Comparison of BD Phoenix AP Workflow with Vitek 2

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ABSTRACT

Background: An important advantage of automated identification and susceptibility testing systems is labor savings. The BD Phoenix™ (BD Diagnostics, Sparks, MD) requires more manual manipulation time than Vitek 2 (Becton Dickinson, Durham, NC) – 190 vs. 91 seconds (p < 0.001) per isolate (JCAFM 2005; 43:235). The new BD Phoenix AP (Instrument) is designed to automate the adjustment of inoculum density and reduce technician’s hands-on time when accessing isolates for Phoenix system inoculation. We compared the manual manipulation time required for panel preparation with the Phoenix System using the AP Instrument and card inoculation for the Vitek 2 System.

Methods: Sixteen batches of 14 isolates (ATCC and clinical strains) were processed using the AP Instrument and Vitek 2 broth liquid handling instructions. After demonstrating proficiency, two operators each set up eight batches on both instruments using panels for identification and susceptibility testing (one MIC/ID panel for Phoenix; 82 and AST cards for Vitek 2). The total time for batch preparation and time required for each defined step in the process were measured. For comparison purposes, two batches of 14 organisms were also set up for the BD Phoenix using the standard manual processing steps.

Results: The average manual manipulation times per isolate were 101 s (range of 86-113 s) for Phoenix and 88-113 s for Phoenix using the AP Instrument. The mean hands-on time (without AP) was 178 s per isolate. The BD Phoenix AP instrument allows placement of up to 8 inoculated ID broths into the rack loaded on the instrument for inoculum density adjustment and transfer to AST broth. For each batch of 14 isolates, there was an average total work time of 0.5 hrs while the AP instrument was processing the 2nd and 3rd racks. The wait time could be utilized for performing other laboratory tasks and appeared to be dependent on the initial inoculum density.

Conclusions: The BD Phoenix AP instrument standardized inoculum density and reduced the hands-on processing time for the Phoenix system by 50%. The Vitek 2 workflow required 12 x more manual manipulation time per isolate than BD Phoenix (p < 0.001).

Methods

Two operators were chosen to perform the testing. Neither had been involved in routine set-up of either instrument but completed numerose practice runs on both instruments until proficiency was demonstrated. The most efficient workflow and workplace organization for setting up both instruments was determined during the practice runs and individual steps in the workflow were clearly delineated. The BD Phoenix AP instrument had been designed to automate the adjustment of inoculum density and technician’s hands-on time when accessing isolates forPhoenix system inoculation. We compared the manual manipulation time required for panel preparation with the Phoenix System using the AP Instrument and card inoculation for the Vitek 2 System.

Results

Table 1 illustrates the individual steps and workflow for each instrument when setting up a batch of 14 isolates. The Vitek 2 SmartCarrier can hold seven isolates when testing for both identification and susceptibility testing, therefore, two fully loaded SmartCarriers were used for each batch. Time necessary to print bar code labels for Vitek 2 was not included in this study. The Phoenix AP uses shuttles that can hold ID and AST broth required to set up five isolates. Therefore, for batches of 14, three shuttles were used, with the third shuttle holding only four isolates. The Phoenix AP hands-on workflow is divided into two sections – steps taken in preparing the shuttle to be placed on the AP, and steps taken after the shuttle is removed from the AP. For this study, each API was placed, loaded and prepared onto the AP in succession before removing the first shuttle for AP processing.

Times required to complete individual steps are shown in Table 1. Among steps comparable between the two instruments, a clear difference is in time requirement for preparing the bacterial suspension. (mean of 42.9 s vs. 33.0 s for Vitek 2 and Phoenix AP, respectively). This can be explained by the need for the technician to manually adjust the turbidity of the suspension in the Vitek 2 to equivalence of a 0.5 McFarland standard. For the Phoenix AP it is only necessary for the turbidity of the suspension to be equal or greater than a 0.5 McFarland standard, greatly reducing the hands-on time needed to prepare the suspension.

The Phoenix AP instrument reduces hands-on time needed to inoculate panels for the BD Phoenix instrument by approximately 50% compared to the standard manual method (Table 2). When tested in batches of 16 isolates, the mean hands-on time to set up a single isolate was 177.7 s by the manual method and 88.5 s using the API instrument, a savings of 88.2 s per isolate.

Table 2: Overall times for batches of 14 isolates, in seconds (mean ± standard deviation)

<table>
<thead>
<tr>
<th>Vitek 2</th>
<th>Phoenix AP</th>
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<tbody>
<tr>
<td>Mean hands-on time per isolate 101.0 s 89.5 s</td>
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<tr>
<td>Total time for batch 14 3276.3 ± 46.0 2593.5 ± 44.2</td>
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</tr>
<tr>
<td>Hands-on time for batch 3276.3 ± 46.0 (54 min 36.3 sec) 2593.5 ± 44.2 (53 min 53.8 sec)</td>
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</table>

Conclusions

• The Phoenix AP Instrument reduces the hands-on time requirement for setting up Phoenix panels by 50% over manual processing.
• Less technician time is required to set up a batch of 14 isolates on the Phoenix using the AP instrument than is required to set up the Vitek 2 (p < 0.001).
• The Phoenix AP required less hands-on time than the Vitek 2 to set up 50 organisms, but this difference did not attain statistical significance (p = 0.083) in the limited number of batches tested.

Reference