Interview Between International Labmate Editor, Gwyneth Astles, and Heather Read-Harper Senior European Manager for Clinical Diagnostics at Beckman Coulter

Can you provide more details about the specific advancements that the DxI 9000 Analyser introduces to address speed, reliability, reproducibility, and quality in immunoassay analysis? How does it compare to other analysers in the market?

All our design decisions for the DxI 9000 Access Immunoassay Analyser were based around how we can create time for the user so they can focus on what matters most.

As the highest throughput immunoassay analyser on the market, the DxI 9000 Analyser addresses the laboratories need for fast turnaround. This high throughput is achieved through a reduction in the pipette cycle, while shorter assay incubation times contribute to a reduction in the overall turnaround time. This was made possible with the introduction of a new fast acting substrate, Lumi-Phos PRO. In addition to a reduction in assay incubation times, Lumi-Phos PRO also enhances the sensitivity and precision of the assays. To further improve reproducibility, the DxI 9000 Analyser features a dedicated sample precise pipettor to pipette volumes as low as 2 uL with exquisite precision, <2% CV. Precise and accurate delivery of patient samples is a critical step in obtaining accurate test results. PrecisionVision Technology, a novel, patented machine vision technology, ensures that those deliveries are correct for every single test.

To further optimise the user experience and improve reliability, Beckman Coulter has introduced SimpleSolve Onboard Guide to inform and automate user interaction, delivering excellence at every interaction. This intuitive software wizard notifies the user of problems and helps fix them before derailing progress. When issues arise, step-by-step instructions empower the operator to resolve them quickly, minimising downtime and reducing the need for service calls. Should the operator need Beckman Coulter service experts, a new remote diagnostic solution, DxS IntelliServe, is available to resolve issues with real-time monitoring, remote operation, and troubleshooting to maximise laboratory uptime and performance.

Can you provide more details about the analyser's footprint and physical size, considering its impressive throughput of up to 215 tests per hour per square meter?

The DxI 9000 Analyser boasts a higher throughput than any other commonly used immunoassay analyser, capable of performing up to 450 tests an hour. This translates to 215 tests per hour per square metre, thus delivering the highest productivity and the most efficient use of space. Workloads are increasing in every laboratory, yet space is often at a premium, so it is imperative to deliver a future proof solution to laboratories so they can continue to meet the needs of their service users.

Can you elaborate on the independent evaluation in which data was compared to the European Federation of Clinical Chemistry and Laboratory Medicine (EFLM) specifications and the level of performance achieved by the DxI 9000 Analyser?

Accreditation standards require laboratories to define analytical performance goals to ensure the assays they provide meet the level of quality necessary for optimal patient care. The most widely used approach employs biological variation to provide target performance goals; this approach assumes that analytical variation should be masked by the larger biological variation. These limits work well for assessing assay imprecision, especially for medical decisions involving individual patients.

Imprecision goals are established by comparison to within-subject biological variation (CV_I), with optimal performance demonstrating a coefficient of variation (CV) <25% CV_I; desirable performance demonstrating a CV of <50% CV_I and minimal performance demonstrating a CV of <75% CV_I.

The European Federation of Clinical Chemistry and Laboratory Medicine (EFLM) host the Biological Variation Database specifications to which many laboratories refer. As part of an independent evaluation, one laboratory performed precision studies on all assays available on the DxI 9000 Analyser in line with CLSI EP05. The laboratory used 2 different commercially available quality control materials at 3 levels and patient pools at low medium and high concentrations for their precision studies. They then assessed the results against the EFLM specifications for optimal, desirable, and minimal precision. Many of the assays evaluated met optimal performance goals – providing confidence in the performance of the DxI 9000 Access Immunoassay Analyser.

How does the Lumi-Phos PRO Substrate work to enable the development of highly sensitive and clinically relevant assays? Can you explain its mechanism in more detail?

During development, we really didn't want to choose between speed and sensitivity. Lumi-Phos PRO employs a novel chemistry that generates a faster light signal response with our existing access alkaline phosphatase tags. It immediately decomposes to emit light in less than 1 minute. Knowing results sooner, means acting faster in critical situations. For example, the Beckman Coulter Access hsTnI assay, widely used in investigation for chest pain in emergency departments, will produce a result in less than 12 minutes.

In addition to the speed, to enable the development of highly sensitive assays, Lumi-Phos PRO provides an improved signal-to-noise ratio. This is achieved because the blanks are lower, and all samples with analytes in them are glowing brighter generating a higher light signal. This is a very powerful lever in the developer's toolbox, they can take advantage of it in multiple ways, such as improvements in assay sensitivity, shortening of the immunoreaction incubation, or the ability to reduce reaction volumes even further.

What are the specific features of ZeroDaily Maintenance, and how does it revolutionise the daily maintenance tasks compared to other analysers? What are the benefits reported by beta users of the DxI 9000 Analyser regarding the reduction in annual maintenance routines?

