Comparison of ESwab™ Collection and WASP® Automation with Swab and Manual Plating for Smear Interpretation and Detection of Pathogens Associated with Wound Specimens

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Abstract

Objectives: Current automated processing platforms are optimized using a swab collected in liquid medium. This study assessed both gram stain and culture interpretation of wound specimens collected by Eswab® for gram stain and plated by the walk away automated processor (WASP™, Copan, Italy) compared with the wound swab applied directly to a slide for gram stain and manual plating of media.
Methods: 43 wound specimens were collected in duplicate from patients attending a wound care clinic. A double Dacron swab (sponge pledgette with 1 ml Stuart medium (Copan, Italy)) was collected first, followed by an Eswab (flocked swab in 1 ml of Aimes medium (Copan, Italy)). Dacron swab specimen gram stains and plates were set up manually and interpreted according to lab protocols. Eswab specimens had 2 slides prepared, a cytospun prep and 30 µl pipetted onto a slide. Eswab tubes were subsequently loaded onto the WASP and processed with a programmed 30 µl drop of specimen and a 4 quadrant streaking pattern. Eswab gram stains and plates were interpreted by different technologists blinded to each others' results. One investigator (KC) interpreted smear correlation and plating results to final culture interpretation.
Results: Smear interpretation: Of the 43 specimens, 36 (84%), 24(67%) and 21(49%) of cytospun, 30 µl drop and direct gram stains, respectively, correlated best with final culture results. Cytospun smears were optimal in 10/36 (27.7%) due to either presence of only a single significant pathogen or in mixed specimens, allowing visualization of all organisms. Growth and isolation: Manual versus WASP plating showed equivalent final culture results in 35(81.4%), better performance with WASP in 6 (14%), and manual plating in 2 (4.6%). In specimens where WASP yielded better results, specimens were either mixed allowing reporting of mixed flora, or identified a single significant pathogen. Where manual plating with direct swab was better, culture results showed only 1+ growth.
Conclusions: Eswab liquid collection, allowing either a cytospun or liquid gram stain provided a more concise smear interpretation correlating to the results of the final wound culture compared to swab culturette and manual smear preparation. WASP provided consistent streaking with detection of additional true pathogens or mixed specimens in 14% of cases.

Background

Automation in the United States

- US not currently a major user of laboratory automation
  - Changing as consolidation is occurring
- Less likelihood of having space to handle eventual smart incubators and line systems
  - Changing as labs move off-site to new facilities
- Microbiology mentality is not one of line equipment
  - Changing as automation benefits are realized

Lifespan Academic Medical Centers

- 4 site Multi-hospital system 1200 beds
- Microbiology and Molecular ID testing
  - Stat testing and blood cultures done at each site
  - Everything else sent to one site for processing
- 50% of laboratory testing is outreach
  - Total volume is 800,000 tests/year

Evaluation of Previ-Isola and WASP found:

- ✓ 54% decrease in hands on time (p< 0.0001)
- ✓ Specimens were better isolated with automated streaking when 2-3 organisms present in urines
- ✓ Planting 30ul of Eswab medium detected 20% additional MRSA positive screens than direct planting/VRE equivalent
- ✓ With Lifespan's volume, a cost savings of approx $20,000 per year could be realized for urines alone
- ✓ Purchased the WASP after assessing all prelim study data

Objective

Increased optimization of automation with addition of wound specimens

1. Would an interpretation of the gram from liquid medium/flocked swab collection be:
   - Worse, equivalent or better than traditional swab with direct swab application to slide?
2. Would tell-tale indicators of significant infection with the gram direct vs. liquid be missed?
   - E.g. Clumps of PMNs assoc. with organisms
3. Would 30 µl ESwab specimens yield better organism recovery than traditional swab specimens onto solid media?
4. Would cytospun specimens provide a:
   - Worse, equivalent, better interpretation with the culture result?
   - Would extra cost be worth the speed of making an interpretation?

Methods

- Collected 43 duplicate specimens from patients attending a wound care clinic
- Specimen collection was:
  - Traditional double dacron swab first (1 mL Stuart)
  - ESwab flocked swab second (1 mL Aimes)
  - Both placed in respective transport tube
- Both specimens came to the central lab for processing
- Figure 1 shows processing steps

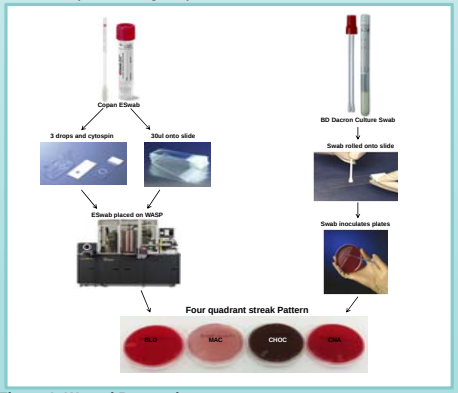

Figure 1: Wound Processing

Results

Smear Preparation

- 36 (84%) cytospun, 24(67%) 30 µl drop and 21(49%) direct swab preparations
  - Correlated best with final culture results
- Cytospun smears were optimal in 10/36 (27.7%) due to either:
  - Presence of only a single organism that could be visualized or
  - Mixed specimens allowing visualization of all organisms

Results Continued

Growth and Isolation

- Manual versus WASP plating showed equivalent final culture results in 35 (81.4%)
- Better detection seen with WASP in 6 (14%)
- Better detection seen with Manual plating in 2 (4.6%)
- In specimens where WASP yielded better results:
  - Specimens were mixed allowing reporting of mixed flora (5) or
  - Identification of a single significant pathogen (1)
- In specimens where Manual plating was better:
  - Culture results showed 1+ growth (SA, Mixed cutaneous)

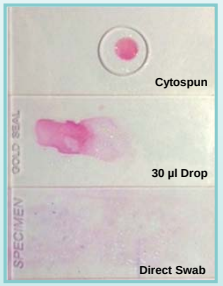

Figure 2: Comparison of Slide Preparations

Conclusions

- Eswab liquid was superior to direct swab smear preparation
  - Cytospin> 30 µl liquid > direct
    - Cytospin prep while requiring an additional step/cytospin funnel correlated best with culture results
    - No issue on interpretation with cells was noted
- 30 µl Eswab liquid media was superior to direct swab plating for growth of organisms
- WASP automated streaking yielded more organisms than manual streaking due to better isolation

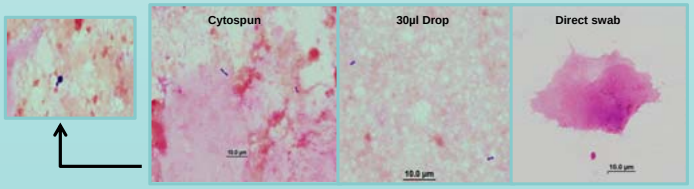

Figure 3: Comparison of Slide Preparations

References

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