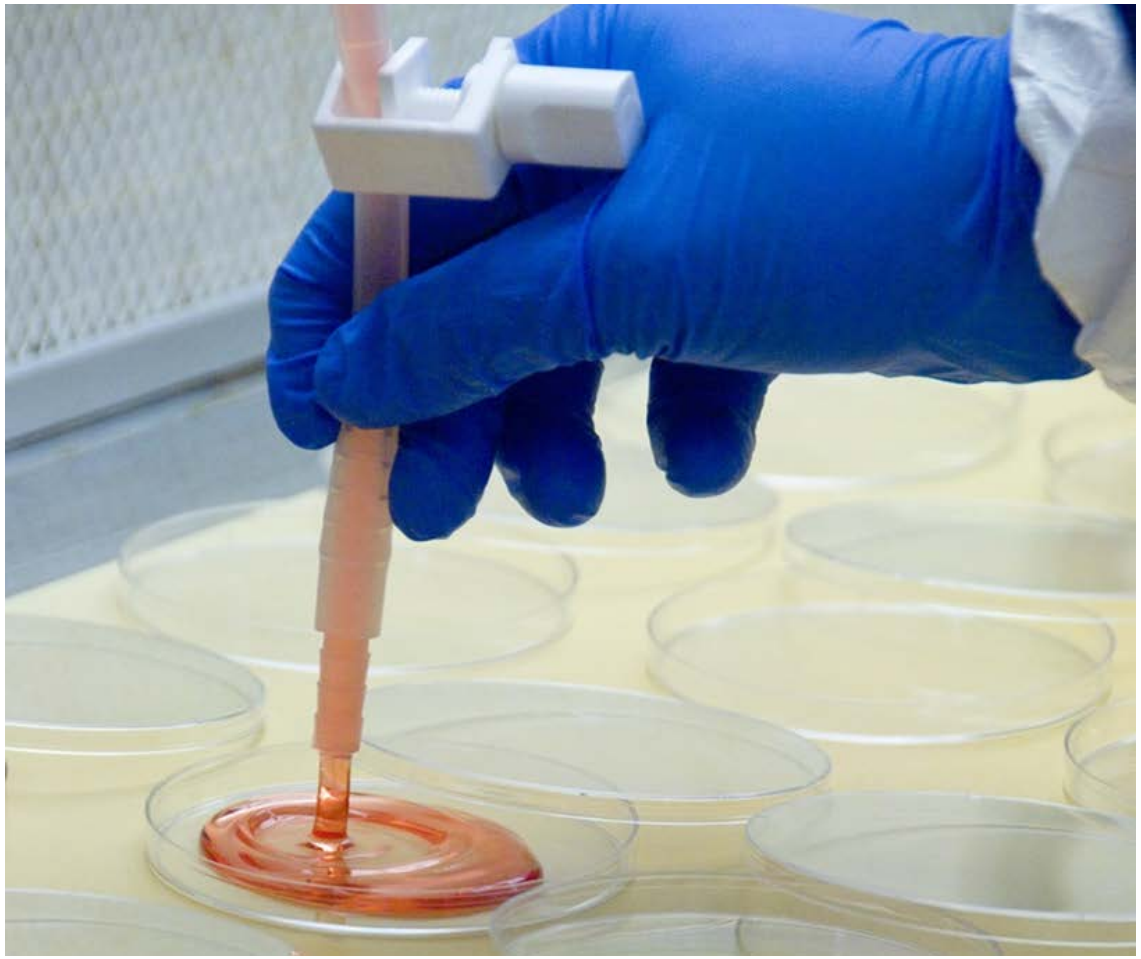
E. coli lactose fermenter patient	
Remel: Heavy growth	BD: Scant or “light” growth

