SmartNotes

Studies show Clever Culture Systems' APAS Independence instrument can boost productivity

An AI-driven microbiology imaging system that can accurately remove negative urine cultures from a laboratory workflow in just seconds represents a huge productivity boosting opportunity.

Rising demand for services and staff shortages mean microbiologists are increasingly being asked to do more with less, putting productivity boosting solutions at the top of any laboratory's wish list.

Artificial intelligence (AI), which can help skilled staff define workflows and focus on clinically relevant samples, is one such solution.

Currently, for example, microbiologists spend large amounts of their precious time screening negative cultures and reporting the results, yet almost 60%[1,2], of urine culture and more than 90% of MRSA/VRE culture plates are negative.[3]

Clever Culture Systems' Automated Plating Assessment System (APAS), known as the APAS® Independence instrument, has been designed and FDA-cleared to sort plates into negative, significant growth, and samples needing review, so technicians don't have to.

It's all about focusing on what matters most, said Jacqueline Getty, Microbiology Technologist at the Hennepin County Medical Center in Minneapolis.

A world of potential

Hennepin was among the first laboratories in the United States to adopt the technology and, since 2019, has presented a growing dataset on its experiences at several ASM and ECCMID annual meetings.

Explaining why the team was so eager to embrace the APAS Independence instrument, Getty said: "Given the role microbiology laboratories play in guiding the most appropriate therapeutic decisions by clinicians, helping to prevent hospital-acquired infections and promoting antimicrobial stewardship, it's not surprising that workloads are continuing to increase."

"At the same time, patient outcomes are increasingly being measured by hours to appropriate response and the emphasis on 'on-demand' microbiology testing are quickly outpacing microbiology staffing levels."

The current microbiology workforce, she explained, is predicted to decline by 20% over the next five years, and reimbursement rates for microbiology testing have declined.

In short, clinical microbiology laboratories are being asked to do more with less. AI could be part of the solution.

AI: The silver bullet?

Compared to more traditional workflows, AI can help decrease turnaround times, improve efficiency, and reduce reliance on maintaining, acquiring, and training a qualified workforce.

Yet while the approach has been much discussed in recent years, it has so far fallen short of providing robust decision-making tools: until now.

The APAS Independence instrument uses machine learning (ML), a subtype of AI which uses computer algorithms to quickly spot patterns in large datasets, to screening urine cultures for growth and direct targeted laboratory work-up.

As the first FDA-cleared system for automated culture plate reading and interpretation, it uses imaging recognition technology and algorithms to automatically read, interpret, and sort incubated culture plates into those considered negative, showing significant growth, and samples needing further review by a microbiologist (see figure 1).*

Evidence-based approach[4]

The Hennepin team have collected data on 6,200 clinical specimens and have used these data to add to the evidence base for the APAS Independence instrument.

Getty explained that the analysis had set out to answer three questions, all of which were fundamental to the instrument's ability to do its job.

"We need to ask ourselves what we want automation to do: does the identification of cases meet the criteria for the way we work urine cultures up in the lab.

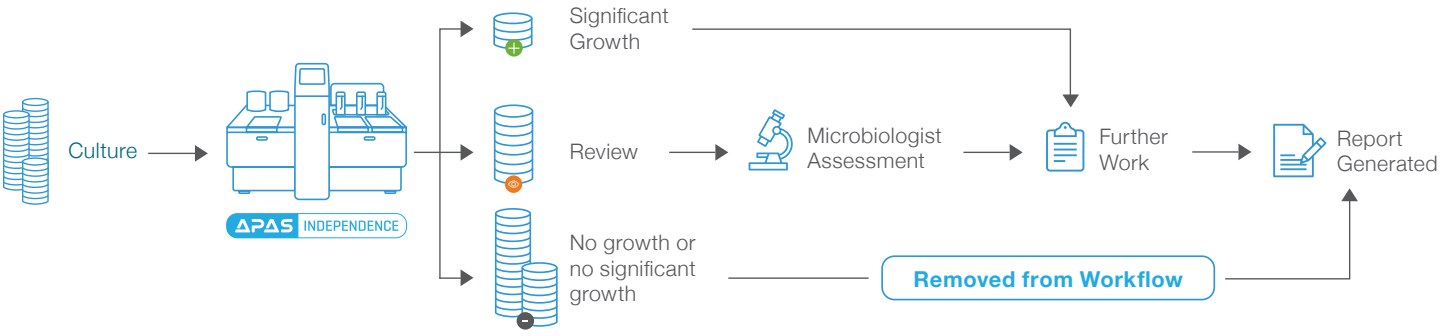
"Specifically, can it identify cases of no growth and auto-remove them from the workflow? Can it identify cases of $>10^4$ CFU/mL growth that we can route to the technicians with a high degree of clinical acuity, and can it identify specimens of low clinical significance, with growth of $<10^4$ CFU/mL, and mark them for review?"

