

REDUCED INCUBATION TIME OF CHROMOGENIC SPECIFIC MEDIUM COMBINED WITH LAB AUTOMATION AND ARTIFICIAL INTELLIGENCE BASED SOFTWARE FOR A FASTER TIME-TO-RESULT OF URINE SPECIMENS

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- Urinary Tract Infections (UTI) are involved in 40% of healthcare-associated infections and are increasingly caused by drug-resistant bacteria. Reporting of rapid bacteriological results is crucial (with reliable identification and antimicrobial susceptibility)
- Automated incubation and imaging are already performed on urine cultures on WASPLab[®] system in several microbiology clinical laboratories combined with chromogenic CHROMID[®] CPS Elite media and empowered by artificial intelligence-based software PhenoMATRIX[®] to ensure rapid results.
- BIOESTEREL microbiological laboratory processes up to 1,300 urine samples per day and is newly equipped with WASPLab[®] /PhenoMATRIX[®] systems. We wanted to go further with early reading at 10-12h on urine samples to demonstrate faster reliable results.
- The purpose of this communication is to demonstrate that early incubation/reading time on CHROMID[®] CPS Elite media empowered by the late WASPLab[®] /PhenoMATRIX[®] solution enables a faster Time-To-Result and Turnaround time of urine samples.



STUDY DESIGN

Methodology

- **730** urine specimens were inoculated onto CHROMID®CPS Elite media and incubated into the WASPLab® at 10h-12h-16h* and to 18h standard incubation time
- Visual reading of the images were performed at each incubation time through WASPLab web App to establish recovery rate of *Escherichia coli* (ECO), *KESC* group (*Klebsiella spp*, *Enterobacter spp*, *Citrobacter spp*, *Serratia spp*), *Enterococcus species* and *PMP* group (*Proteus spp*, *Morganella spp*, *Providencia spp*)
- PhenoMATRIX® algorithm was evaluated at 12h onto 974 specimens **

Evaluation of the performance

Based on multiple rules, we evaluated the results on :

- the recovery rate of *E.coli*, *KESC*, *Enterococcus* and *PMP*
- the agreement on the Clinical status of the specimen
- the performance of PhenoMATRIX® for the detection of negative specimens and positive *E.coli* and *KESC* group

*Current incubation time at BIOESTEREL

**second evaluation realized after the implementation of WASPLab® in routine

RESULTS

- Among the 730 specimens, a recovery rate at 10h of **89.9% for *E. coli***, 47,7% for *Enterococcus*, 60,8% for *KESC* and 63,2% for *PMP*, reaching respectively **98,6%**, 82,2%, 80,4%, and 79% at 12h (Table 1)
- Agreement on the clinical status of the specimen of 89,5%* at 10h reaching **93,6%** at 12h (Table 2). False negative at 10-12h were double checked with the results of the routine leading to an final agreement of :

- ✓ 97% at 10h
- ✓ 98,5% at 12h

- PhenoMATRIX® agreement of 99,7% for the detection of negative specimens* and a recovery rate of :

- ✓ 98,1% for *E.coli*
- ✓ 94,4% for *KESC*

showing the high sensitivity of the system (Table 3)

* Two remaining discrepant results due to micro-colonies not taken into account in the rules of PhenoMATRIX®

Table 1: Recovery rate

Species	Recovery	Incubation time		
		10h	12h	16h
ECO	%	89.86% (195/217)	98.62% (214/217)	100% (217/217)
	IC95%	[85.13 ; 93.21] %	[96.01 ; 99.71] %	[98.31 ; 100.00] %
Enterococcus	%	47.66% (51/107)	82.24% (88/107)	99.07% (106/107)
	IC95%	[38.45 ; 57.04] %	[73.92 ; 88.33] %	[94.90 ; 99.98] %
KESC	%	60.78% (31/51)	80.39% (41/51)	100% (51/51)
	IC95%	[47.09 ; 72.97] %	[67.54 ; 88.98] %	[93.02 ; 100.00] %
PMP	%	63.16% (12/19)	78.95% (15/19)	94.74% (18/19)
	IC95%	[41.04 ; 80.85] %	[56.67 ; 91.49] %	[75.36 ; 99.06] %

Table 2: Clinical status agreement

	18h			Agreement	False negative			False positive		
	NEG	POS	POLY		vs POS 18h	vs POLY 18h	vs all specimens	vs NEG 18h	vs POLY 18h	vs all specimens
10h	NEG 309	55	1	89.5% (653/730) [87.01 ; 91.48] %	14,0%	3,8%	7,6%	1,0%	69,2%	2,9%
POS	3	337	18							
POLY	0	0	7							
12h	NEG 312	36	1	93.6% (683/730) [91.54 ; 95.12] %	9,2%	3,8%	5,0%	0%	38,5%	1,4%
POS	0	356	10							
POLY	0	0	15							
16h	NEG 312	4	0	99.2% (724/730) [98.22 ; 99.70] %	1,0%	0%	0,5%	0%	7,7%	0,3%
POS	0	388	2							
POLY	0	0	24							

Table 3: PhenoMATRIX

Status	Number	%total	Agreement
Negative	591	60,68%	99,66%
Ecoli	107	10,99%	98,13%
KESC	18	1,85%	94,44%

CONCLUSION

8 hours Faster Time to results in comparison to the standard routine urine workflow with a **high recovery rate of *E. coli* on CHROMID® CPS Elite media**

Improved turnaround time with real added value for the right patient therapy setting.

High reliability and accuracy for patients results due to limited risk of false negative

Best sensitivity of PhenoMATRIX® intelligence algorithms at early reading time for the detection of positive specimens compared to human visual reading

Artificial intelligence brings a real added value for the management of urine specimens at early reading time



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