

# **“Clinical Microbiology: the future looks clear as stool!”**

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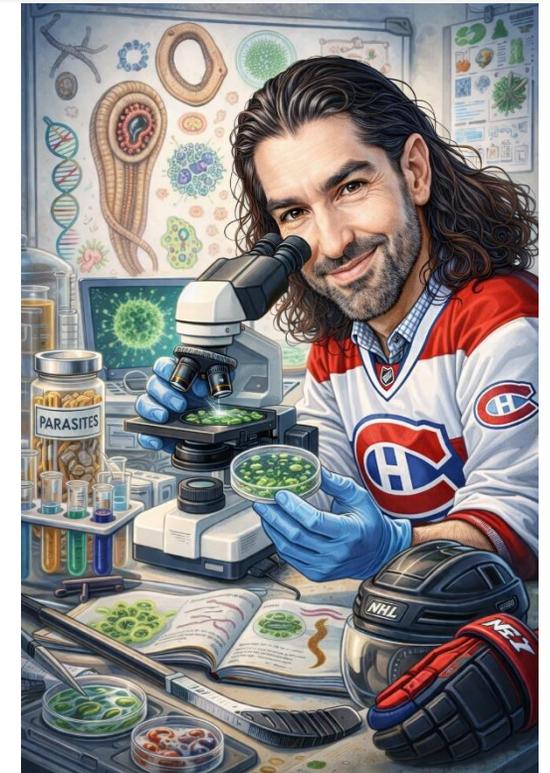
**MaineHealth**

**Professor of Internal Medicine, Tufts University School of Medicine**

# Disclosures

AI Images throughout

- Techcyte – research reagents, collaboration
- Leven Vision - consultant
- Seegene – Scientific Advisory Board
- Biorad – Scientific Advisory Board
- Genetic Signatures – speaker fees, clinical trials activities
- bioMérieux – consultant, speaker fees, stock ownership, spousal income



All relevant financial relationships listed for this individual have been mitigated.

# Objectives

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- Describe the state of clinical microbiology labs for adopting new or losing existing technology
- Discuss the impact of emerging pathogens on the clinical microbiology laboratory
- Recall the impact of declining vaccination and the need for laboratory capacity

# Your Dinner Time, Story Time

## A New Experience

Not Quite The Same as Disgusting Parasite Cases



# Lab Medicine...we have dealt with a lot of



- White powder in envelopes
- “Ebola” protocols
- LDT regulation...multiple scares
- MoIDx & other red tape payment walls
- COVID
- Staffing shortages
- Protecting Access to Medicare Act reform (-15%)

*I will not be talking about any of these!*

# Clinical Microbiology in My Time



- 2008 – a new metallo-beta-lactamase in *Klebsiella pneumoniae*
  - NDM-1 – “That’s not a problem here.” – welcome 2010
- “Drug resistance in TB for RIPE is a problem”
  - Also 2008 – XDR TB is reported in 59 countries
- 2009 – Novel Influenza of H1N1 of swine origin
  - Oseltamivir resistance within weeks

2008 Research Fellowship in Public Health

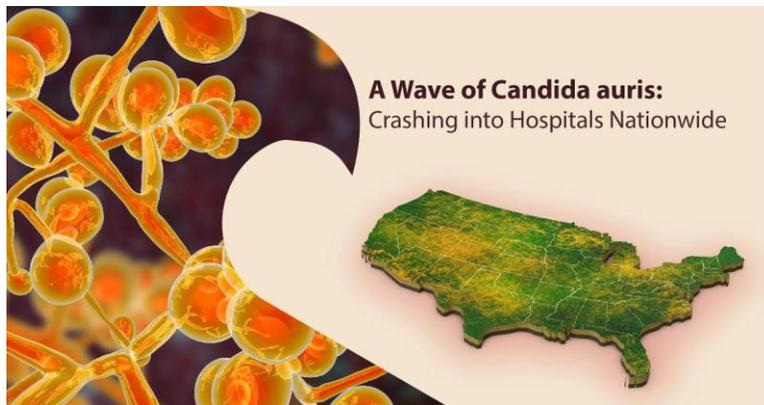
2009 CPEP Fellowship

World Health Organization (2008). "Countries with XDR-TB confirmed cases as of June 2008"

# Clinical Microbiology in My Time



- 2009 - *Cryptococcus gattii* will kill us all...
  - 2016 ...no wait...



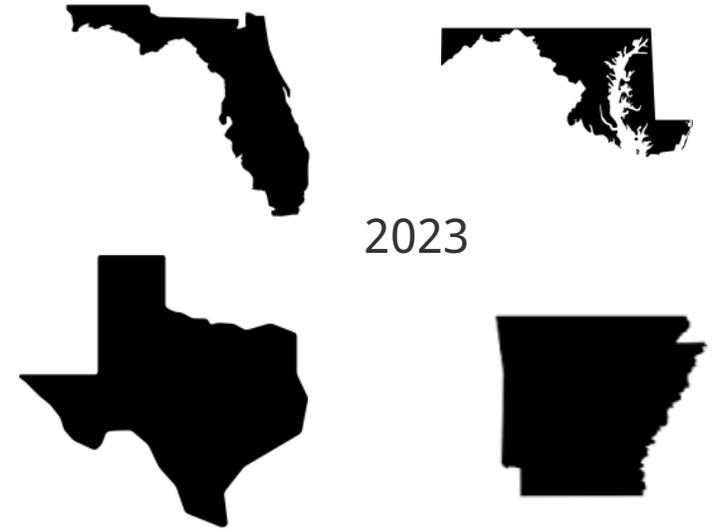
RAWR I am  
*Trichophyton indotineae*!!!

Or am I  
*Trichophyton*  
*mentagrophytes*  
genotype VII?

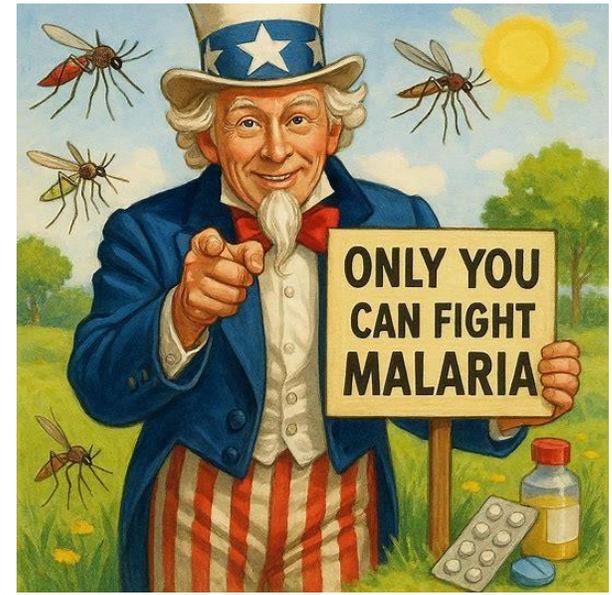


- At least the dermatophytes are still mild

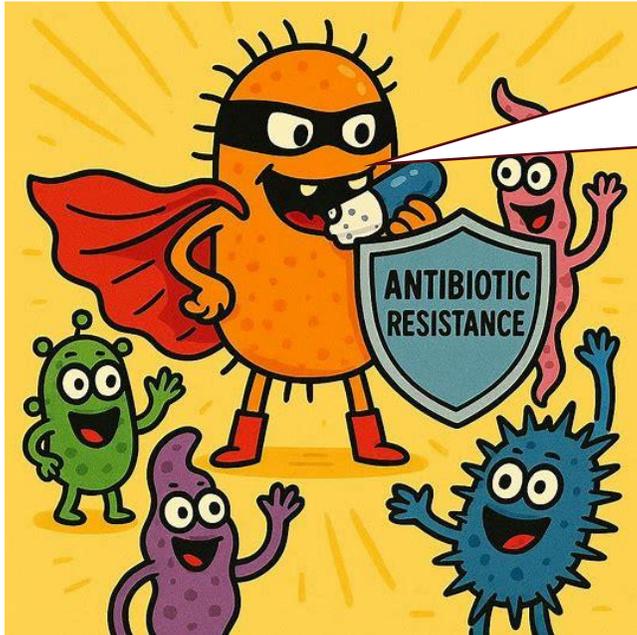
<https://blog.eoscu.com/blog/a-wave-of-candida-auris-infections-crashing-in-hospitals-nationwide>



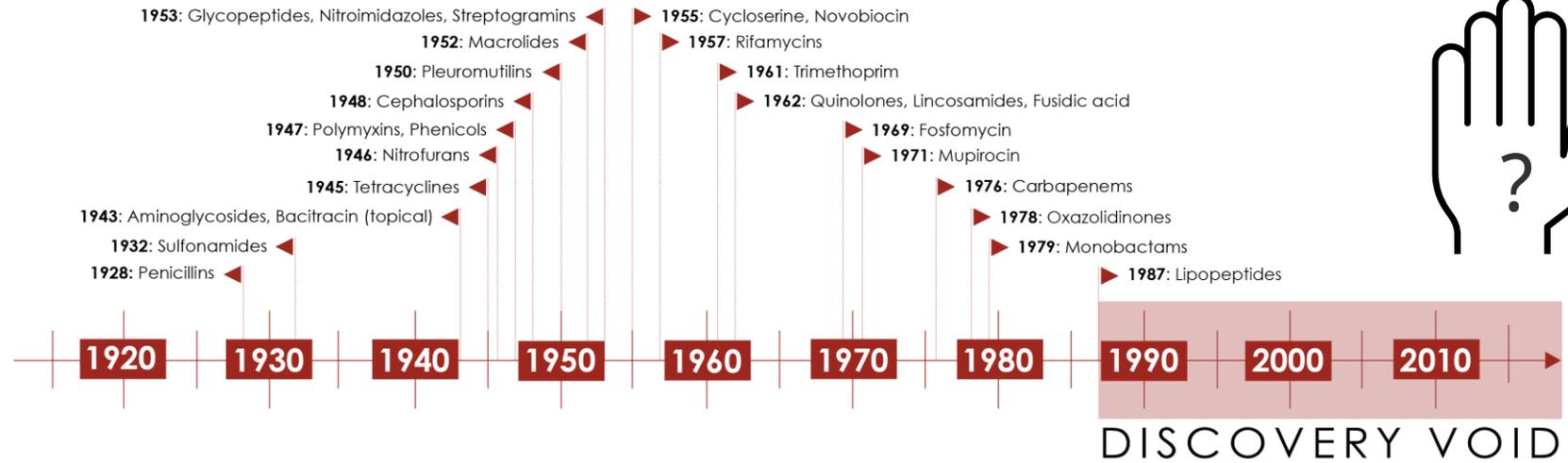
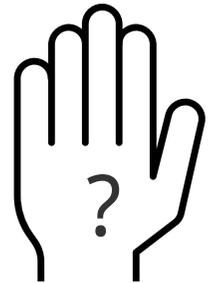
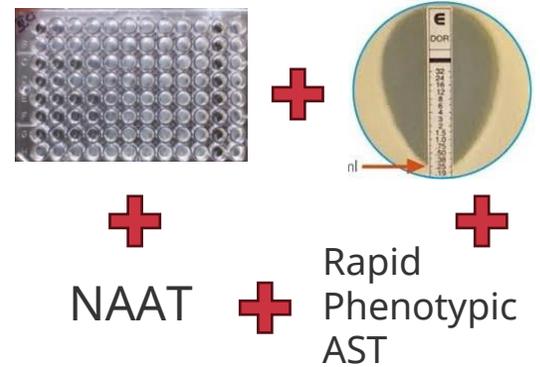
Malaria is back!



