Increased Recovery of Pathogens Using Copan's WASPLab Laboratory Automation in Microbiology

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REVISED ABSTRACT

Objective: The objective of this study was to observe the effects of using Copan's WASPLab Laboratory Automation on the recovery and detection of pathogens from clinical specimens.

Methods: A wide range of specimens were processed on WASPLab using a customized automation platform (inoculation, incubation in Smart Incubators, and digital image reporting). Consecutive specimens were processed in real-time simultaneously and blinded on WASPLab and manually according to standard operating procedures. Analytical and post-analytical processes followed incubation of plates in the Smart Incubators and manually in off-line incubators. Identification of pathogens was achieved using a combination of mass spectrometry, Vitek2, chromogenic media, and standard biochemical tests.

Results: A total of 874 specimens were evaluated in parallel comparing WASPLab automation with routine methods. For urine cultures (n=264) using Orientation CHROMagar, 16% (n=43) of specimens had positive cultures (≥ 10 x 10^6 CFU/L) using WASPLab vs. no growth with manual processing. 18/43 (42%) grew significant pathogens. Faecal specimens (n=58) using standard enteric media, 19% (n=11) were screened positive using WASPLab vs. manual processing, however all were non-pathogenic (*H. alvei*, *M. morganii*, *P. aeruginosa*, and *C. amalonaticus*). For sterile fluids (n=35), additional pathogens (*E. coli* and *Enterococcus faecalis*) were isolated from abscess fluid recovered from THIOL broth processed on WASPLab. For vaginal/rectal specimens (n=25), one additional pathogen (GBS) was detected using LIM broth enrichment and chromogenic agar sub-culture by WASPLab vs. manual processing. Surveillance specimens [MRSA (n=251), VRE (n=220), and ESBL (n=21)] were tested using various chromogenic and selective agars. A 4% increase (n=19) of specimens had positive cultures using WASPLab vs. manual processing.

Conclusion: Using Copan's WASPLab automation resulted in an increase in pathogen recovery when compared to manual processes. This increase can be attributed to the standardized inoculation of specimens, consistent streaking and isolation of colonies when compared to manual processes. With the immediate incubation of media following automated processing, the uniform temperatures and atmospheric conditions maintained in the Smart Incubators creates a favorable environment conducive to bacterial growth and detection.

INTRODUCTION

Copan WASP® (Walk-Away Specimen Processor) is an automated instrument for liquid sample processing for Microbiology. The WASP provides a comprehensive system which encompasses all aspects of automated specimen processing, planting and streaking, Gram slide preparation and enrichment broth inoculation. WASP® streamlines operations and maintains its position as the only Walk-Away Specimen Processor capable of managing all aspects of specimen setup (**Figure 1**).

Copan WASPLab™ (WL) is a sophisticated barcode driven microbiology specimen processor and work-up system connected with WASP using a conveyor track. WL moves samples from front end processing to full specimen management, automated incubation, and digital Microbiology (**Figure 1**).

OBJECTIVES

The purpose of this study was to observe the effects of using Copan's WASPLab™ Laboratory Automation on the recovery and detection of pathogens from clinical specimens.
Specifically looking at the effects resulting from automating the setup, processing, incubation and reporting of a variety of specimen types while simultaneously comparing the manual processes of setup, processing, incubation and reporting.

MATERIAL & METHODS

A total of 874 specimens were evaluated in parallel comparing WASPLab automation with routine methods. A wide range of specimens were processed on WASPLab using a customized automation platform (inoculation, incubation in Smart Incubators, and digital image reporting). Consecutive specimens were processed in real-time simultaneously and blinded on WASPLab and manually according to standard operating procedures. Analytical and post-analytical processes followed incubation of plates in the Smart Incubators and manually in off-line incubators. Identification of pathogens was achieved using a combination of mass spectrometry (bioMerieux), Vitek2, chromogenic media, and standard biochemical tests.