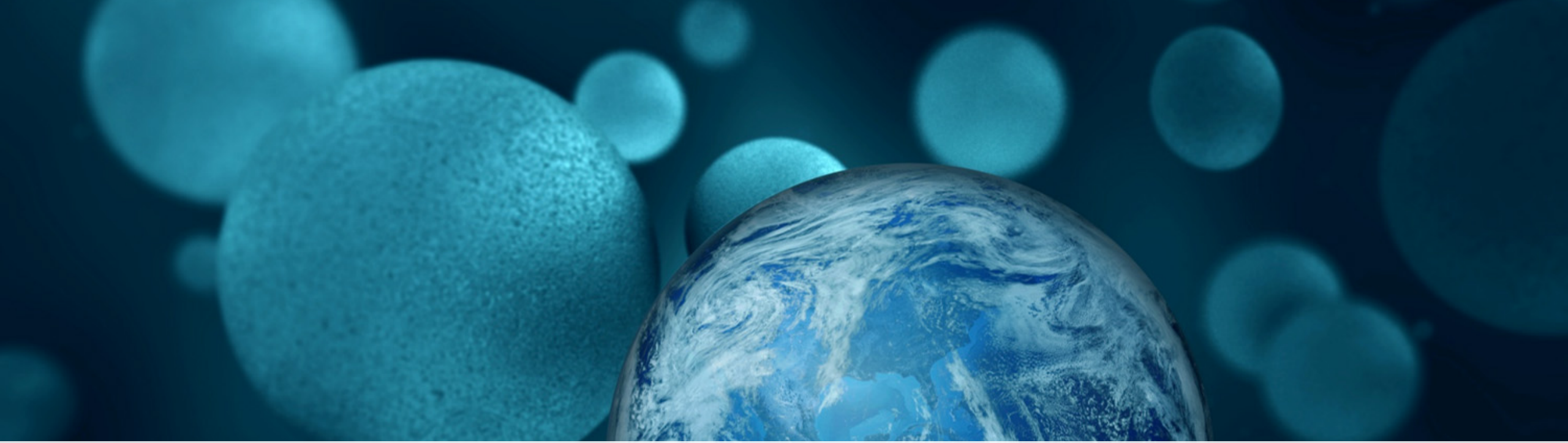


Shared with permission from Poudre Valley Hospital, BD to Remel media comparison tests

Media validation

While validation is not always needed, think IQCP. You'll need to reflect on your risk profile from you old vendor to your new vendor to ensure you're prepared for any inspections.





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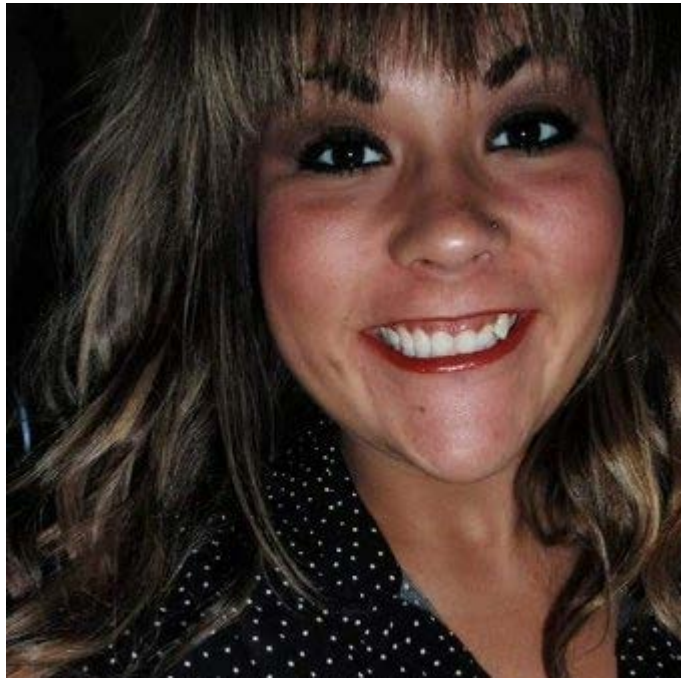
How Cultural Media Can Deliver Value To Your Lab

Brittney Bunn, PhD.
16 March 20

Technical support specialist



Dr. Brittney M. Bunn, PhD.

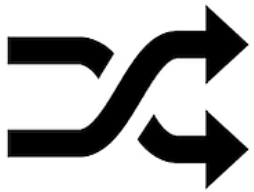
Dr. Brittney M. Bunn obtained her Ph. D. in chemistry from Case Western Reserve University. She currently serves as a Service Support supervisor for Thermo Fisher Scientific and has held other roles in the Technical Service department during her tenure of four years.

Simple Conversion Steps to Remel Media

1. Onboarding Inventory Worksheet

Provide your Thermo Fisher Account Manager with a list of your annual media usage.

2. Cross Reference List

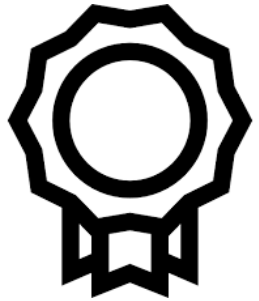


Equivalent part numbers and descriptions and will submit your usage information to our planning department.

3. Validate (*If required*)

Free of Charge Validation Media Pack will be shipped containing the media you have selected.

4. Conversion Completed



Technical support will provide assistance and confirm successful validation.
Your regular shipment date will be confirmed.

Preparation

Implementation

Ordering

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Ordering process – Direct from the Thermo Fisher Scientific

How to place your order

1.

EMAIL

csemail
@
thermofisher.com

PHONE

1-800-255-6730 Option 1

What to include in your order

2.