# We Are Losing the War On Drugs...err Bugs??



I am fighting for my life...  
and making more work  
for you!



© ReAct Group 2015

<https://www.reactgroup.org/toolbox/understand/how-did-we-end-up-here/few-antibiotics-under-development/>

# The Future looks...better? Maybe?



1980s



2010s



?? TLA

AI

??

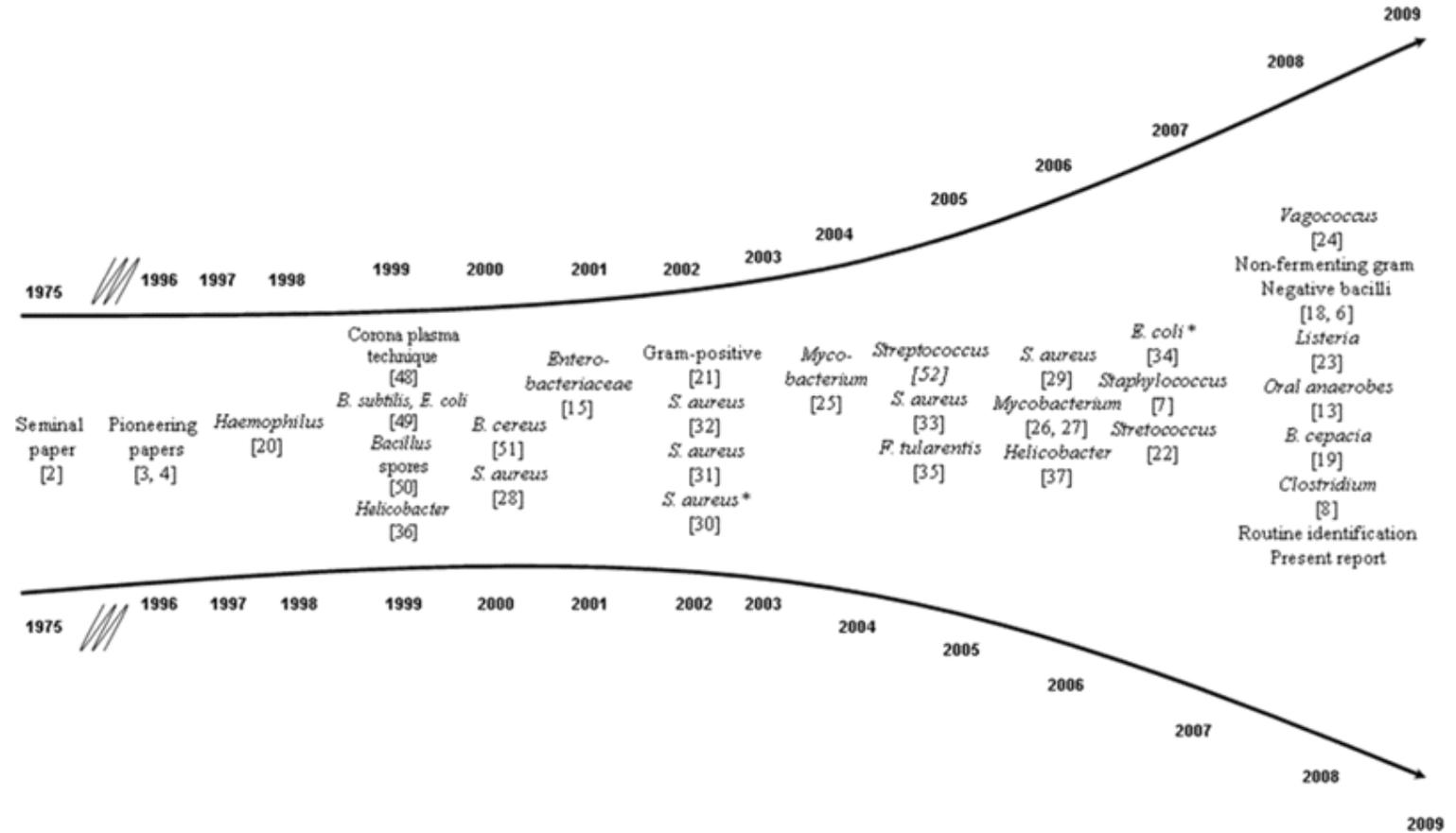
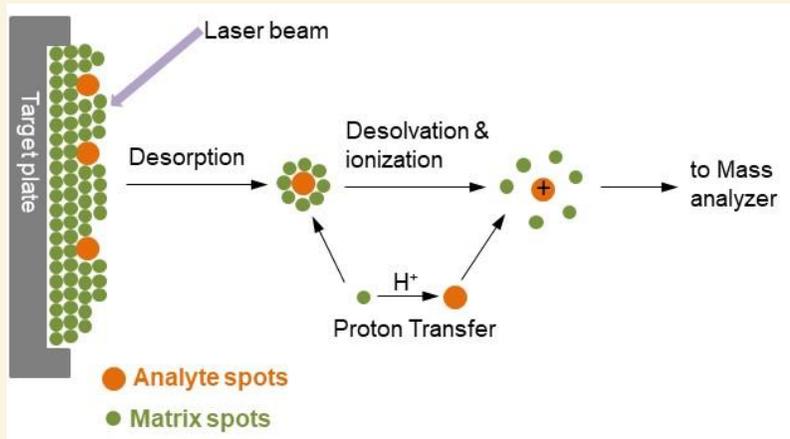




# Adopting New Technology An Artificial Example

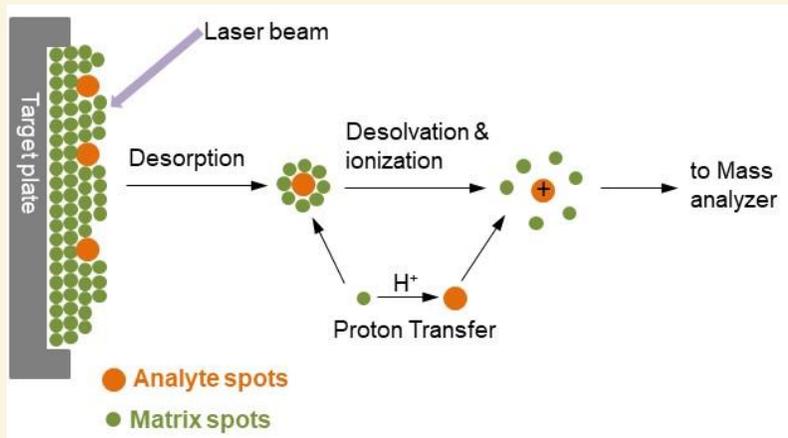
# 1996

## “You can identify bacteria with LASERS!”



Piseth Senget. Al. Clinical Infectious Diseases, Volume 49, Issue 4, 15 August 2009, Pages 543-551

“But...ThAt Is cHeMiStRy!”



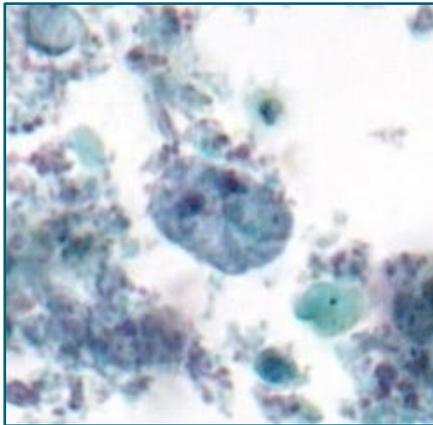
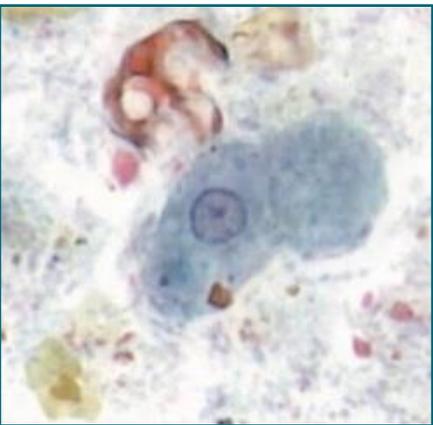
Biochemicals = microbiology

But Europe!

But \$\$\$ & Risk!

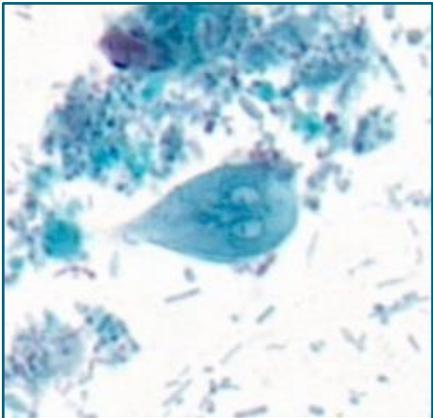
But workflow & accuracy

- 2009 – MALDI-TOF enters lab

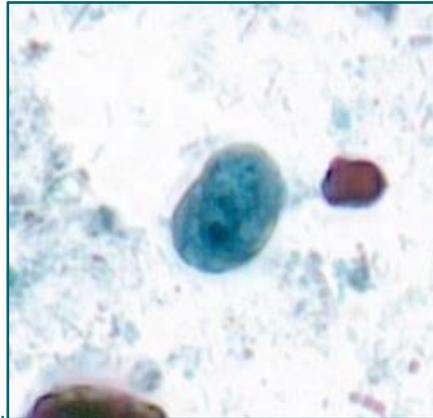


# Digital Imaging & Machine Learning A.I. for Stool Parasitology

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**“BuT tHaT’s AnAtOmIC PaTh?!”**



# Microscopy for Parasites

- **Pros:**

- Detect anything you can see
- Fun!

