#5579

June 14, 2024

Artificial Intelligence (AI) for use with Identifying Urine Culture Results that can be Automatically Released to the Patient's Records without Staff Intervention.

Ross J. Davidson, **Conor Porter, Charles Heinstein, Audra Russell-Tattrie, Joline Head, Glenn Patriquin**

Nova Scotia Health Authority, Halifax, NS, Canada

•Nova Scotia Health Authority
•Division of Microbiology
•Room 309 Mackenzie Building
•5788 University Avenue
•Halifax, Nova Scotia B3H 1V8
•Ross.Davidson@nshealth.ca

Introduction

Many laboratories, while historically cost conscious, have strived to deliver accurate results to their clinician colleagues as cost effectively as possible. However, the last half decade, and certainly post-pandemic, has seen laboratories struggle to manage their laboratory operations in an era where human resources are now at a premium.
In response, many laboratories are exploring "Microbiology Laboratory Automation" (MLA) instruments to supplement routine analysis allowing technologists to be redeployed to other areas of the laboratory or to perform more complex or esoteric tasks.
Further enhancing the MLA's ability to automate the work- flow of processing specimens is the advancement of artificial intelligence (AI) allowing these instruments to report both culture negative and positive results without human intervention.
We assessed Copan's PhenoMATRIX (PM) artificial intelligence software (Copan, Brecia, Italy) for its ability to accurately assign urine culture results to categories of No Growth (NG), No Significant Growth (NSG; <10 colonies, single isolate), or *Escherichia coli* (EC) for potential automatic release of results to the clinician.

Methods

Urines were cultured onto BD BBL CHROMagar Orientation agar (CHROMagar, Paris, France) and incubated for 16 hours in Copan's WASPLab microbiology laboratory automation system in ambient air at 37ºC. Urine specimens were assessed by Copan's PhenoMATRIX (PM) artificial intelligence software or manually (M) by laboratory technologists. Culture results were interpreted by PM as 1) No Growth (NG), 2) No Significant Growth (NSG), 3) *E. coli* (EC), or 4) other growth. Laboratory technologists also read the same urine culture images and their 'Manual' (M) results were compared to PM results.

Results

A total of 2,972 urine cultures were processed and evaluated; of these 1701 were categorized as NG, NSG, or EC.

Initial agreements between cultures read manually by technologists and those read by the PhenoMatrix were:

NG: 98.9%
NSG: 96.8%
EC: 98.6%

Combining NG and NSG values together, the percent agreement increased to 99.8%.

Eight (0.47%) cultures had discrepant results (Table 1).

After post-discrepancy analysis, there was a 99.9% agreement for NG and NSG combined and a 99.7% agreement for *E. coli.*

Discussion

Urine cultures are one of the microbiology laboratories high volume tests that occupy significant technologist time.

This study demonstrated that the PhenoMatrix can both process and reliably interpret urine cultures.

Combining Copan's WASPLab with PhenoMatrix artificial intelligence software allows cultures with NG, NSG or *E. coli* to be automatically released to the clinician without further technologist intervention.

Table 1. Discrepancies between Manual and PhenoMatrix Interpretation

Manual Image interpretation	PhenoMatrix Interpretation	Post Discrepant Analysis	Correct Result
NSG	EC	> 100,000 EC < 10,000 NSG	PM correct
NSG	EC	NSG	M correct
**Mixed growth	EC	> 100,000 EC	*NA
Mixed growth	EC	> 100,000 EC 60,000 Enterococci	*NA
Mixed growth	NSG	NSG	PM correct
Pure growth	NG	Yeast	M correct
Pure growth	NG	NG	PM correct
Pure growth	EC	EC	*NA

*NA (neither incorrect)
** Two morphotypes of *E. coli*

Conclusion

Phenomatrix artificial intelligence combined with Copan's MLA could potentially free up significant technologist time allowing the re-deployment of technologists to other areas of the laboratory.