Poster: P446

CPHM03 -

Diagnostic Bacteriology: UTI Testing

Utilizing Digital Imaging to Determine Optimal Incubation Times for Routine Urine Cultures

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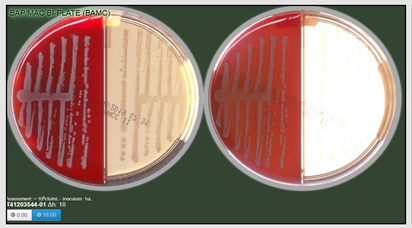
ABSTRACT

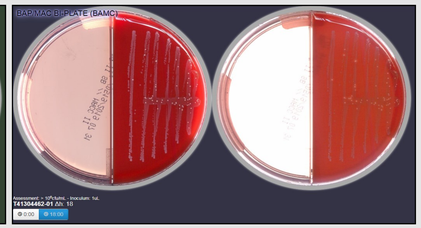
Background: Full laboratory automation has the potential to image cultures at defined period times to expedite the release of results while maximizing efficient use of laboratory staff. This study focused on TAT for urine culture results using Copan's WASPLab digital imaging to determine optimal reading times. We compared reading urine cultures from Blood and MacConkey agars every 2 hours starting at 11/12/13 hours and up to 23/24 hours using the WASPLab.

Materials and Methods: Urine specimens collected during the fall and winter months of 2017 were included in the study. A total of 946 specimens were analyzed by observing digital images taken with the WASPLab every two hours. A total of 184 (19.5%) of the specimens were negative throughout the study period.

Results: Of the remaining 762 positive cultures, 109 (14.3%) had optimal growth at 11/12 hours of incubation, 133 (17.5%) after 13/14 hours, 84 (11.0%) after 15/16 hours, 412 (54.1%) after 17/18 hours, 10 (1.3%) after 19/20 hours and 14 (1.8%) after 23/24 hours of incubation. Thus, 31.8% of all positive urine cultures could be read optimally at 14 hours of incubation, with a total of 96.9% of all positive urine cultures having optimal reading times at or before 18 hours. In addition, all 24 urine specimens showing optimal growth after 18 hours of incubation had growth detected on blood agar on or before 18 hours. As there was a concern for possibly missing slower growing organisms after only 18 hours of incubation, such as yeast and alpha-hemolytic colonies, these cultures were looked at individually. All specimens that contained yeast (25 cultures) or small alpha-hemolytic colonies (27 cultures) were also detected at or before 18 hours of incubation.

Conclusions: In summary, based on our patient population, including reading times at 14 and 18 hours, would allow for approximately 1/3 of positive urine cultures to be worked up after only 14 hours of incubation (including over half of the cultures that contained gram negative bacilli) and the other approximately 2/3 of positive urine cultures to be worked up after 18 hours of incubation. The 3.1% of cultures that had optimal reading times after 18 hours would not be missed as growth was detected at or before 18 hours of incubation. Instituting a single 18 hour read time would allow a more optimized work flow in the laboratory, better utilization of microbiology staff, and have a positive impact to clinicians and patients.





INTRODUCTION

Nearly 1 in 3 women have a clinically significant urinary tract infection (UTI) by the age of 24, almost half of women will experience a UTI in their lifetimes, and almost half of women who get one UTI experience a recurrence within 6-12 months. In the United States, UTIs account for more than 8-10 million office visits, 1-3 million emergency department visits and 100,000 hospitalizations each year. Therefore, it is not surprising that urine constitutes the most common type of specimen submitted to the microbiology laboratory. When treated promptly and properly, lower UTIs (infections of the bladder and urethra) rarely lead to complications. However, if left untreated, a UTI can have serious consequences such as spread of the infection from the bladder to one or both kidneys. When bacteria infect the kidneys, they can cause damage that may permanently reduce kidney function, and in people who already have kidney problems this can lead to kidney failure. Thus, the efficient detection of the causative agent of a UTI along with the antimicrobial susceptibility testing of the pathogen can be critical for patient care.

Full laboratory automation has the potential to image microbiological cultures at defined periods of time and can lead to expedited release of results while maximizing the efficient use of laboratory staff. This study focused on utilizing Copan's WASPLab digital imaging to determine the optimal time for urine culture incubation in order to accurately detect significant urinary pathogens.