- **Cons:**

- Insensitive
- Requires well-trained personnel
- Maintaining competence
- Time-consuming
- Scope fatigue/burnout/retiring workforce...lack of new interest



# Ova & Parasite Exam

- Standard O&P (most conventional parasites)
  - **Wet mount stain:** specimen + iodine
  - **Trichrome stain:** specimen on slide + stain

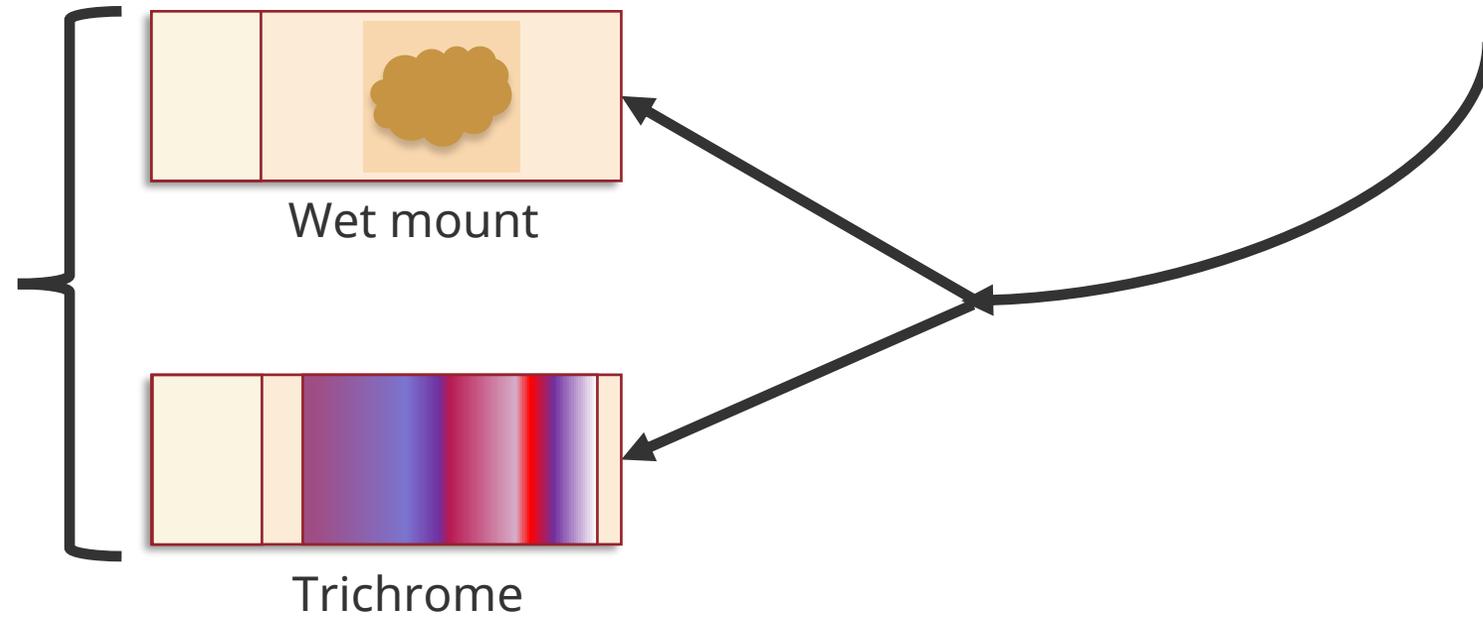
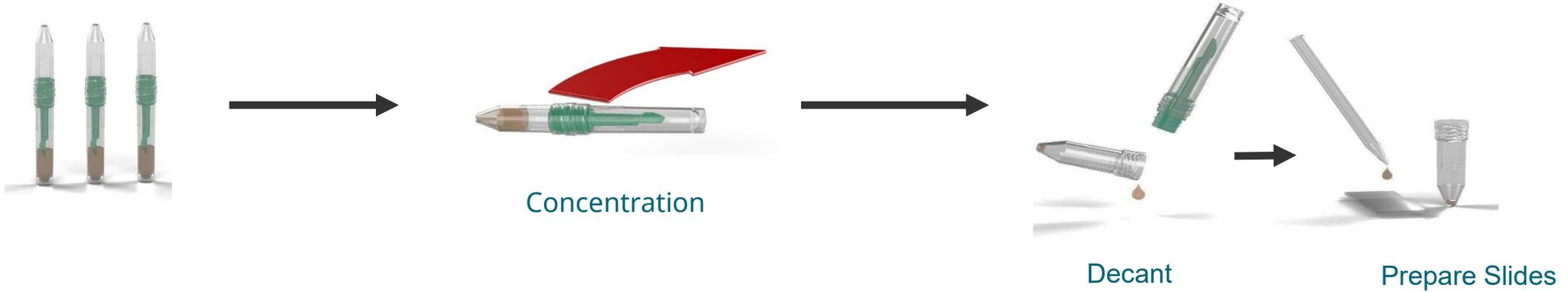


# O&P Use

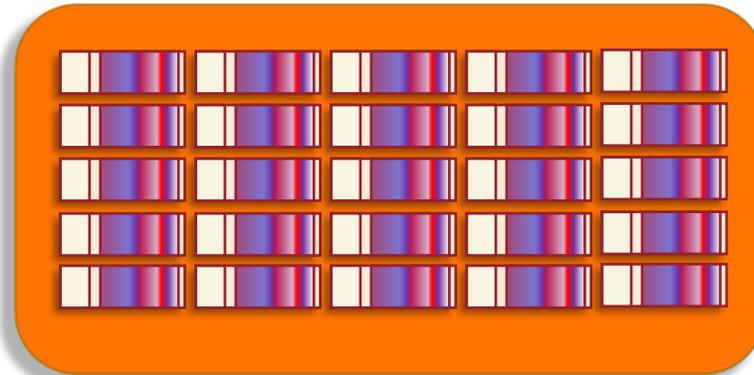
- **Recommended:** 3 specimens/patient
  - Reasonable exposure/risk
- **Reality:** EVERYONE with diarrhea (exaggeration)
- ~120k orders/year
  - ~240k preps/examinations



# O&P Preanalytical



# O&P Analytical



- ✓ ~2.5 – 3 hours/run
- ✓ ~98% negative

2-5 min/slide (technologist variable)

“Questionable artifacts” can take longer

# Concerns for O&P Reading

- ✓ Eye strain
- ✓ Neuromuscular strain
- ✓ Burnout/low Satisfaction
- ✓ Decreased Accuracy
  - Individual
  - Time of day
  - Workload



Content credentials  
Generated with AI · November 20, 2023 at 1:05 PM

# Integration Goals

- ✓ Faster
- ✓ Easier
- ✓ More sensitive
- ✓ Less hands on

**Goal:** Screen out 70% of negative specimens w/no microscope.



# Trichrome AI Analytical Sensitivity

Dilution	Technologist read	AI read
Neat	Giardia + Blastocystis	Giardia (276) + Blastocystis (129)
1:1	Giardia + Blastocystis	Giardia (95) + Blastocystis (19)
1:2	Giardia + Blastocystis	Giardia (68) + Blastocystis (17)
1:4	Giardia + Blastocystis	Giardia (79) + Blastocystis (46)
1:8	Negative	Giardia (70) + Blastocystis (13)
1:16	Giardia + Blastocystis (rare)	Giardia (12) + Blastocystis (10)
1:32	Negative	Giardia (16) + Blastocystis (5)
1:64	Negative	Giardia (15) + Blastocystis (2)
1:128	Negative	Giardia (9) + Blastocystis (1)
1:256	Negative	Giardia (15) + Blastocystis (1)

AI (with constrained scan region) was 4-6 fold more sensitive than a human

Mathison BA. J Clin Microbiol. 2020 May 26;58(6):e02053-19

# Trichrome AI Slide-Level Accuracy

## O&P Examination

CNN Model Analysis

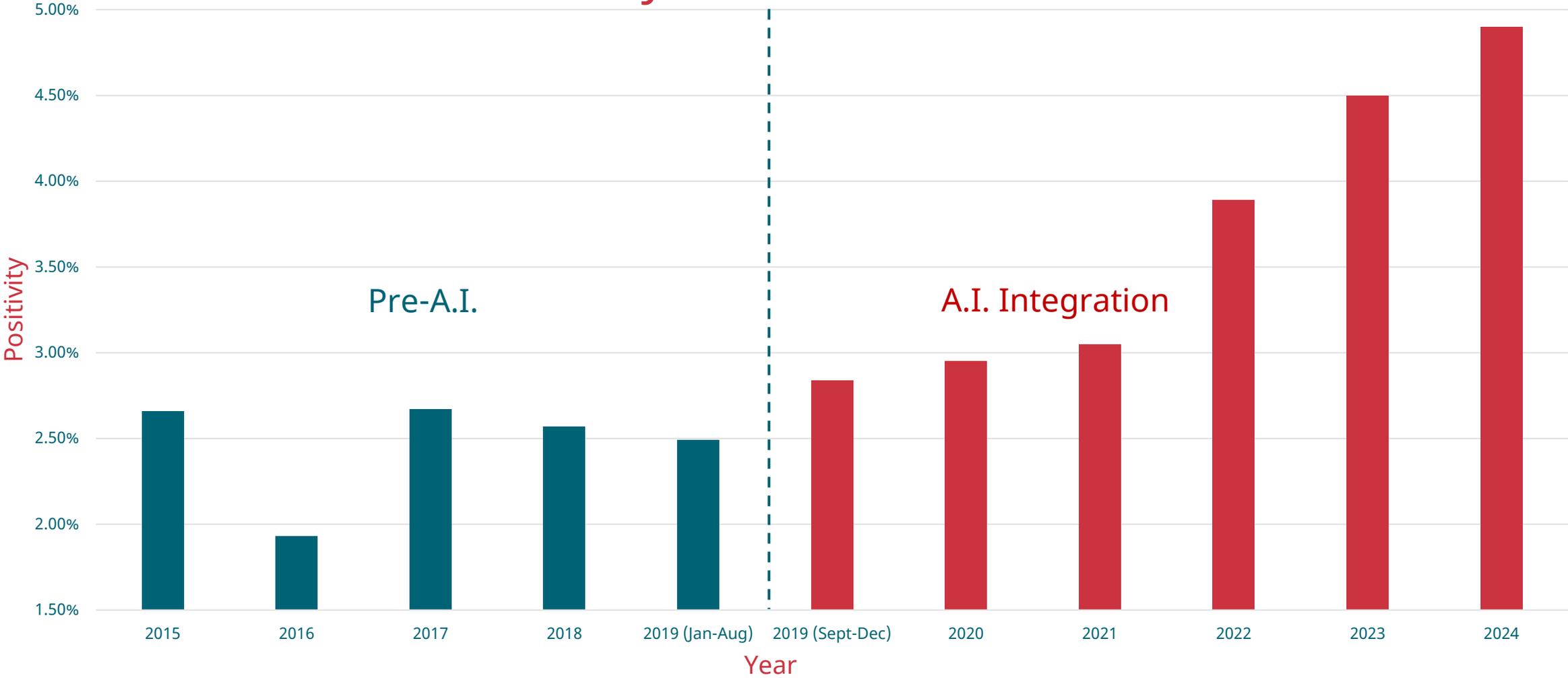
	Positive	Negative
Positive	86	2
Negative	1	104