To answer these questions, the team compared the APAS Independence instrument's screening decisions with that of a technician across the full 6,000-plus specimen dataset.

A total of 1,860 of the specimens were negative, and there was 100% agreement between the instrument and the technicians in reviewing, interpreting, and removing these no growth urine cultures from the workflow. As such, 30% of the 6,200 specimens were successfully, and accurately, removed from the bench's workload.

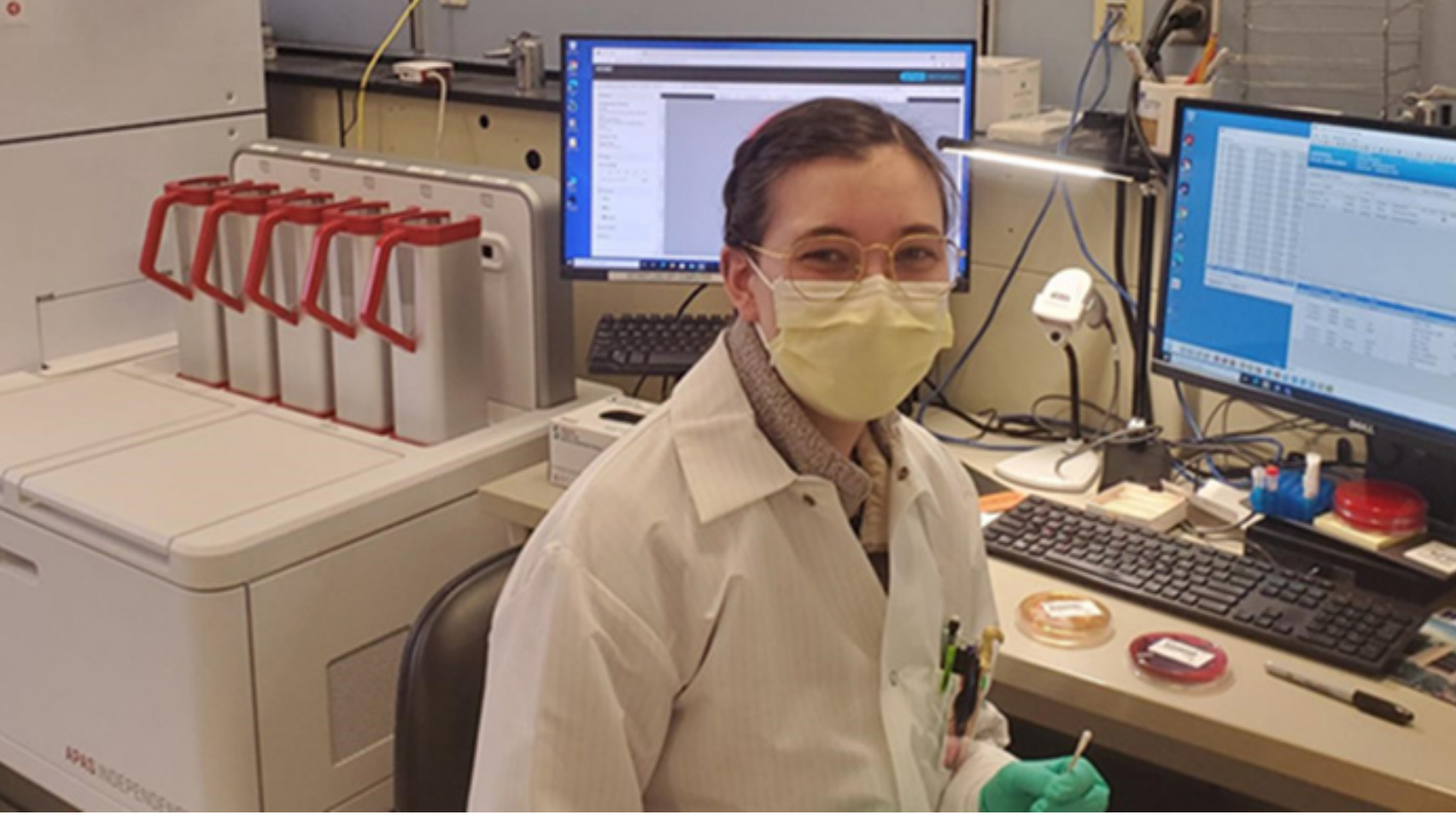
There was also 99% agreement in terms of detecting the 2,646 plates with a clinically significant growth of $\geq 10^4$ CFU/m.

