Comparison of two chromogenic media and conventional media in the primary isolation and identification of urinary tract pathogens

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Abstract

Objective: To evaluate the performance of two chromogenic media, UriSelect 4 (US, Bio-Rad Laboratories) and BBL CHROMagar Orientation (CO, Fort Richard Laboratory Ltd), compared to that of a conventional method, for the primary isolation and identification of urinary tract pathogens.

Methods: A total of 239 urine specimens (with white blood cells >50 million/L) processed in the LabPlus Microbiology Laboratory (Auckland City Hospital) during the period of January-February 2009 were tested. Each specimen was routinely processed using a conventional method which utilises a split Blood agar/MacConkey agar plate (BA/MC, Fort Richard Laboratory Ltd) and Cystine-Lactose-Electrolyte-Deficient agar plate (CLED, Fort Richard Laboratory Ltd). Specimens were also inoculated onto US and CO. The resulting cultures were enumerated and isolates identified when defined criteria were met. The results were compared and any discrepancies investigated.

Results: A total of 89 clinically significant organisms were isolated. The number of organisms which were isolated and identified correctly by US, CO and BA/MC was 87 (97.7%), 88 (98.9%) and 84 (94.4%) respectively. The chromogenic media were able to identify 70% of the isolates on Day 1 compared to 12.2% by conventional methods.

Conclusion: The replacement of BA/MC and CLED with CO was recommended and implemented at LabPlus based on its superior ability to detect mixed cultures, the ability to directly identify common urinary tract pathogens and its higher isolation rate of micro-organisms.

Key words: culture media, chromogenic substrates, microbiological technics, urinary tract infection, laboratory diagnosis

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Introduction

Urinary tract infections (UTIs) are prevalent worldwide and are considered to be the most common type of bacterial infection in humans. In the community, the majority of UTIs are uncomplicated but are often recurrent. The incidence of these infections is high, with an estimated 80-90% of women experiencing at least one episode during their lifetime (1). Its importance in the hospital setting is also profound, where they are responsible for 40-60% of all nosocomial infections (2). The aetiology of nosocomial UTIs are often more diverse than uncomplicated community-acquired infections and can be frequently polymicrobial (3).

The role of the microbiology laboratory in the diagnosis and monitoring of UTIs is extensive and comprises a significant part of the daily workload. At LabPlus, the microbiology department receives approximately 40,000-50,000 urine specimens a year. The laboratory protocol for processing these specimens includes urine dipstick chemistry, microscopy and the utilisation of CLED agar for a colony count (4). The decision to culture the urine is then based upon microscopy results, primarily the presence of bacteria and number of white blood cells (>10 million/L). BA/MC is used as the primary plate for recovery of urinary pathogens. In addition to the split plate, a Colistin-Nalidixic acid-Agar plate (CNA, Fort Richard Laboratory Ltd) is also inoculated if the patient is pregnant or is catheterised to better visualise Gram positive organisms. Identification of bacteria recovered from these media is then based upon colonial characteristics and the results of biochemical tests.

Since 1990, chromogenic culture media have been commercially available as an alternative way to detect bacterial pathogens (5). Such media contain specific enzyme substrates which when utilised release coloured dyes resulting in pathogens forming coloured colonies.

Currently, there is a range of chromogenic media that is available commercially for the isolation and identification of urinary tract pathogens. This study focuses on two of these media – US and CO. Both media incorporate chromogenic enzyme substrates which allow for the detection of bacterial enzymes -glucosidase (-GLU), -galactosidase (-GAL) and tryptophan deaminase (TDA) (6,7). Utilisation of these substrates results in the development of unique coloured colonies. In addition, both media also have the ability to prevent swarming of Proteus spp.

The aim of this study was to evaluate the performance of two chromogenic media, CO and US, compared to the conventional method for the isolation, enumeration and identification of urinary tract pathogens. This study also aimed to investigate incubation time flexibility of chromogenic media. Finally, the possibility of replacement of conventional media with one of the chromogenic media was explored.