Positive percent agreement: 98.88% [95% CI 93.76% to 99.98%]

Negative percent agreement: 98.11% [95% CI 93.35% to 99.77%]

Mathison BA. J Clin Microbiol. 2020 May 26;58(6):e02053-19

# Positivity Rate of O&P Exams



# Wet-mount Slide Scan & AI



# Training & Validation Set

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- **Fixatives:** Formalin, Alcorfix, TOTAL-FIX, EcoFix, SAF, Unifix
- **Origins:** ARUP, Mayo, CDC, Africa, Asia, Europe
- **Concentration methods:**  
Vertical filtration, ethyl acetate sedimentation, gravity filtration

# Accuracy: Initial

Target 10+ & 10 -

Mathison et. al.  
Nov 2025, *J Clin Micro*

Organism	Positive Accuracy	Negative Accuracy
<i>Dientamoeba fragilis</i>	9/10 (90%)	99/100 (99%)
<i>Giardia duodenalis</i>	10/10 (100%)	100/100 (100%)
<i>Endolimax nana</i>	10/10 (100%)	99/100 (99%)
<i>Cyclospora</i> species	10/10 (100%)	100/100 (100%)
<i>Entamoeba hartmanni</i>	10/10 (100%)	99/100 (99%)
<i>Blastocystis</i> species	15/15 (100%)	100/100 (100%)
<i>Chilomastix mesnili</i>	6/10 (60%)	99/100 (99%)
<i>Entamoeba</i> species	10/10 (100%)	99/100 (99%)
<i>Iodamoeba buetschlii</i>	10/10 (100%)	99/100 (100%)
<i>Cystoisospora belli</i>	10/10 (100%)	100/100 (100%)
<i>Balantioides coli</i>	10/10 (100%)	100/100 (100%)
<i>Ascaris lumbricoides</i>	9/10 (90%)	100/100 (100%)
<i>Trichuris trichiura</i>	8/10 (80%)	100/100 (100%)
Hookworm/ <i>Trichostrongylus</i> sp.	10/10 (100%)	100/100 (100%)
Fish Tapeworm	9/10 (90%)	100/100 (100%)
<i>Taenia</i> species	10/10 (100%)	100/100 (100%)
<i>Enterobius vermicularis</i>	10/10 (100%)	100/100 (100%)
<i>Strongyloides</i> species	9/10 (100%)	100/100 (100%)
<i>Rodentolepis nana</i>	10/10 (100%)	100/100 (100%)
<i>Hymenolepis diminuta</i>	10/10 (100%)	100/100 (100%)
<i>Schistosoma mansoni</i>	10/10 (100%)	100/100 (100%)
<i>Paracapillaria philippinensis</i>	10/10 (100%)	100/100 (100%)
<i>Paragonimus</i> species	10/10 (100%)	100/100 (100%)
<i>Fasciola</i> sp./ <i>Fasciolopsis buski</i>	10/10 (100%)	100/100 (100%)
<i>Clonorchis/Opisthorchis</i> spp.	10/10 (100%)	100/100 (100%)
<i>Schistosoma japonicum</i>	5/10 (50%)	100/100 (100%)
Total Agreement	250/265 (94.3%)	94/100 (94%)

# Accuracy: Resolved

66% increased diagnostic yield

Mathison et. al.  
Nov 2025, *J Clin Micro*

Organism	Positive	Negative
<i>Dientamoeba fragilis</i>	11/11 (100%)	102/103 (99%)
<i>Giardia duodenalis</i>	26/26 (100%)	103/104 (99%)
<i>Endolimax nana</i>	21/21 (100%)	102/103 (99%)
<i>Cyclospora</i> species	11/11 (100%)	103/104 (99%)
<i>Entamoeba hartmanni</i>	12/12 (100%)	102/103 (99%)
<i>Blastocystis</i> species	61/61 (100%)	103/110 (94%)
<i>Chilomastix mesnili</i>	13/16 (81%)	102/104 (98%)
<i>Entamoeba</i> species	49/49 (100%)	102/112 (91%)
<i>Iodamoeba buetschlii</i>	20/20 (100%)	102/104 (98%)
<i>Cystoisospora belli</i>	10/10 (100%)	103/103 (100%)
<i>Balantioides coli</i>	13/13 (100%)	103/103 (100%)
<i>Ascaris lumbricoides</i>	17/18 (95%)	103/104 (99%)
<i>Trichuris trichiura</i>	30/30 (97%)	103/103 (100%)
Hookworm/ <i>Trichostrongylus</i> sp.	26/26 (100%)	103/103 (100%)
Fish Tapeworm	10/10 (100%)	103/103 (100%)
<i>Taenia</i> species	10/10 (100%)	103/103 (100%)
<i>Enterobius vermicularis</i>	11/11 (100%)	103/103 (100%)
<i>Strongyloides</i> species	17/18 (94%)	103/104 (99%)
<i>Rodentolepis nana</i>	13/13 (100%)	103/103 (100%)
<i>Hymenolepis diminuta</i>	10/10 (100%)	103/103 (100%)
<i>Schistosoma mansoni</i>	10/10 (100%)	103/103 (100%)
<i>Paracapillaria philippinensis</i>	10/10 (100%)	103/103 (100%)
<i>Paragonimus</i> species	10/10 (100%)	103/103 (100%)
<i>Fasciola</i> sp./ <i>Fasciolopsis buski</i>	10/10 (100%)	103/103 (100%)
<i>Clonorchis/Opisthorchis</i> spp.	10/10 (100%)	103/103 (100%)
<i>Schistosoma japonicum</i>	9/9 <sup>2</sup> (100%)	103/103 (100%)
Misc. Small Protozoans <sup>1</sup>	22/22 (100%)	102/111 (92%)
Total Agreement	472/477 (98.9%)	Variable by target*

# Relative Limit of Detection

Mathison et. al.  
Nov 2025, JCM.

	<i>Entamoeba</i>					
	Series A [8 years exp.]		Series B [<1 year exp.]		Series C [3.5-4 years exp.]	
Dilution	Software	Technologist	Software	Technologist	Software	Technologist
Neat	Detected (n=185)	Detected	Detected (n=261)	Detected	Detected (n=141)	Detected
1:1	Detected (n=99)	Detected (n=2)	Detected (n=101)	Detected	Detected (n=120)	Detected
1:2	Detected (n=75)	Detected (rare)	Detected (n=70)	Detected (rare)	Detected (n=44)	Detected
1:4	Detected (n=25)	Detected (rare)	Detected (n=40)	Detected	Detected (n=26/27)	Detected
1:8	Detected (n=10)	Detected (n=2)	Detected (n=6)	Not Detected	Detected (n=16)	Detected
1:16	Detected (n=2/3)	Not Detected	Detected (n=3)	Not Detected	Detected (n=2)	Not Detected
1:32	Detected (n=2)	Not Detected	Detected (n=2)	Not Detected	Detected (n=1)	Detected (suspicious)
1:64	Detected (n=1)	Not Detected	Detected (n=1/2)	Not Detected	Detected (n=3)	Not Detected
1:128	Not Detected	Not Detected	Not Detected	Detected (possible, rare)	Not Detected	Not Detected
1:256	Not Detected	Not Detected	Detected (n=1?)	Not Detected	Not Detected	Not Detected
1:512	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected

# Relative Limit of Detection

Mathison et. al.  
Nov 2025, JCM.

	<i>Trichuris trichiura</i>					
	Series A [8 years exp.]		Series B [<1 year exp.]		Series C [3.5-4 years exp.]	
Dilution	Software	Technologist	Software	Technologist	Software	Technologist
Neat	Detected (n=49)	Detected	Detected (n=49)	Detected	Detected (n=45)	Detected
1:1	Detected (n=12)	Detected	Detected (n=15)	Detected	Detected (n=22)	Detected
1:2	Detected (n=10)	Detected	Detected (n=16)	Detected	Detected (n=11)	Detected
1:4	Detected (n=1)	Not Detected	Detected (n=5)	Detected (rare)	Detected (n=9)	Detected
1:8	Detected (n=1)*	Not Detected	Detected (n=1)*	Not Detected	Detected (n=1)	Not Detected
1:16	Not Detected	Not Detected	Detected (n=1)	Not Detected	Not Detected	Not Detected
1:32	Not Detected	Not Detected	Detected (n=1)	Not Detected	Not Detected	Not Detected
1:64	Detected (n=1)	Not Detected	Not Detected	Detected (rare)**	Not Detected	Not Detected
1:128	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
1:256	Detected (n=1)	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
1:512	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected

# Relative Limit of Detection

	<i>Ascaris lumbricoides</i>					
	Series A [8 years exp.]		Series B [<1 year exp.]		Series C [3.5-4 years exp.]	
Dilution	Software	Technologist	Software	Technologist	Software	Technologist
Neat	Detected (n=23)	Detected	Detected (n=23)	Detected	Detected (n=23)	Not Detected
1:1	Detected (n=3)	Detected	Detected (n=7)	Detected	Detected (n=12)	Detected
1:2	Detected (n=5)	Detected	Detected (n=1/2)	Detected	Detected (n=5)	Detected
1:4	Detected (n=1)	Not Detected	Detected (n=2)	Detected	Detected (n=1)	Not Detected
1:8	Detected (n=2)	Not Detected	Detected (n=1)	Detected (rare)	Not Detected	Not Detected
1:16	Detected (n=1)	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
1:32	Not Detected	Detected (n=1)*	Not Detected	Not Detected	Not Detected	Not Detected
1:64	Not Detected	Not Detected	Not Detected	Detected (possible, rare)*	Not Detected	Not Detected
1:128	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
1:256	Not Detected	Not Detected	Detected (n=1)	Not Detected	Not Detected	Not Detected
1:512	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected

Mathison et. al.  
Nov 2025, JCM.