Figure 1: Incorporating the APAS Independence instrument into routine laboratory workflow



*For more information see special use conditions on https://cleverculturesystems.com/apas-independence/ and IFU.

Performance characteristics are with Thermo Scientific™ Remel™ brand media.



Of the 1,468 plates with ≤10^4 CFU/mL, there was 83% agreement, though this was adjusted to 98% upon review.

Explaining why, Getty said 2% of cases (125) had been misidentified due to defects in the label or the media, such as gouges.

Of the remaining 4%, 247 cases involved small colony alpha-Streptococci species, which were deemed not clinically significant. Removing these specimens from the clinical workflow, Getty said, saved about four minutes a case, or 16.4 hours of cumulative technologist time.

Getty also noted that 0.8% of this remaining 4% were determined to be clinically reportable as *Staphylococcus saprophyticus*, and 1.2% involved the detection of non-beta hemolytic Group B Streptococci in women of child-bearing years.

They concluded that the APAS Independence instrument was highly accurate in enumerating colony counts in urine cultures grown in the lab, and that adding a reporting structure for cases involving <10^4 CFU/mL could successfully remove 35.9% of specimens from the workflow.

"That equates to significant additional time for the tech to focus on other tasks, whether that be getting to clinically relevant cultures sooner, starting downstream workups earlier, or tackling some of the other tasks in laboratory," said Getty.

What is the APAS Independence instrument?

The APAS Independence instrument uses imaging technology and AI algorithms to automatically read, interpret, and sort incubated culture plates into those with no significant growth, significant growth, and samples that need review.

To learn more about the APAS Independence instrument and the technology that powers it, visit **thermofisher.com/apas**

[1]Millán-Lou et al., 2018. Comparing Two Automated Techniques for the Primary Screening-Out of Urine Culture. www.ncbi.nlm.nih.gov/pmc/articles/PMC6302016/

[2]Mejuto et al., 2017. Automated Flow Cytometry: An Alternative to Urine Culture in a Routine Clinical Microbiology Laboratory www.ncbi.nlm.nih.gov/pmc/articles/PMC5635286/

[3]Hassoun et al, 2017. Incidence, prevalence, and management of MRSA bacteremia across patient populations-a review of recent developments in MRSA management and treatment. www.pubmed.ncbi.nlm.nih.gov/28807042/

[4]Getty J et al. 2022. Evaluation of the APAS Independence as an artificial intelligence tool for urine culture reporting in a clinical hospital setting. ASM Microbe 2022. Washington, DC. www.pubmed.ncbi.nlm.nih.gov/32920021/

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thermofisher.com/apas

Contact information:
microbiology@thermofisher.com
USA +1 800 255 6730

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