Materials and methods

Specimens

Urine specimens sent to LabPlus Microbiology for microscopy, culture and sensitivities (MCS) were used. A total of 239 samples were included – 174 midstream urine specimens, 29 catheter urine specimens, 35 casual urine specimens and 1 bag urine specimen. The samples were collected during the months of January and February 2009. A criteria of white blood cells >50 million/L or the presence of bacteria seen in microscopy was utilised in order to increase the chance of isolating clinically significant cultures for the study.

Chromogenic media

Quality control of the media was performed for each new batch to check for correct colour development for a range of organisms. Half of a plate was used per sample. Both chromogenic media require 18-24 hours of incubation.

Day 0

Urine specimens meeting the criteria for the study were inoculated onto both US and CO using a 0.001mL disposable plastic loop to achieve isolated colonies. The laboratory number of each specimen was noted to allow access to information on the paperless Delphic Micro system (e.g., microscopy results, specimen type). The media were placed in a box (to protect the chromogenic substrates in the media) and incubated initially for 18 hours at 35 ± 2°C in ambient air.

Day 1

To test the flexibility of the incubation time, both media were read at 18 hours, 24 hours and prolonged incubation (40 hours).
Identification procedures were performed at 18 hours unless the culture looked in need of longer incubation. Each plate was enumerated and a code given (0 = A0, <10⁷ = A1, 10⁷-10⁸ = A2, >10⁸ = A3; organisms/L). A0 and A1 cultures were not identified (insignificant). A2 and A3 cultures were identified if there was a pure growth of an organism, or, if a mixed sample had <10 million epithelial cells per litre on microscopy in which case the predominant or up to two organisms were identified. If an A2 or A3 sample had >10 million epithelial cells per litre on microscopy and three or more organisms upon culture, no organisms were identified (likely contamination). Any amount of Streptococcus agalactiae (Group B streptococci, GBS) was reported for specimens of colony was recorded for both media.

Presumptive identification of the organisms by colour was made according to the manufacturers’ instructions (both media had the same colour reactions). Confirmatory tests for Escherichia coli, Enterococcus spp. and Proteus mirabilis were performed as suggested by the manufacturers, allowing their identification on Day 1. The presumptive identification of the other organisms was confirmed by conventional methods used in LabPlus. Table 1 shows the identification chart used in this study. At both 18 and 24 hours incubation, a detailed description of the appearance of each type of colony was recorded for both media.

### Table 1. Identification chart based on chromogenic colour production (references 6 & 7).

<table>
<thead>
<tr>
<th>Colour of colony</th>
<th>Presumptive identification</th>
<th>Confirmatory tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pink (β-GAL +)</td>
<td><em>Escherichia coli</em></td>
<td>Spot indole – positive*</td>
</tr>
<tr>
<td>Blue-green small (β-GLU +)</td>
<td><em>Enterococcus spp.</em></td>
<td>Gram stain – gram positive cocci*</td>
</tr>
<tr>
<td>Beige with brown halo (TDA +)</td>
<td><em>Proteus mirabilis</em></td>
<td>Spot indole – negative*</td>
</tr>
<tr>
<td>Large blue/purple (β-GLU +)</td>
<td><em>Klebsiella, Enterobacter, Serratia, Citrobacter spp. (KESC group)</em></td>
<td>Remel RapID ONE identification kit</td>
</tr>
<tr>
<td>Beige with brown halo (TDA +)</td>
<td><em>Proteus, Morganella, Providencia spp. (PMP group)</em></td>
<td>Spot indole – positive Remel RapID ONE identification kit</td>
</tr>
<tr>
<td>Diffuse sheeney pale orange often with greenish pigment</td>
<td><em>Pseudomonas aeruginosa</em></td>
<td>Oxidase – positive Cetrimide plate - pigment</td>
</tr>
<tr>
<td>Small white dry</td>
<td><em>Yeast (Candida spp.)</em></td>
<td>Wet film – budding yeast CHROMagar™ Candida</td>
</tr>
<tr>
<td>Small cream/yellow</td>
<td><em>Staphylococcus aureus</em></td>
<td>Catalase – positive 5% Salt Agar, DNA agar and Trehalose Mannitol Phosphatase Agar (TMDPA)</td>
</tr>
<tr>
<td>Small pale pink</td>
<td><em>Staphylococcus saprophyticus</em></td>
<td></td>
</tr>
<tr>
<td>Small white (catalase positive)</td>
<td><em>Staphylococcus spp.</em></td>
<td></td>
</tr>
<tr>
<td>Small translucent pale blue</td>
<td><em>Streptococcus agalactiae (GBS)</em></td>
<td>Streptococcal Grouping Latex kit – Group B</td>
</tr>
<tr>
<td>Very fine blue</td>
<td><em>Lactobacillus spp.</em></td>
<td>Gram stain – Gram Positive bacilli typical lactobacilli</td>
</tr>
<tr>
<td>Other</td>
<td>Unknown</td>
<td>Investigation required</td>
</tr>
</tbody>
</table>