Submit Product Information

Thermo Fisher Part Number	Thermo Fisher Product Description	Thermo Fisher Pack Size
R01202	Blood Agar, 5% Sheep Blood	100/PK
R01302	Chocolate Agar	100/PK

When you'll receive your order

3.

NEXT DAY DELIVERY

Orders received by **2:00 P.M.** (Central Standard Time) **Monday through Thursday**

What is the ordering process now that we've converted?

Cardinal Health and Fisher Healthcare customers order processes will remain the same

Orders are dropped - shipped overnight to ensure our customers receive their orders as soon as possible

No changes to your current ordering process!

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Managing Deliveries

Receiving your new media

Inspection

Laboratory personnel are responsible for inspecting media upon receipt and documenting the inspection

Packing List

The packing list provides the information required for quality control documentation

Documentation

REMEL has provided a section on the packing list for the customer to record this inspection when the media is unpacked

Orientation

Keep in mind REMEL plated media are shipped media side up. You will have to rotate the plates 180 degrees to a right side up position before using

Media Handling & Storage Guide

Maintaining Optimal Media Performance

- Most media have 10-12 week shelf life from date of manufacture
- Prepared Media shipments are validated at ambient temperature so avoid drying by leaving out for extended periods of time
- Different manufacturing processes determine the moisture levels and result in wetter or dryer media

Proper handling of your new media will ensure optimal performance

thermo scientific

Handling and Storage of Prepared Plate Media

Providing you with the highest quality media products is our goal. For optimal media performance, guidelines related to media handling and storage are listed below.

Expedite to laboratory

Ensure adherence to recommendations for storage and handling from the time media is received at your facility until it is used for patient testing.[1] CLSI. 2004. Quality Control for Commercially Prepared Microbiological Culture Media. 3rd ed. Approved Standard, M22-A3. CLSI, Wayne, PA.

Refrigerate upon arrival

Store media in the original packaging, with the media-filled side of the plate at the top, at 2-8°C up to the date of expiration. Storage temperature should be monitored daily. To avoid freezing, do not store media adjacent to the freezer compartment of the refrigerator.[2] CLSI. 2004. Quality Control for Commercially Prepared Microbiological Culture Media. 3rd ed. Approved Standard, M22-A3. CLSI, Wayne, PA. Manufacturer's recommendation.

Store in the dark

Media should be stored in its original packaging; especially formulations containing dyes, indicators, and blood. Toxicity attributable to oxygen radicals and hydrogen peroxide resulting from prolonged light exposure may have a deleterious effect on performance and appearance.[3] Bridson, E.Y. 2006. The Oxoid Manual. 9th ed. Oxoid Ltd. Basingstoke, U.K. Murray, P.R., E.J. Baron, J.H. Jorgensen, M.A. Pfaller, and R.H. Yolken. 2003. Manual of Clinical Microbiology, 8th ed. ASM, Washington, D.C. Manufacturer's recommendation.

Avoid direct air flow

Minimize dehydration by storing and incubating media away from direct air flow, including fans. Additionally, media should not be stored in biological safety cabinets.[4] Manufacturer's recommendation.

Incubate with humidity

Maximum growth and recovery of microorganisms is achieved when the humidity is 70% or higher. Use a humidified incubator or alternatively a basin of water placed in the incubator (change water frequently or add an antifungal agent to avoid contamination).[5] Koneman, E.W., S.D. Allen, W.M. Janda, P.C. Schreckenberger, W.C. Winn, Jr. 1997. Color Atlas and Textbook of Diagnostic Microbiology. 5th ed. Lippincott, Williams & Wilkins, Philadelphia, PA. Isenberg, Henry D. 2004. Clinical Microbiology Procedures Handbook 2nd ed. ASM, Washington, D.C.

Utilize plate bags

Maintain media integrity by replacing unused plates in the original bag at the end of each day and returning them to the refrigerator. Bags should be closed, to reduce moisture loss. Stability may be adversely affected by a recurrent shift between room temperature and refrigeration.[6] Koneman, E.W., S.D. Allen, W.M. Janda, P.C. Schreckenberger, W.C. Winn, Jr. 1997. Color Atlas and Textbook of Diagnostic Microbiology. 5th ed. Lippincott, Williams & Wilkins, Philadelphia, PA.

Technical Support

Technical Support

Our technical support team offers world class expertise at your demand

- Dedicated member resources readily available to assist with protocols, product transitions, troubleshooting and IQCP resources
- You can reach us via:
  - Email: microbiology.ts.us@thermofisher.com
  - Phone: 1-800-255-6730 Option 2
- Best-in-class, multi-language support with unparalleled global reach

Microbiologists serving Microbiologists

Questions