C-314

# Evaluation of HardyCHROM™ UTI for the Isolation and Identification of Common Urinary Tract Pathogens

J. Jang[1], W. Phillips[2], S. Strickler[2], A. Y. Hsiung[2], J. Hardy[2]

[1]Veterans Administration Medical Center, San Francisco, CA | [2]Hardy Diagnostics, Santa Maria, CA

## Abstract

Urine cultures are the most commonly performed tests in clinical laboratories, contributing significantly to laboratory expense and workload. Amongst positive urine cultures, *E.coli* is the most common causative agent and is associated with 90% of all urinary tract infections (UTI) in ambulatory patients, and 50% of nosocomial UTIs. In addition to *E. coli*, other common urine pathogens include *Proteus*, *Enterococus*, *Pseudomonas*, *Enterobacter*, *Morganella*, *Klebsiella*, *Serratia*, and *Staphylococcus* species. Many laboratories have attempted to decrease time and materials involved in UTI testing and diagnosis by using chromogenic media.(2)

In this study, we evaluated the accuracy of HardyCHROM™ UTI in the detection and presumptive identification of the most common UTI pathogens. A total of 224 isolates previously identified to the species level were tested, including 100 clinical E. coli strains, 84 miscellaneous species of *Enterobacteriaceae* and *P. aeruginosa*, and 40 isolates of Gram positive organisms. In addition to the clinical strains, ATCC quality control organisms were evaluated as well to ensure accuracy. Performance was evaluated after twenty-four hours of incubation in an aerobic environment at 35°C. Of the 224 isolates tested, HardyCHROM™ UTI demonstrated 100% sensitivity and specificity with expected color reactions. A subset of the isolates (n=75) was also tested under Vitek™ I system to verify the identification accuracy of HardyCHROM™ UTI in comparison to the automated method, and also to rule out the possibility of the chromogens interfering with the identification reaction wells. All of the color reactions were found to be in accordance with the Vitek™ I results.

The results of this study suggest that HardyCHROM™ UTI can be used as an accurate and reliable primary medium for the differentiation and identification of common UTI pathogens isolated in urine cultures.

## Introduction

The time and cost involved with processing urine cultures for the presence of urinary tract infection (UTI) has lead to the need for reliable and rapid identification procedures. Over the past few years the development of culture media containing chromogens and/or fluorogens has led to a great number of methods for the rapid identification of microorganisms within primary isolation media.(1)

## Introduction (continued)

Hardy Diagnostics' HardyCHROM™ UTI uses a combination of chromogens for the detection of the most common urinary tract pathogens. The chromogens in this media release chromophores when cleaved by enzymes unique to common UTI pathogens. This reaction results in the production of genera-specific colored colonies that allow for the presumptive identification of a large number of UTI genera.

Clinical laboratories report E. coli as the most common pathogen responsible for the majority of urinary tract infections. With HardyCHROM™ UTI, *E. coli* colonies can be definitively identified as pink-rose colonies, with no further testing required. *Enterococcus* spp. can also be definitely identified as small teal colored colonies with no further testing on this media. Other common UTI pathogens that can be presumptively identified on HardyCHROM™ UTI include *Klebsiella*, *Enterobacter*, *Serratia*, *Proteus*, *Morganella*, *Providencia*, *Pseudomonas*, *Staphylococcus aureus*, *Staphylococcus saprophyticus*, and *Candida* spp.

## Materials and Methods

This study evaluated previously identified clinical isolates from Hardy Diagnostics' microorganism collection and Veterans Administration Medical Center, San Francisco (VASF). The isolates (clinical and ATCC) used in this study were as follows: *E. coli* (n=100), *P. mirabilis* (n=19), *M. morganii* (n=6), *Providencia* spp. (n=3), *S. marcescens* (n=12), *Enterobacter* spp. (n=12), *Klebsiella* spp. (n=22), *P. aeruginosa* (n=10), *Enterococcus* (n=20), *S. aureus* (n=10), *S. saprophyticus* (n=10). ATCC strains were used as control.