# Relative Limit of Detection

Mathison et. al.  
Nov 2025, JCM.

	Hookworm					
	Series A [8 years exp.]		Series B [<1 year exp.]		Series C [3.5-4 years exp.]	
Dilution	Software	Technologist	Software	Technologist	Software	Technologist
Neat	Detected (n=2)	Not Detected	Detected (n=2)	Not Detected	Detected (n=4)	Not Detected
1:1	Detected (n=2)	Detected (n=1)	Detected (n=2)	Detected (rare)	Detected (n=1)	Not Detected
1:2	Not Detected	Not Detected	Not Detected	Not Detected	Detected (n=1)	Not Detected
1:4	Not Detected	Not Detected	Not Detected	Not Detected	Detected (n=1)	Not Detected
1:8	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
1:16	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
1:32	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
1:64	Not Detected	Not Detected	Not Detected	Not Detected	Detected (n=1)	Detected
1:128	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
1:256	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected
1:512	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected	Not Detected

# AI For Parasitology Value Added

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- Excellent screening tool for positive & negative slides
- Excellent performance for all pathogens in models
- Increased diagnostic yield vs manual O&P (66% ↑)
- Increased analytic sensitivity vs humans
- Less scope time



Blaine Mathison, BS, M(ASCP)



**Is that realistic for others?**

# Pramana spectralHT = \$\$\$



# Piggy Backing @MaineHealth?

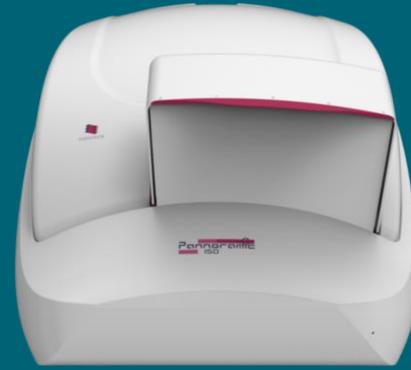


120,000 (ARUP) vs 4500 (MH)

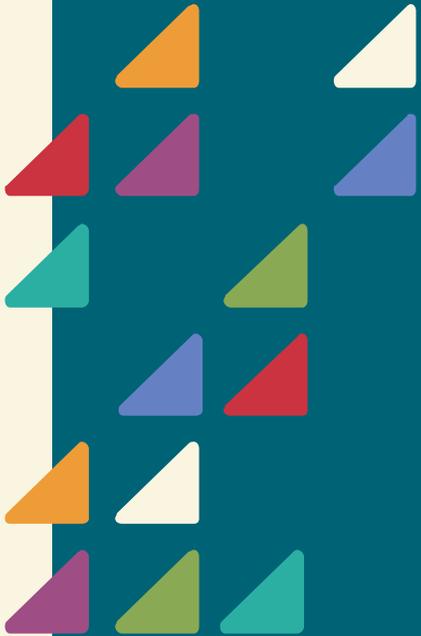
Trichrome ✓

Wet-mount X

Shift offset?

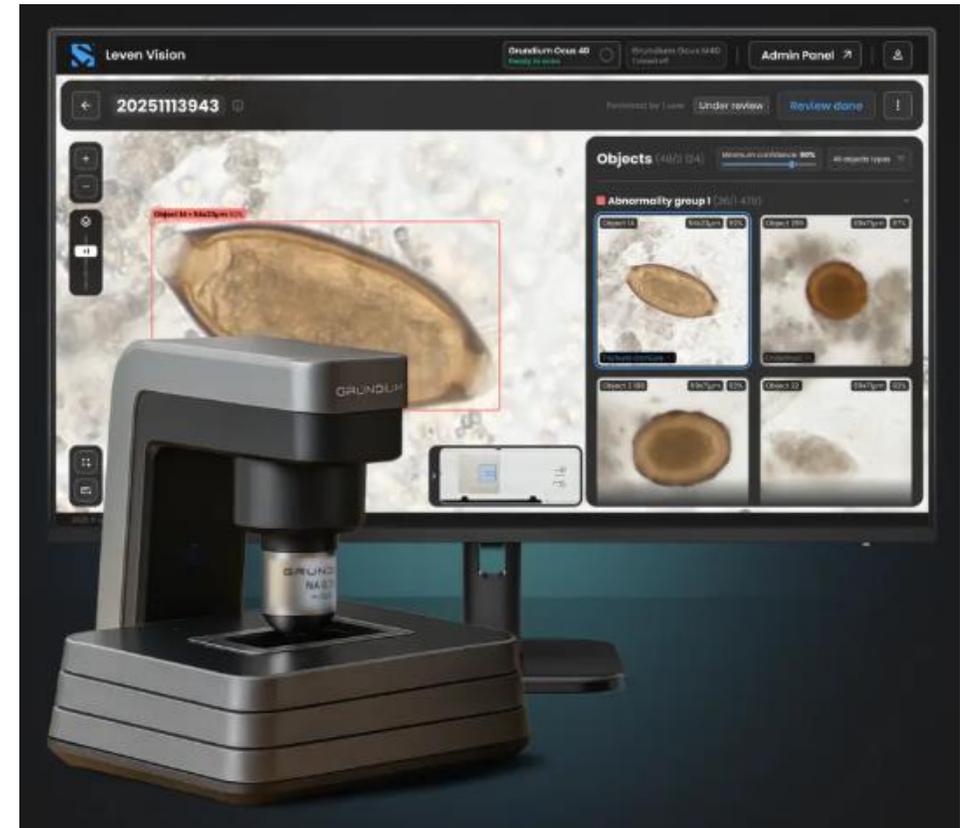


# Consider Other Scanners



# Parascout

- Currently O-US
- Smaller labs
- Inexpensive scanner
- Wet-mount and trichrome
- No published studies yet
  - ESCMID poster 2026



<https://www.leven.vision/>

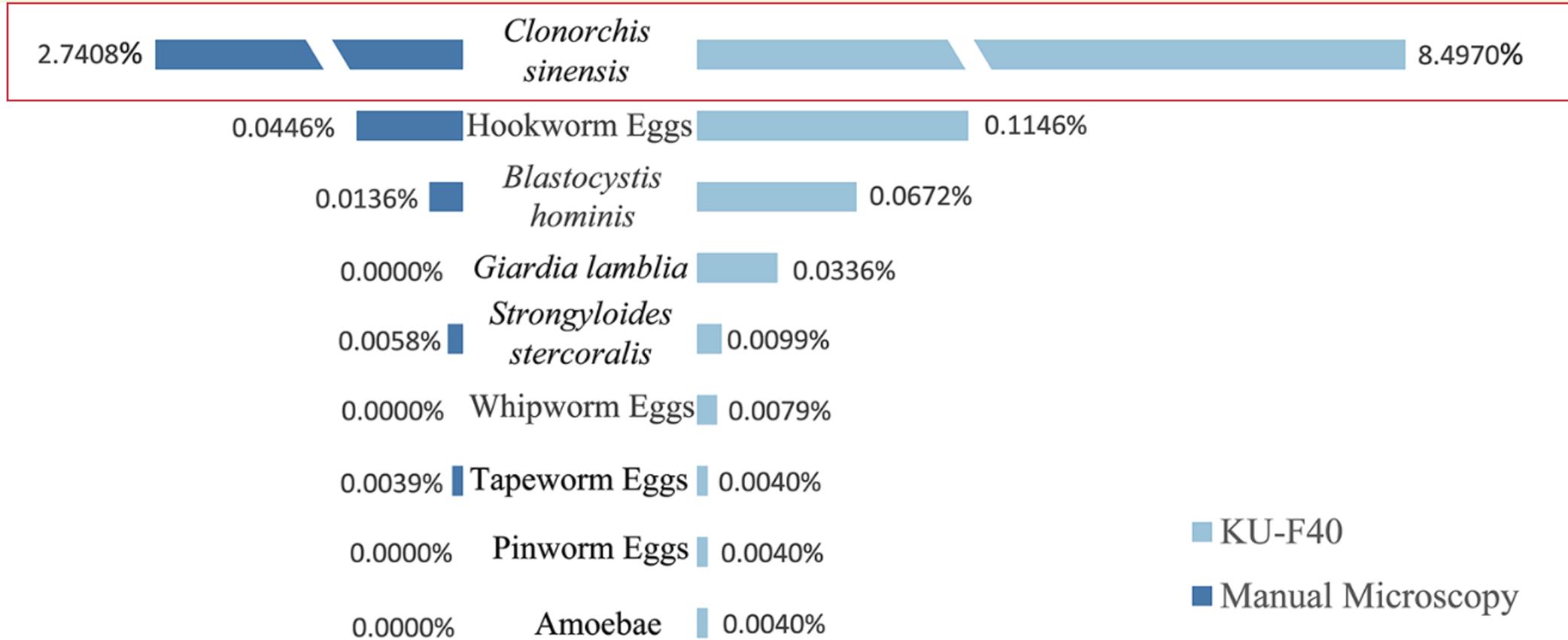
# KU-F40 Fully Automated Feces Analyzer

- Currently O-US
- Wet-mount only
- High throughput
- Flotation & sedimentation
  - +/- iodine