*recommended by manufacturer and allows confirmation of identification on Day 1

Day 2
Cultures were examined for the final time at 40 hours incubation and any differences in appearance were noted. Any confirmatory tests put up the previous day were examined and results recorded.

Day 3
The results from conventional routine cultures of each specimen in the study were obtained from the Delphic Micro system and recorded. Any discrepancies between the results obtained by the conventional method and the chromogenic study were investigated.

### Results

**Culture results**
Of the 239 samples cultured, 155 (65%) were not identified, 76 (32%) were followed up and identified and 8 (3%) were isolated and identified by some but not all three media (i.e., discrepancies). Out of the 76 specimens which met the criteria for identification, 62 grew single organisms and 6 grew two clinically significant organisms. The remaining 8 specimens revealed GBS from urine specimens of pregnant patients.

Table 2 summarises the 74 isolates identified in the study (excluding GBS recovered from pregnant patients). E. coli was the primary isolate in the study (55.4%), followed by the KESC group (9.5%) and Enterococcus spp. (9.5%).
Table 2. A summary of the 74 isolates identified in the study (excluding GBS from pregnant patients).

<table>
<thead>
<tr>
<th>Organism</th>
<th>Exact match</th>
<th>Same ID but difference in purity</th>
<th>Total number of isolates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pure</td>
<td>Mixed predominantly</td>
<td>Two isolates</td>
</tr>
<tr>
<td>E. coli</td>
<td>24</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>KESC group</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>E. cloacae</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>K. pneumoniae</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Enterococcus</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>P. aeruginosa</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>S. aureus</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>CNS*</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Other Candida</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>GBS</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>P. mirabilis</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lactobacillus</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>All species</td>
<td>40 (54.1%)</td>
<td>8 (10.8%)</td>
<td>12 (16.2%)</td>
</tr>
</tbody>
</table>

* CNS, coagulase negative staphylococci

Fourteen of the cultures obtained the same final identification by all three media, but media differed greatly in their ability to demonstrate mixed growth (i.e., detection of a pure growth compared to detection of a mixed growth with a predominant isolate). Mixed growth was seen in 11 (78.6%), 6 (42.9%) and 5 (35.7%) cases in US, CO and BA/MC respectively.

During the study a total of 45 urine specimens from pregnant patients were cultured. Eleven out of 45 (24.4%) were found to harbour GBS. Eight cases were recovered from all three media, the remaining 3 cases showed discrepancies in isolation of this organism.

Table 3 summarises the discrepancies found in the study. Of the eight discrepancies, seven should have resulted in identification. Of the eight discrepancies, CO was correct in six of the cases, US in five and BA/MC in two.