After the inoculation, the HardyCHROM™ UTI plates were incubated aerobically for 24 hrs at 35 degrees C. and read according to manufacturers' recommendations.

In a separate evaluation carried out at VASF, 75 isolates randomly selected pathogens were also tested on the Vitek™ I system to verify the identification accuracy of HardyCHROM™ UTI in comparison to the automated method, and also to rule out the possibility of the chromogens interfering with the identification reaction wells. Colonies picked from blood agar were tested in parallel as a control.

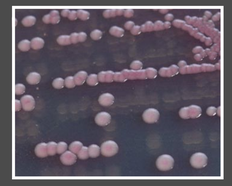
## Results

**Table 1:** All microorganisms (clinical and ATCC) showed the expected colors at 24 hours of incubation, as shown in the table below:

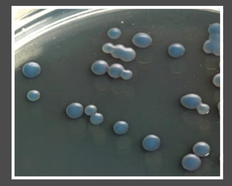
| Species (number of isolates) | Expected color reactions |
|---|---|
| *Escherichia coli* (n=100) | pink-rose colony |
| *Proteus mirabilis* (n=19) | golden-orange colony with brown halo |
| *Morganella morganii* (n=6) | golden-orange colony with brown halo |
| *Providencia* spp. (n=3) | golden-orange colony with brown halo |
| *Serratia marescens* (n=12) | metallic blue-gray colony |
| *Enterobacter* spp. (n=12) | metallic blue-gray colony |
| *Klebsiella pneumoniae* (n=20) | metallic blue-gray colony |
| *Klebsiella oxytoca* (n=2) | metallic blue-gray colony |
| *Pseudomonas aeruginosa* (n=10) | colorless, translucent colony |
| *Enterococcus faecalis* (n=5) | small turquoise colony |
| *Enterococcus faecium* (n=5) | small turquoise colony |
| *Enterococcus gallinarum* (n=5) | small turquoise colony |
| *Enterococcus cesseliflavus* (n=5) | small turquoise colony |
| *Staphylococcus aureus* (n=10) | cream colony |
| *Staphylococcus saprophyticus* (n=10) | light-pink colony |

**Table 2:** Accuracy of HardyCHROM™ UTI in comparison to the Vitek™ I system:

| Species (number of isolates) | HardyCHROM™ UTI | Vitek™ I Result |
|---|---|---|
| *E. coli* (n=50) | All pink-rose | All correct ID |
| *Klebsiella/Enterobacter/Serratia* (n=16) | All metallic blue-gray | All correct ID |
| *Proteus/Morganella/ Providencia* (n=8) | All golden-orange | All correct ID |

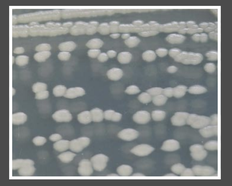


Colony morphology of *E. coli* on HardyCHROM™ UTI



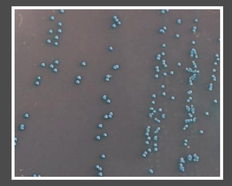
Colony morphology of *Klebsiella/Enterobacter/Serratia* on HardyCHROM™ UTI

Colony morphology of *Proteus/ Morganella/Providencia* on HardyCHROM™ UTI



Colony morphology of *P. aeruginosa* on HardyCHROM™ UTI

Colony morphology of *S. aureus* on HardyCHROM™ UTI



Colony morphology of *Enterococcus* spp. on HardyCHROM™ UTI

Colony morphology of *S. saprophyticus* on HardyCHROM™ UTI

## Conclusion

The data presented demonstrated that HardyCHROM™ UTI showed 100% sensitivity and specificity against organisms tested.

HardyCHROM™ UTI plates offer a reliable and rapid method for the accurate detection of common UTI pathogens, thus streamlining the identification process and overall laboratory turn-around-time.

The time saving feature of HardyCHROM™ UTI offers clinical laboratories the opportunity to devote more attention and effort to problematic cultures.

## References

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