<https://www.keyubio.com>

# KU-F40 System retrospective study

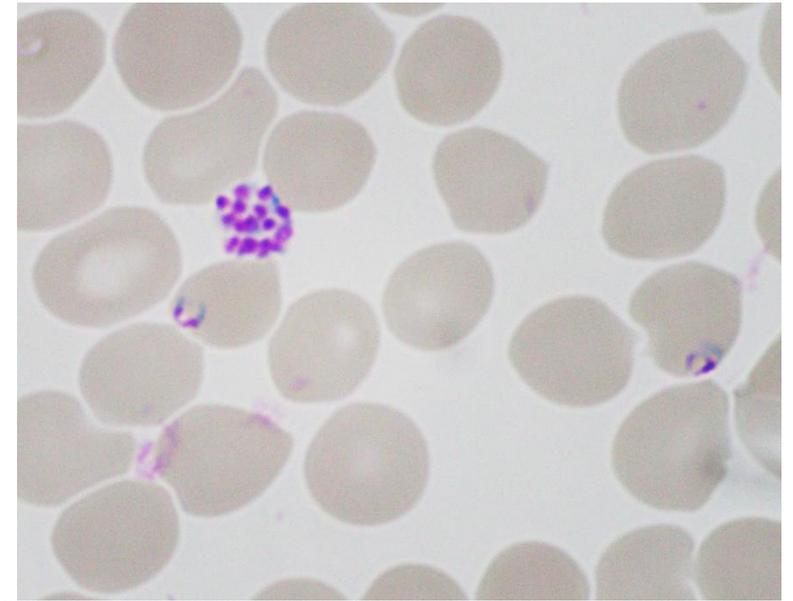


Tornado diagram for parasite (egg) species detection levels by manual microscopy and KU-F40. Note: Due to the significant difference in detection levels between *Clonorchis sinensis* eggs and other parasites (eggs), an open section is used to represent the omitted portion of the actual detection level

Huang et al. Nature Scientific Reports 15, 2025

# Blood smears

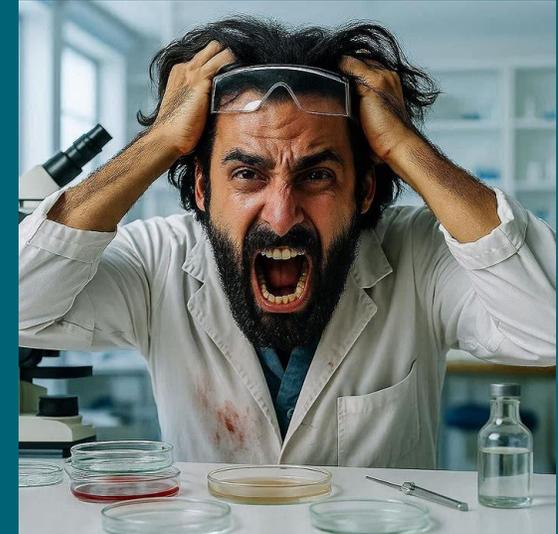
- Giemsa stains for malaria
- **Early findings:** Imperfect sensitivity, high specificity (for *Plasmodium* sp.)
- **Challenges**
  - Species-level ID is poor
  - Does not detect other blood parasites
- **Commercial example(s)** – EasyScan GO, miLab MAL



# A.I. in Microbiology: Here or Close

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- Culture plate interpretation – colony predictions
- Gram stain interpretation
  - Nugent
- AFB stains
- AST interpretation (FDA cleared)
- Pap smear interpretation (FDA cleared)

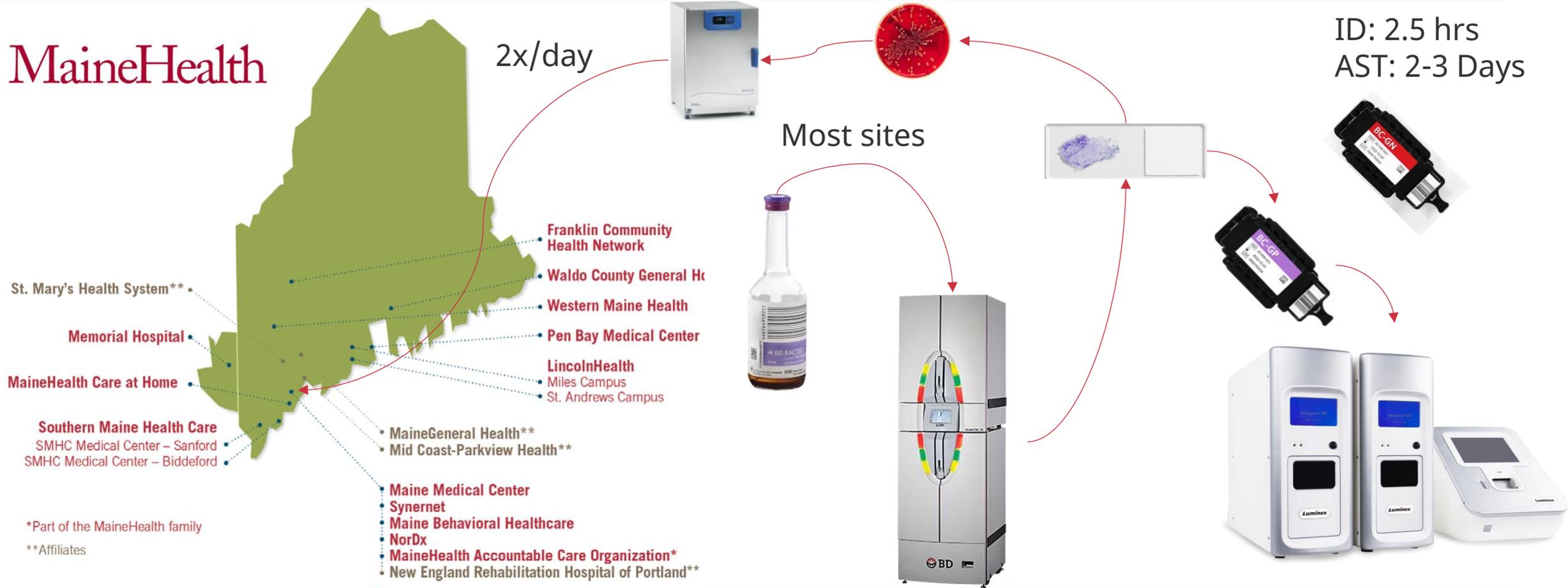


**Thank you for being a valuable customer...we are now closed.**

\*Disclaimer: Many IVD manufacturers will be mentioned by name. No endorsements are intended

# MaineHealth Blood Culture Beauty

MaineHealth



\*Part of the MaineHealth family  
\*\*Affiliates

# Maine Medical Center – Portland/B-S, 929 bd



# Maine Medical Center Blood Culture Beauty

MaineHealth

Southern Maine Health Care

Maine Medical Center

NorDx



7 Miles  
1/Hr



Page Stewardship  
on call

1 hr - ID  
6 hr - AST

### Rapid Blood Culture Diagnostics for Ambulatory Management of Uncomplicated Gram-Negative Bloodstream Infections

and phenotype. During the study period, all blood cultures with GNB on initial Gram stain were tested with Accelerate

the patients were prescribed an antimicrobial for which the discrepancy was present. In 2 cases, the rapid phenotype

**Martina Boda,<sup>1,✉</sup> Kristina E. Rokas,<sup>1</sup> Christina F. Yen,<sup>2</sup> Daniel J. Diekema,<sup>2,✉</sup> and Nicholas J. Mercuro<sup>1,✉</sup>**

<sup>1</sup>Department of Pharmacy, MaineHealth Maine Medical Center, Portland, Maine, USA; and <sup>2</sup>Division of Infectious Diseases, MaineHealth Maine Medical Center, Portland, Maine, USA

With these limitations in mind, our findings may support that a subgroup of adults who are stable with GNB BSI from a known source (primarily urinary) and have an early clinical response to empiric therapy could safely switch to an oral antibiotic based on rapid phenotype to facilitate early discharge or prevent admission. These data support the conclusions from Ventres et al that rapid phenotypic results can optimize patient outcomes when coupled with antimicrobial stewardship [1]. These hypotheses warrant confirmation in a prospective randomized trial.

# Accelerate Diagnostics Files for Chapter 11 Protection and Agrees to Terms to Sell Substantially All Assets



NEWS PROVIDED BY

**Accelerate Diagnostics, Inc.** →

May 08, 2025, 09:00 ET

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<https://www.prnewswire.com/news-releases/accelerate-diagnostics-files-for-chapter-11-protection-and-agrees-to-terms-to-sell-substantially-all-assets-302450047.html>

Bruhyyy!!!



June 6, 2025

“Can we set up a 45 minute call to present the next generation Wave platform from Accelerate?”

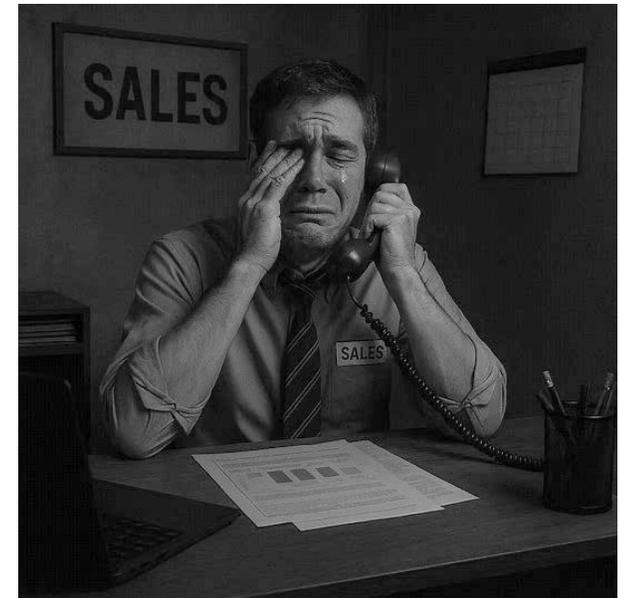


# The Critical Call

- Aug 4 - "Sorry. No more reagents will be available."
- Aug 5 - ~2 weeks supply remain on hand (est. T.O.D. 8/23/2025)
  - Prior order had been "delayed in fulfillment"
- Aug 6 - Not enough controls to use all the supplies

...revive Gram Negative Verigene and IT build (STAT!)

- Aug 16 - Last Pheno run
- August 17<sup>th</sup> - Verigene GN Panel goes live (again) for MMC-P & MMC-B



# Accelerate Diagnostics completes asset sale and moves toward liquidation plan

Investing.com | SEC Filings

Published 08/18/2025, 05:09 PM



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Accelerate Diagnostics completes asset sale and moves toward liquidation plan

<https://www.investing.com/news/sec-filings/accelerate-diagnostics-completes-asset-sale-and-moves-toward-liquidation-plan-93CH-4198694>

acceleratediagnostics.com

is parked free, courtesy of Godaddy.com

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“Is there a chance the Pheno could come back?”