<table>
<thead>
<tr>
<th>Organism(s)</th>
<th>Medium with correct interpretation</th>
<th>Description of inconsistency</th>
</tr>
</thead>
<tbody>
<tr>
<td>GBS (in pregnant female)</td>
<td>US and CO</td>
<td>Both US and CO recovered A2 growth with a mixture of organisms which included GBS. BA/MC recovered A1 growth with no GBS</td>
</tr>
<tr>
<td>GBS (in pregnant female)</td>
<td>US and CO</td>
<td>Both US and CO grew a mixture of organisms but not GBS. However, GBS was recovered on BA/MC</td>
</tr>
<tr>
<td>GBS (in pregnant female)</td>
<td>BA/MC</td>
<td>Both US and CO recovered A2/A3 growth whereas the conventional method recovered A1 growth resulting in no identification</td>
</tr>
<tr>
<td>C. albicans</td>
<td>US and CO</td>
<td>Both US and CO gave an equal mixture of 3 organisms and thus were not identified.</td>
</tr>
<tr>
<td>P. aeruginosa</td>
<td>US and CO</td>
<td>US grew an equal mixture of GBS and Enterococcus spp. which were identified. BA/MC grew an equal mixture of GBS and Staphylococcus spp. which were identified</td>
</tr>
<tr>
<td>Lactobacillus spp.</td>
<td>US and CO</td>
<td>Colonies on US and CO were identified as Enterococcus spp. based on colour formation and Gram stain. The identification of S. bovis was made by conventional method on Day 5 using Crystal GP (BBL)</td>
</tr>
<tr>
<td>GBS, Enterococcus spp. and Staphylococcus spp.</td>
<td>CO (a3 organisms ID not carried out)</td>
<td>CO grew an equal mixture of 3 organisms and thus were not identified.</td>
</tr>
<tr>
<td>Streptococcus bovis</td>
<td>BA/MC</td>
<td>Colonies on US and CO were identified as Enterococcus spp. based on colour formation and Gram stain. The identification of S. bovis was made by conventional method on Day 5 using Crystal GP (BBL)</td>
</tr>
</tbody>
</table>
A total of 89 clinically significant organisms were isolated in the study (74 non-GBS organisms + eight GBS organisms + seven organisms which should have been identified from the discrepancies). The number of organisms which were isolated and identified correctly by US, CO and BA/MC was 87/89 (97.7%), 88/89 (98.9%) and 84/89 (94.4%) respectively.

Isolates were identified faster by chromogenic media compared to conventional methods. 69.5% of all significant isolates were identified on Day 1 on both chromogenic media compared to 12.2% using conventional methods.

**Incubation times and colour production by chromogenic media**

24 hours of incubation was the most reliable period for observing cultures. The major concern at 18 hours of incubation was in regards to some of the Gram positive organisms. There were a few cases in which white non-distinct colonies (mostly *Staphylococcus* spp.) at 18 hours looked pure but on review at 24 hours colour development of some of these colonies had occurred (e.g., light pink or light yellow). Prolonged incubation (~40 hours) yielded bigger colonies and sometimes irregular looking colonies, however, the colour of the colonies did not change.

Colour production by the majority of organisms was accurate and corresponded well with the manufacturers’ descriptions. However, presumptive identification of *S. aureus* based only on colour production was not reliable. The US reading chart showed *S. aureus* as yellow colonies, while CO described the colonies as opaque cream. During the study, white cream and yellow colonies of *S. aureus* were encountered.

**Figure 1.** Colonial appearance on BA, MC agar, US and CO (from left to right). A. *E. coli* and *Enterococcus* spp.; B. *Enterococcus* spp. and GBS; C. *E. coli*, *K. pneumoniae* and *P. mirabilis*.

![Image](image.png)

**Discussion**

The gold standard for the diagnosis of UTIs is the quantitative culture of urine samples on solid media. Traditional media include CLED agar, BA and MC agar. Presumptive identification of urinary pathogens and detection of mixed cultures on such media can be difficult, time consuming and requires experience. The development of media which utilise various chromogenic substrates has made the process of interpreting urine cultures easier and faster. Previous researchers have demonstrated the equal or superior performance of various chromogenic media compared to conventional media for the isolation and identification of urinary tract pathogens (8-18). The results from this study were in agreement with prior findings.

In this study, isolation and identification of isolates was found to be best on CO (98.9%), followed closely by US (97.7%) and least favorable by the conventional method (94.4%). Chromogenic media carry many advantages which can be seen at every point of the culture reading and identification process. The initial visual screening of a chromogenic plate compared to BA/MC is easier, faster and more reliable (Figure 1). Coloured colonies also allow for more accurate detection of mixed cultures which help to identify contaminated specimens, leading to reduced workload and unnecessary work up of clinically insignificant organisms (8,10). With regards to quantification, chromogenic media allow for a more accurate count since very small colonies are easier to see and stand out from the media compared to CLED agar. Importantly, enumeration and identification can be performed on the same plate unlike the conventional method (CLED for enumeration, BA/MC for identification).