Plate Media:

- MRSA chromogenic media: MRSA Select – Bio-Rad
- VRE chromogenic media: Colorex – Dalynn (Alere)
- Urine: Orientation CHROMagar - Becton-Dickinson
- ESBL: MacConkey Agar with 2 ug Cefpodoxime
- GBS chromogenic media: GBS Select – Bio-Rad
- Enteric media: Sorbitol MacConkey, Cefsulodin Irgasan Novobiocin Agar, Hektoen Enteric Agar, Campylobacter Selective Agar (Preston)
- Standard plating media: Sheep Blood Agar, MacConkey Agar, Chocolate Agar, Brucella Agar, Bacteroides Bile Esculin Agar

Tube Media: Copan

- THIOL (Thioglycollate) Broth
- LIM Broth

RESULTS & DISCUSSION

A total of 874 specimens were evaluated in parallel comparing WASPLab Laboratory Automation with routine methods. These results were compared to those obtained by conventional, manual cultures. Samples tested were from clinical areas including: pediatric, oncology, nephrology, surgical, antenatal, long term care and servicing 14 hospital sites.
Overall, there was an increase in organism detection by 9% (76/874) when compared to standard, conventional culture methods with 46% (35/76) of these being pathogenic in nature (**Table 1**).
Specifically for urine cultures, there was an increased prevalence [58% (25/43)] of mixed growth representing normal urogenital and skin flora. Similarly for VRE surveillance cultures, there was an increased prevalence [42% (5/12)] of breakthrough vancomycin sensitive enterococci. Overall, the increased prevalence can be attributed to the improved isolation of colonies by WASP processing and the favorable growing conditions inside the SMART incubators. During off-line, non-automated incubation of cultures, there is the continuous interruption of incubation and bacterial growth due to the entry and exit of cultures by staff.
Numerous colonies/cultures requiring further workup to rule-out/confirm pathogenicity were missed during manual processing and reporting when compared to the automated reading and workup using digital microbiology images provided by WL.

Table 1: Organisms Isolated, Detection & Prevalence of Pathogenicity

Organism(s) isolated	Specimen Type	Increase in Detection	Prevalence of Pathogenicity
Entercoccus sp., *Pseudomonas aeruginosa*, *E. coli*, *Streptococcus anginosus* group, *Proteus sp.*, β-hemolytic streptococci (*S. agalactiae, S. pyogenes*)	Urine (invasive & non-invasive)	43/264 = 16%	18/43 = 42%
Hafnia alvei, *Morganella morganii*, *Pseudomonas aeruginosa*, and *Citrobacter amalonaticus*	Faecal	11/58 = 19%	0/11 = 0%
Escherichia coli, *Enterococcus faecalis*	Sterile Fluids - Abscess (THIOL)	2/35 = 6%	2/2 = 100%
Streptococcus agalactiae (GBS)	Vaginal/Rectal (LIM)	1/25 = 4%	1/1 = 100%
ESBL *E. coli*, Methicillin Resistant *S. aureus* (MRSA), Vancomycin Resistant *Enterococcus sp.* (VRE)	Surveillance (ESBL, MRSA & VRE)	19/492 = 4%	14/19 = 74%

Dual E-Swab

Figure 1: WASP

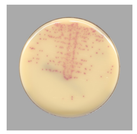
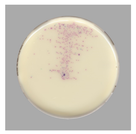
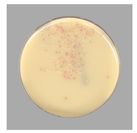


Figure 1: WASPLab



MRSA culture at 18 hours



VRE culture at 18 hours

CONCLUSIONS

1. Using Copan's WASP & WASPLab resulted in an increase in pathogen recovery when compared to manual processes.
2. Increase in pathogen recovery can be attributed to the WASP's standardized inoculation of specimens, consistent streaking and better isolation of colonies when compared to manual processes.
3. Uniform temperatures and atmospheric conditions maintained in the Smart Incubators creates a favorable environment conducive to bacterial growth and detection.
4. Decreasing the length of incubation times in the SMART Incubators will decrease the amount of breakthrough & mixed growth seen with VRE and Urines cultures respectively.
5. Digital images provided by WASPLab are undistorted, clear, and crisp enabling the user to accurately identify and report pathogens.