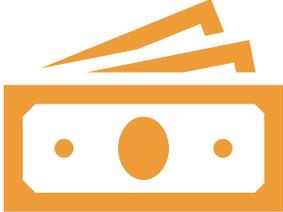
“Should we store the instruments just in case...”



# The Fallout (Negative)



Increased TTR



Increased LOS\*



Increased time on broad spectrum Abx\*

\*DISCLAIMER: Full data pending: perception & limited data analysis from antimicrobial stewardship

# The Fallout (Positive)



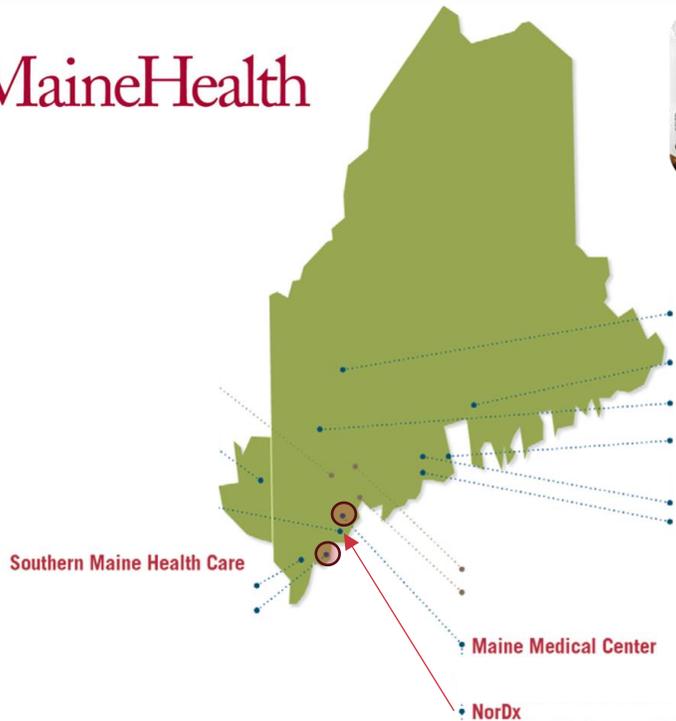
More space



Easier Workflow

# Where We Stand Today

MaineHealth



7 Miles  
1x/Hr



2.5 hr - ID  
2-3 day - AST

Page Stewardship  
on call

# What Immediate Options Did We Discuss?

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Q-Linea

Reveal

Require separate ID Procedure  
(Verigene ID's not 100% compatible)  
No rapid MALDI currently

# Just One Story...

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T2  
Biosystems

Qvella

Selux Dx  
(?)

\*\*\*DISCLAIMER: This is NOT an exhaustive list\*\*\*

# So Many More Products Coming...BUT

- Can you risk it?
- PAMA + cost increase?
- Are we at odds with ourselves?
- Do we just have to wait it out...

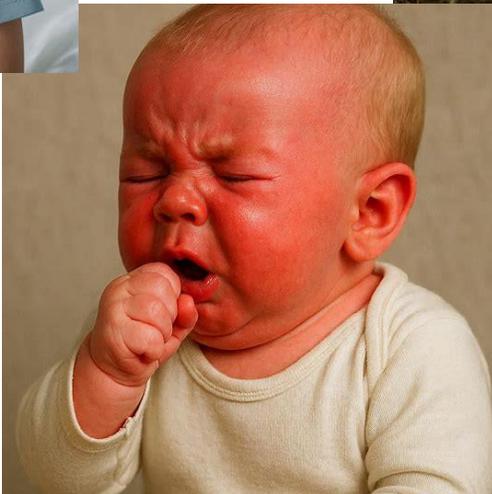




**Not malaria resurgence  
...and not funny**



# Re-emergence or emergence of Pathogens



# MUMPS... DON'T RISK IT

Do you have a son or daughter starting or returning to university or college in the Fall? They could be at risk for contracting mumps. Contact the institution or your family doctor for more information on how your child can get a free MMR vaccination.

  
NOVA SCOTIA  
Health Promotion  
and Protection

[www.gov.ns.ca/hpp/mumps](http://www.gov.ns.ca/hpp/mumps)

**Jill got the MUMPS.  
Then Jill partied  
with her friends.  
Poor Jill.  
Now all  
her friends  
hate her.**

Mumps means 9 days of no parties,  
no friends, no classes.  
Intense pain in cheeks and throat.  
Difficulty chewing or swallowing.  
Weakness. Fever.  
Mumps can cause sterility,  
meningitis and deafness.

For information about the free mumps immunization,  
your eligibility and clinics in your area, please call:  
Calgary Health Link (403) 943-5465  
Edmonton Health Link (780) 408-5465  
Health Link Alberta (toll-free) 1-866-408-5465  
or visit: [www.health.alberta.ca](http://www.health.alberta.ca)

**Protect yourself  
against the mumps.**

**Get IMMUNIZED**



Adapted with permission from Province of Nova Scotia.

**The swelling's  
not so bad.  
It's the severe  
testicular  
pain...**

Mumps means 9 days of no parties,  
no friends, no classes.  
Intense pain in cheeks and throat.  
Difficulty chewing or swallowing.  
Weakness. Fever.  
In some cases, severe testicular  
pain and swelling.  
Mumps can cause sterility,  
meningitis and deafness.

For information about the free mumps immunization,  
your eligibility and clinics in your area, please call:  
Calgary Health Link (403) 943-5465  
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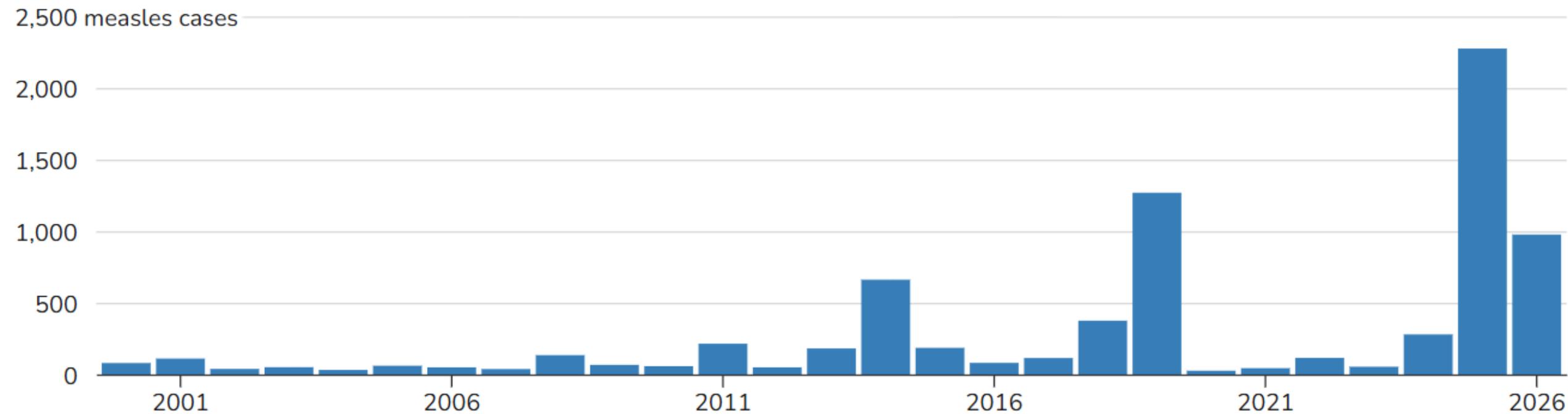


Adapted with permission from Province of Nova Scotia.



<https://www.environmentandsociety.org/arcadia/mumps-post-secondary-environment-targeted-advertising-2007-2008-alberta-mumps-vaccination>

# Guess Who's Back? Back again?



<https://www.cdc.gov/measles/data-research/index.html>

# Measles' back, tell a friend

- 2025 AI model fitting for each state based on extrapolated county data for <5 y.o.
  - Electronic parental response

Percent of children vaccinated by age 24 months (1 dose or more): 90.8% (birth year 2016)

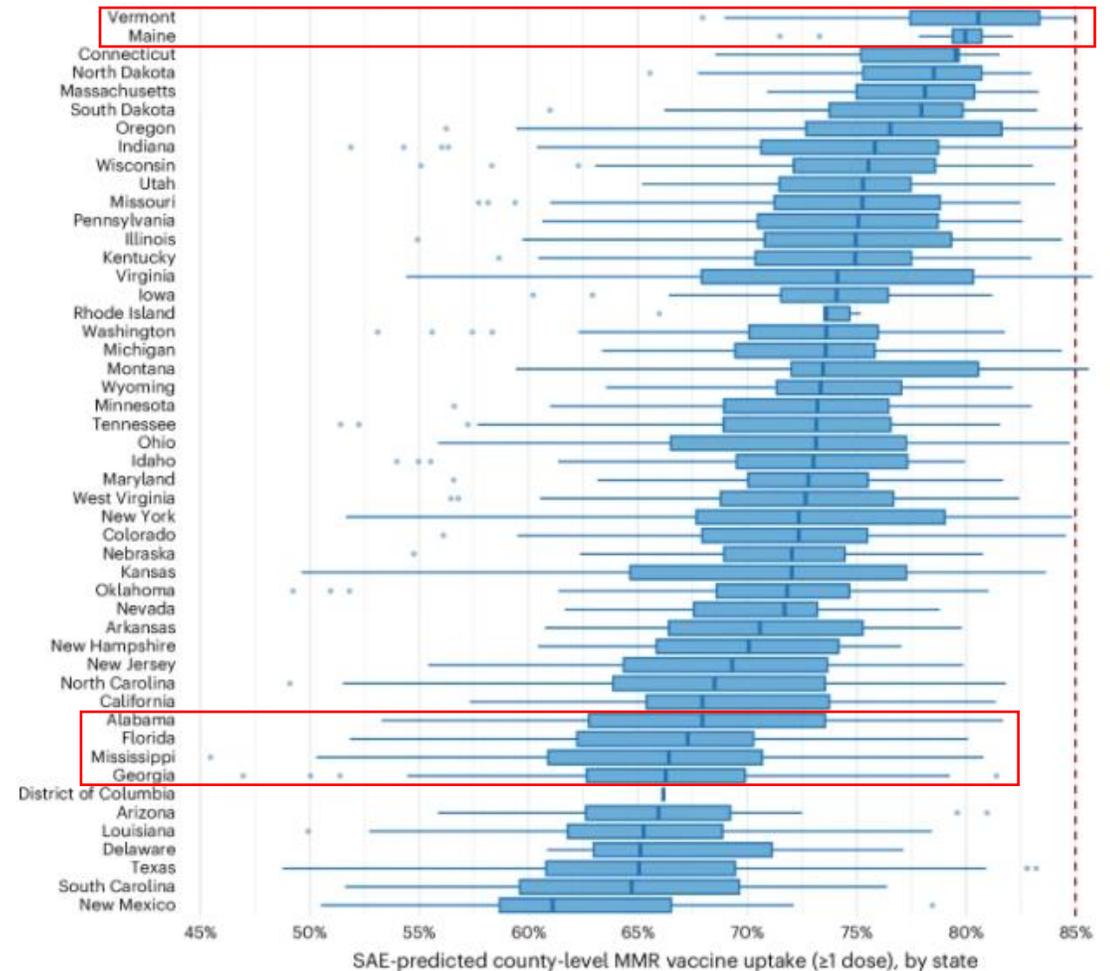
Percent of adolescents ages 13–17 years vaccinated (2 doses or more): 91.9% (2019)