Most organisms isolated in the study were correctly presumptively identified based on colour production as described by the manufacturers. However, colonies of *S. aureus* exhibited a range of colours. This observation was consistent with the findings of Scarparo et al. (17). It is recommended, therefore, that colonial colour should not be used for the presumptive identification of *S. aureus* due to its unreliability.

Definitive identification of *E. coli*, *P. mirabilis* and *Enterococcus* spp. is possible on Day 1 with the use of chromogenic media and a rapid test allowing for earlier antibiotic therapy initiation. Spot indole (for confirmation of *E. coli* and *P. mirabilis*) was used without difficulty and the colouration of the colonies did not interfere with the positive reaction. The confirmatory test for enterococci is a Gram-stain. This step may be unnecessary as the colonial morphology was very distinctive and there was no confusion with other blue colony producing organisms (GBS, lactobacilli, KESC). Many studies did not perform any type of confirmatory test for enterococci (8-11,13,14,16).

Although there were no issues in this study regarding the identification of these three organisms, other studies have discussed some problems which should be considered. These include the ability of some *Enterobacter* spp. and *Citrobacter* spp. to produce pink colonies (emphasising the importance of a spot indole test) (10-12,17); the ability of *E. coli* to produce cream-coloured colonies (although rarely) (17); and false positive spot indole test for *P. mirabilis* when isolated with indole positive strains of *E. coli* or *K. oxytoca* (17).

Organisms from the KESC group were recovered well and easily distinguished from other Gram negative bacilli. This study showed that a RapidID ONE could be inoculated straight from the chromogenic plate to give an identification on Day 1 and was performed on 5 out of the 7 isolates of KESC organisms with no errors. The chromogenic media’s ability to detect mixtures was utilised to ensure that a pure growth was present before the test was put up.

Vaginal colonisation with GBS in pregnant patients can lead to neonatal infections thus identification of these organisms in urine specimens is crucial (19). GBS grew on both US and CO as translucent, light blue colonies. However, the colour chart provided by US showed colonies that were translucent and white/grey. This colour discrepancy again raises the issue of the validity of the colour chart and suggests that a more reliable chart should be produced.

There were only 8 discrepancies identified (Table 3) i.e. no correlation between the three methods with regards to isolation and identification of urinary tract pathogens. Three of the cases were due to differing colony counts in which *C. albicans*, *P. aeruginosa* and *Lactobacillus* spp. grew as A2/A3 on chromogenic media but A1 on CLED agar. This observation may be explained by the introduction of technical error in the inoculation and reading of the CLED plate (which uses a calibrated filter strip), or, the chromogenic media’s ability to grow and visualise these organisms better. The latter explanation could also account for 2 of the 3 discrepancies regarding GBS in which both chromogenic media...
detected GBS not seen on either BA/MC or CNA plates. However, this is contrary to an observation made by Aspevali et al. (11) who found that chromogenic media did not consistently support the growth of Gram positive and fungal urinary tract pathogens. Further investigation of this matter is recommended. The third discrepancy regarding GBS was in favour of the conventional method. This could be explained by the greater inoculum size (0.01mL on CNA compared to 0.001mL on US and CO) which would increase the chance of growing GBS if a patient had a low level of colonisation. Another discrepancy involved the identification of S. bovis, an organism that is rarely isolated in urine as a cause of UTI. However, isolation of this organism is significant as faecal carriage is associated with carcinoma of the colon (4,20). An incorrect identification of enterococci was made on the chromogenic media based on the Gram stain reaction and colony colour. It is important when questionable colony colours and morphology are seen that the colony is investigated fully by conventional identification methods.

A limitation of the study was the moderate number of urine samples tested. This was due to the limited time of specimen collection. Only samples received in January and February 2009 were included in the study. In addition, a predefined criteria for specimen inclusion was put in place to increase the probability of processing only positive samples. This further reduced the number of analysed specimens.