METHODS

The laboratory's currently protocol was to process all urine specimens on the Copan WASP automated processing instrumentation and read urine culture images taken with the WASPLab on both blood agar and MacConkey agar at 2-time frames: 14 hours of incubation and again at 24 hours of incubation. Previous data showed that the 14-hour image read resulted in the ability to work up approximately 20% of the all clinically significant culture growth.

In order to determine the optimal time for reading urine cultures, we compared images taken from 946 patient urine specimens every 2 hours on both media starting at 11/12 hours of incubation up to 23/24 hours. Results for each specimen were recorded indicating the presence or absence of growth, and if growth was present the colony count and type of colonies present.

RESULTS

A total of 184 or 19.5% of the specimens were negative at each time frame images were read. Of the remaining 762 positive cultures, 109 (14.3%) had optimal growth at 11/12 hours of incubation, 133 (17.5%) after 13/14 hours, 84 (11.0%) after 15/16 hours, 412 (54.1%) after 17/18 hours, 10 (1.3%) after 19/20 hours and 14 (1.8%) after 23/24 hours of incubation .

See Table 1 below:

Table 1

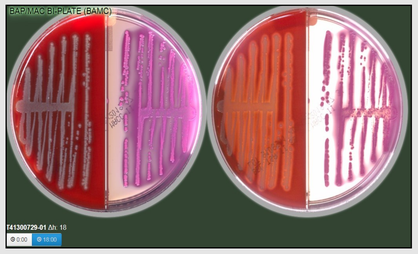
Hours of incubation	*11/12*	*13/14*	*15/16*	***17/18***	*19/20*	*21/22*	*23/24*
Percentage of cultures w/optimal reading	*109 (14.3%)*	*133 (17.5%)*	*84 (11.0%)*	***412 (54.1%)***	*10 (1.3%)*	*0 (0.0%)*	*14 (1.8%)*

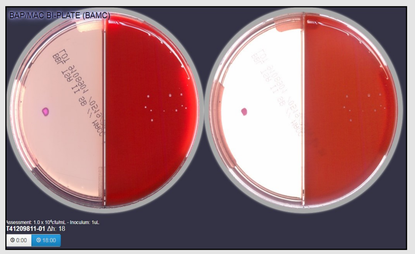
RESULTS (cont'd)

A total of 242 (31.8%) of all positive urine cultures could have images read optimally at 14 hours of incubation. A total of 96.9% of all positive urine cultures had optimal image reading times at or before 18 hours of incubation.

A total of 24 (2.5%) urine specimens showed optimal growth after 18 hours of incubation, however, 100% (24/24) of these cultures had growth detected on the blood agar on or before this time frame. Although they had not yet had their optimal incubation, they would not have been called negative; these would be continued to be incubated until such time that appropriate work up could be performed.

All urine specimens that showed slower growing organisms, such as yeast (25 cultures) or small alpha-hemolytic colonies (27 cultures) also had growth detected at or before 18 hours of incubation.





CONCLUSIONS

Based on our patient population, changing our image reading times from 14 and 24 hours to 14 and 18 hours, would allow for approximately 1/3 of positive urine cultures to be worked up after only 14 hours of incubation (including over half of the cultures that contained gram negative bacilli). The other approximately 2/3 of positive urine cultures could be worked up after 18 hours of incubation rather than needing to wait until a full 24 hours of incubation. The 3.1% of cultures that had optimal reading times after 18 hours would not have been missed as growth was detected at or before 18 hours of incubation in all of these cultures. These cultures would continue to be incubated until they could be appropriately worked up.

In addition, as there was a concern for possibly missing slower growing organisms, such as yeast and small alpha-hemolytic colonies after only 18 hours of incubation, these cultures were looked at individually. All specimens growing yeast (25 cultures) or small alpha-hemolytic colonies (27 cultures) were also detected at or before 18 hours of incubation.

The data from this study indicates that the laboratory's current 24-hour incubation time could be shortened to 18 hours without negatively impacting culture accuracy and reliability. In addition, the possible elimination of the 14-hour image read would allow for streamlining the culture process and allow for more specimens to be processed accommodating increased capacity as needed. In our facility, instituting a single 18-hour image read would allow a more optimized work flow in the laboratory, effective utilization of microbiology staff, and have a positive impact to clinicians and patients delivering urine culture results hours sooner.