- \*92-95% needed for herd immunity
- VT & ME are highest and still not high enough

Zhou et al. Nature Health volume 1, pages 138–144 (2026)

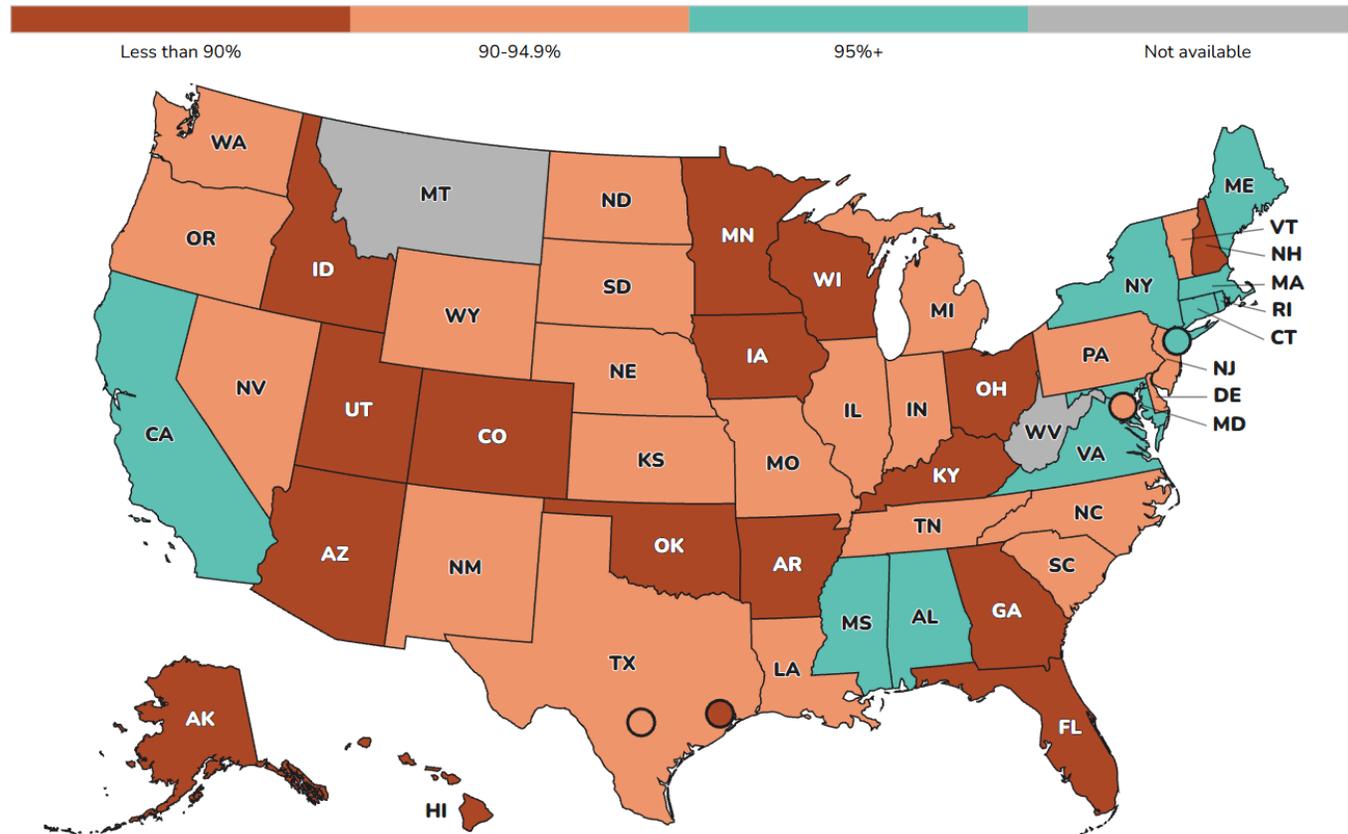
<https://www.cdc.gov/nchs/fastats/measles.htm>

Fig. 2: County-level estimates of MMR vaccine uptake ( $\geq 1$  dose) among US children under age 5 by state.



# CDC Data: Kindergarten Vaccination Rates 2024-25

Percent Vaccinated



Provider & school entry phone surveys

<https://www.cdc.gov/measles/data-research/index.html>

# What is Driving This?

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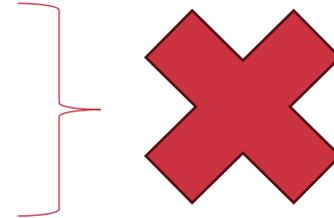


- The Wakefield Effect
- COVID disruptions
- COVID vaccine politics
- Vaccine hesitancy
- Social media
- “Fake News”
- Real news

# Measles and Mumps In Normal Times



- Historically: Reference Labs & PHLs
- Mumps – IgM & NAAT
- Measles – IgM & NAAT



# These Are Not Normal Times...

- Reference Labs & PHL capacity?
  - Surge capacity
- TAT & appropriateness?
  - Unicorn cases
- LDTs...(sigh...sorry)
  - NAAT? Maybe
  - IgM? Doubtful – IFA, MAC-ELISA



# Natural Infection vs Vaccine Derived

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- Live attenuated vaccine – MMR
- Vaccine derived infections rare, but previously predictable
- IgM with age restrictions for use?
  - 12-24 months interp. ???
- PCR for two targets?

# A Complicated Problem with a Simple Solution

- 2023-2025 CDC Surge Capacity Project
  - PHL resources in question
- Hologic Panther Open access LDT
- 3 month data
  - 525 tests, 491 patients
  - 16 positives
    - 10 vaccine-derived
    - 6 wild-type

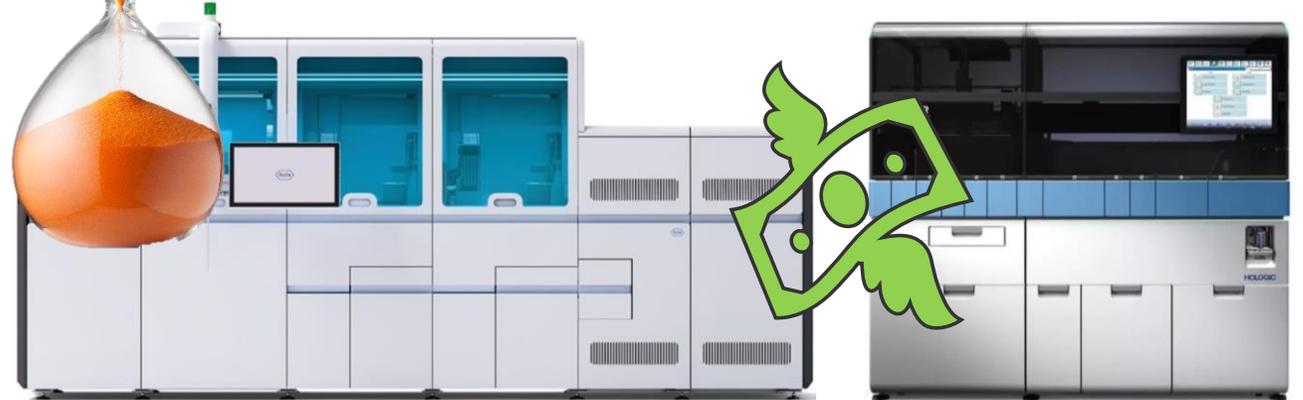
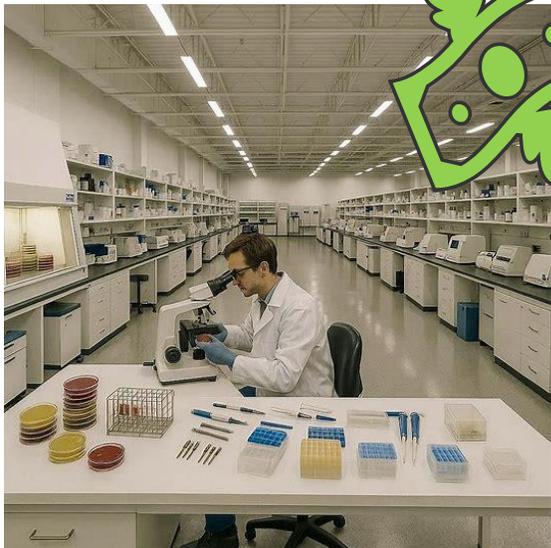
ARUP now offers a molecular measles virus test that distinguishes between disease-causing and vaccine strains of the virus.



Anderson C, Rawal M, Hymas W, Slev P, Bradley BT. J Clin Microbiol. 2026 Jan 14;64(1):e0140225.

Benjamin T. Bradley, MD, PhD

# What Happens if This Continues?



# Challenges or Opportunities?

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- New technologies: risk...maybe a win?
- Losing technology: sucks but...opportunity for change?
- Emerging pathogens: diversify & grow your lab's value? Or drown?
  
- Nothing is "changing"...it's always been this way.
  - The scale & pace has changed



The Future? Clear as...



# Acknowledgments

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## MaineHealth

- **NorDx Microbiology Lab**
- **Antimicrobial Stewardship**
  - Nick Mercurio
  - Christina Yen
  - Kristina Connolly
- **Infectious Disease**
  - Dan Diekema

## ARUP

- **Blaine Mathison**
- **Ben Bradley**

## ARUP Parasitology Lab

- **Everyone!**

## TechCyte

- **John Walker**
- **Ben Cahoon**

# Thank You



Questions?

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