Cost is an important issue if a laboratory is considering introducing a new method. Although chromogenic media are more expensive, there may be cost savings due to easier recognition of significant isolates during culture reading and faster, more accurate detection of mixed cultures. A reduction in error may be seen in tests as picking an isolated colony from the plate is easier and more accurate when the colonies are coloured. This in turn will reduce workload by avoiding unnecessary repetition of tests. With time, these savings may be significant and will also result in faster reporting of isolates. Previous researchers have shown that the use of chromogenic media can be less expensive than conventional methods (8,13,17,18). Their conclusions however were based on cheaper chromogenic media (price varies depending on country) (17), unnecessarily excessive methodology (18) and unrealistic labour times (8). The conclusion made by Retelj and Harlander (13) seems to be the most reasonable. They stated that the use of chromogenic media for urinary tract pathogens is cheaper than conventional methods only when there is a high proportion of bacteriuria positive samples and a high isolation rate of E. coli and P. mirabilis.

A cost analysis was performed on the isolation, enumeration and identification of these two organisms to check the validity of the statement made by Retelj and Harlander. The cost for E. coli using conventional methods was $0.97. This included BA/MC, ¼ CLED agar, spot indole test, ¼ MacConkey agar, ¼ Citrate agar and associated labour costs. The cost for P. mirabilis using conventional methods was $2.20. This included BA/MC, ¼ CLED agar, spot indole test, ornithine test and associated labour costs. Isolation, enumeration and identification of either E. coli or P. mirabilis using chromogenic media cost $1.01 and $0.88 by US and CO respectively. This included ½ chromogenic agar, spot indole test and associated labour costs. Therefore, in the context outlined by Retelj and Harlander it is very likely that the use of chromogenic agar would result in cost savings, especially with the less expensive CO.

The application of chromogenic media for routine use would require some changes. Notably, the incubation time must be strictly controlled as sufficient time is required for the bacteria to convert the chromogenic substrates into colour. Eighteen hours of incubation is minimal while 24 hours is optimal and the most reliable. To ensure this, a rearrangement of the schedule for reading cultures would need to be made. Twenty four hours of incubation was necessary for the complete colour development of staphylococci. This was observed when a pure looking culture at 18 hours revealed mixed growth when re-read at 24 hours. This phenomenon was not mentioned in the available literature and should be considered. The use of CLED for enumeration and the selective inoculation of BA/MC and CNA plates for identification could be removed and replaced with inoculation of half a plate of chromogenic media for all urine specimens. This would streamline urine processing and will reduce the frequency of technical errors. In addition, if culture is performed on all urine specimens, results from a urine dipstick are unnecessary and could also be eliminated especially as studies have shown that urine dipstick results have low specificity and variable sensitivity (21,22).

The use of chromogenic media will not affect antibiotic susceptibility testing as demonstrated by other researchers (8,9,17,18). The number of mixed susceptibilities that must be repeated on isolated colonies will likely be reduced with the regular use of chromogenic media (8). Antibiotic susceptibilities were not performed in this study and could be investigated to validate this point.

Following the study, BA/MC, CLED and CNA plates were replaced with CO as part of a planned process review of urine processing and culture. Implementation of CO to the routine process at LabPlus required additional training of staff in the use of chromogenic agar. However, once staff were confident in differentiating colonies by colour the time to read plates was consequently reduced.

In conclusion, in this study both chromogenic media were superior to the conventional method and offered additional advantages in the detection and identification of urinary tract pathogens. These advantages showed: a) prevent the swarming of Proteus spp. and spreading of mucoid E. coli and K. pneumoniae; b) enable accurate enumeration of isolates; c) enable direct identification of common urinary tract pathogens by colony colour and a rapid test; d) enable faster and more accurate detection of mixed cultures resulting in increased detection rates of contaminated samples; and e) allow susceptibility testing to be performed directly from the plate.

The most common isolate responsible for UTI (E. coli) can be identified a day earlier than by conventional methods, allowing the clinician to commence an initial course of antibiotics based on the organism’s most common susceptibility pattern. This is important especially in the setting of a nosocomial UTI when patients are often immunocompromised (23). In the laboratory, the use of chromogenic media will significantly reduce the daily workload and will result in cost-savings with time due to improved efficiency.

Conclusions
Due to the slightly better isolation and identification rate of isolates CO was superior to US. The substitution of BA/MC with CO for the primary isolation of urinary tract pathogens was recommended and implemented successfully at LabPlus. Furthermore, the elimination of the CLED agar count and CNA plate from the routine processing of urine samples was possible with the use of CO and helped to improve the overall culturing process.

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