

Artificial intelligence and diagnostic microbiology: comparison of the APAS Independence with chromogenic UTI media Analysis Module and routine plate-in-hand with traditional CLED media at NHS William Harvey Hospital



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INTRODUCTION

Examination of urine culture is one of the most performed tests in the clinical microbiology laboratory accounting for a significant proportion of the total workload. In general, this investigation is performed by a trained scientist, which selects predominant organisms in the investigation of urinary tract infections. As workload increases, further demand for automation of plate reading will likely increase to relieve pressure.

PURPOSE

This was a joint investigation into the reliability of automated urine culture workflow utilising the APAS Independence by Clever Culture Systems within a busy clinical NHS laboratory. The APAS Independence utilises advanced artificial intelligence and machine learning in the examination of culture plates through image capture via the automated on-board imaging suite.

METHODOLOGY

A blinded head-to-head comparison of clinical urine culture sample processing was performed using the APAS Independence with Thermo Fisher Brilliance UTI Clarity media (and Analysis Module) and Thermo Fisher CLED with Andrade's using plate-in-hand interpretation as the laboratory's reference method. A total of 1974 samples were run in parallel with both UTI Clarity media and CLED with Andrade's. The APAS Independence operator was blinded to the reference method results.

Results for the manually read CLED plates were extracted from the laboratory's LIMS (APEX) using Cognos and compared directly to UTI Clarity results from the APAS Independence.

RESULTS

- ✓ Overall agreement between the use of the APAS Independence with UTI clarity media and the traditional CLED manual workflow was 83% inclusive of plates sent for review.
- ✓ Agreement of no significant growth between Brilliance UTI and CLED workflows was **98.8%**, accounting for 852 plates or 43.0% of the work processed. In turn this led to the confident removal of 43.0% of plates from the total workload.
- ✓ Total agreement of organisms classified as "Pink-red" by the APAS Independence which identified as *E. coli* though CLED workflow was 94.2% agreement.
- ✓ Positive identification of *E. coli* comprised of 411 of the 1974 plates examined, accounting for 20.8% of the total workload.

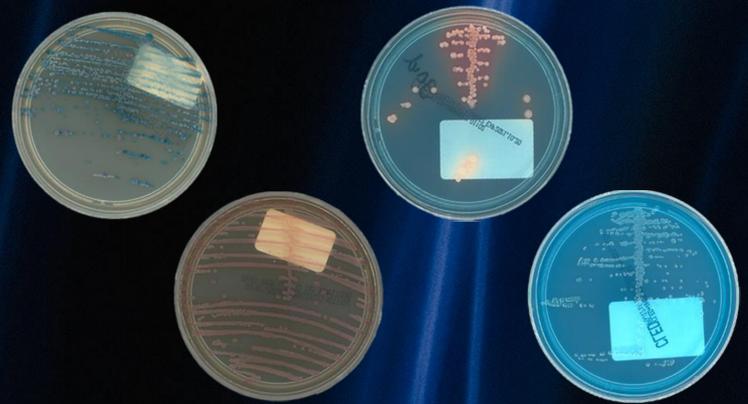


Figure 1: Examples of UTI Brilliance Clarity and CLED plates

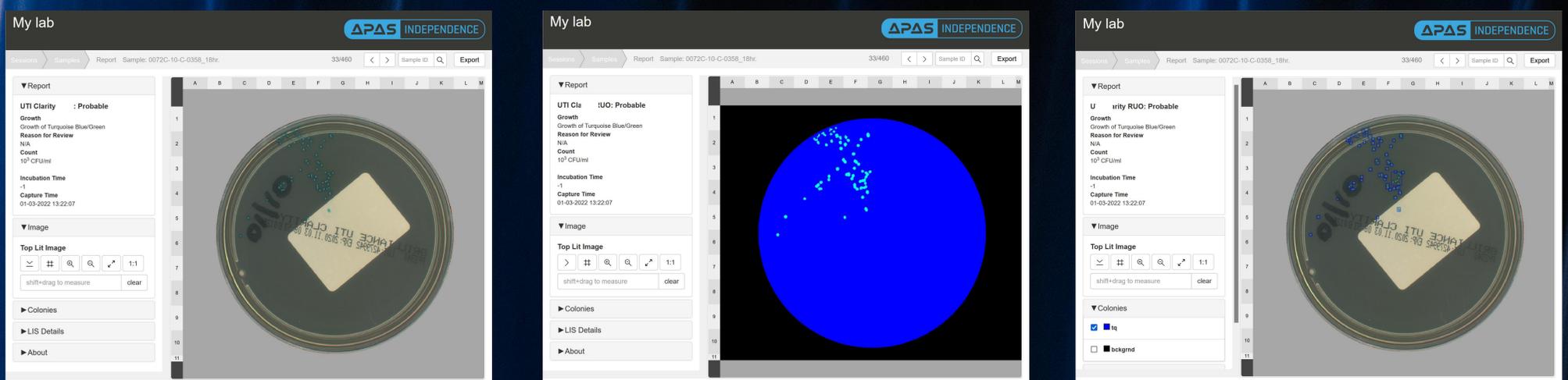


Figure 2: APAS web reports. Left: Standard APAS web report with APAS interpretation and growth summary. Middle: The APAS per pixel classification result demonstrating high accuracy. Right: APAS classification bounding boxes demonstrating each colony classification.

CONCLUSION

- ✓ The APAS Independence using UTI Clarity media offers a reliable alternative to manual plate reading of urine cultures in comparison to traditional bench reading with CLED Andrade's media as demonstrated by the significant agreement between both workflows.
- ✓ The APAS Independence allows for the removal of negative culture plate reading from the urine bench workflow, demonstrating high levels of agreement, with the potential to free up clinical laboratory staff to perform more complicated laboratory tasks.
- ✓ Alternative identification of significant growth *E. coli* colonies using automation has also been demonstrated, with the potential for the APAS Independence and UTI Clarity to replace traditional identification of *E. coli* in urine culture as a cost-effective alternative to the use of MALDI-ToF identification in urine culture analysis.

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