It is widely acknowledged that laboratories face resource constraints. Staff have less time to undertake the lengthy routine maintenance tasks that are still necessary on many immunoassay instruments on the market today. The DxI 9000 Analyser sets a new standard in productivity with industry-leading minimal maintenance. No daily maintenance is required. With ZeroDaily maintenance there is no daily hands-on maintenance but also no daily automatic maintenance performed by the analyser. The system requires less than 15 minutes of instrument-guided weekly maintenance. This incredible feature ensures more uptime and predictable performance.

Feedback from the early adopter sites concluded that no daily maintenance enabled them to look at quality improvements that could be made in the whole sample journey. When there is continuous quality improvement, then there is a reduction in time wasted. This means that every minute working is a benefit to the patient.

PrecisionVision Technology seems to play a significant role in preventing erroneous reporting. Can you provide additional insights into how this technology identifies and prevents erroneous reporting? What specific safeguards are in place to enhance system reliability and reproducibility?

Providing accurate results is imperative and confidence in those results is critical. PrecisionVision technology is a novel, patented machine vision technology which pairs cameras and algorithms to detect processing errors and notify the user in real time. PrecisionVision Technology not only catches sample and processing errors but also stops erroneous results from being reported. Pictures are taken at multiple points of the process and are interpreted in conjunction with sophisticated algorithms. If the output does not meet the specific criteria, the user is notified, and the processing of that test is stopped, alerting the user to intervene in real time. The patient sample can be investigated while the analyser continues to process the rest of the tests in parallel.

For example, PrecisionVison Technology will measure volume accuracy for both aspiration and delivery of sample for every test. It is also utilised in automated system diagnostic routines such as monitoring wash efficiency and particle resuspension capabilities of the system at routine cadences. It's another layer of confidence that the instrument is performing consistently well.

Could you elaborate on the specific process of how the DxI 9000 Analyser incorporates tube identification, cap detection, tip check, and other automated safeguards to prevent erroneous reporting?

Throughout the whole process – from loading the samples onto the instrument and through the analytic processing of every test, PrecisionVision Technology safeguards against erroneous reporting. The first camera confirms the absence of caps and assesses the size and shape of the tubes and of course, read barcodes. Obviously, with immunoassay, accuracy at all stages is critical. This technology is also checking the total reaction volume and residual volume within the reaction vessel, so visualising every analytical stage of that sample. It really is an exciting technological advancement.

The Access NT-proBNP assay is mentioned as quantifying N-terminal pro B-type natriuretic peptide levels. How does this assay work to indicate heart function, and how are age-based cutoffs incorporated for improved interpretation of test results?

N-terminal (NT)-pro hormone BNP (NT-proBNP) is well established for use in diagnosis of heart failure and included in standard of care guidelines for and European Society of Cardiology (ESC). Testing of natriuretic peptide biomarkers adds value to clinical judgement and has demonstrated benefit when used in both emergency and outpatient settings.

NT-proBNP, aids in diagnosis, risk stratification and severity assessment for heart failure; it supports decision making across every stage of heart failure care.

The Access NT-proBNP assay is a paramagnetic particle, chemiluminescent immunoassay for the quantitative measurement of N-terminal pro B-type Natriuretic Peptide in human serum or plasma to aid in the following:

- Diagnosis of heart failure
- Assessment of heart failure severity
- Risk stratification of patients with heart failure
- Risk stratification of patients with acute coronary syndrome (ACS)

Access NT-proBNP provides rapid results in less than 11 minutes and increases accuracy in diagnosing heart failure with age-based cutoffs for improved test result interpretation.

The used of age-based cutoffs has demonstrated significantly improved specificity and positive predictive value (PPV) for diagnosing heart failure in an emergency department setting compared to single cutoff strategies.

Rule-out threshold independent of patient's age: 300 ng/L (pg/mL)

Age-stratified Rule-In cutoffs:

< 50 years old	450 ng/L (pg/mL)
50 – 75 years old	900 ng/L (pg/mL)
> 75 years old	1,800 ng/L (pg/mL)

The press release states that the DxI 9000 Access Immunoassay Analyser is globally available in the majority of countries. Are there any plans for further expansion into other countries where it might not currently be available?

The DxI 9000 Access Immunoassay Analyser continues to be rolled out globally at the cadence dictated by country specific registration processes.

Given the impressive advancements in the DxI 9000 Access Immunoassay Analyser, could you shed light on what the anticipated future developments or next steps might be for this technology?

Beckman Coulter has recently announced a new partnership with Fujirebio to support therapeutic development, clinical trials, reimbursement, and routine clinical adoption in the field of neurodegenerative diseases, specifically Alzheimer's disease.

Current diagnostic solutions rely on PET-imaging or a lumbar puncture for cerebral spinal fluid testing. Fujirebio and Beckman Coulter intend to bolster widespread access to patient-friendly, blood-based diagnostic capabilities which will complement and accelerate the impact of breakthrough Alzheimer's Disease therapeutics.

Beckman Coulter will also be partnering with MeMed, a leader in the emerging field of advanced host-response technologies, to jointly develop and commercialise the proven MeMed BV® test for use on our DxI 9000 Access Immunoassay Analyser.

The MeMed BV® test provides the ability to distinguish between bacterial and viral infections early in the diagnostic process which has significant potential to impact patient care.