Microbiology laboratory of St Elisabeth Hospital - Tilburg, The Netherlands

The microbiology lab at St Elisabeth Hospital in Tilburg (Netherlands) is in charge of bacteriological analysis for two local hospital sites (a total of 1,125 beds) and 450 general practitioners, covering a population of 500,000. It processes and analyses some 75,000 samples per year.

The lab operates 24/7 and employs 22 technical analysts (the equivalent of 16.3 full-time employees).

Keeping samples on the move

Thanks to a 24/7 service and advanced automation, the microbiology lab at Tilburg hospital can now deliver analysis results earlier, contributing to more efficient patient care.

A pioneer in process automation, the microbiology lab at Tilburg hospital commissioned a first generation fully automated system from BD Kiestra™ in 2010. In 2014, the lab's on-going improvement efforts led to a further step forward.

The lab installed a second generation BD Kiestra™ Total Lab Automation solution, including faster processing systems, an automated inoculation unit and two new ReadA Compact incubators. Increasing automation with digital imaging has further reduced the need for repetitive tasks and manual plate handling.

Eliminating peaks of activity

At the same time, the lab changed its working hours to run a 24/7 service with existing staff. This eliminated peaks tied to previous work schedules - for example, samples delivered overnight and waiting till morning to be processed.

With this new organisation, samples can be processed continuously with no interim delays.

During the different work shifts, analysts on duty can perform any of the different phases in the process with the support of automated systems - inoculation, plate image reading, sample proceeding, identification and antibiotic susceptibility testing.

"Combining technology and organisation has enabled us to balance the lab's workload throughout the day and issue results faster", says Marco Janssens, Laboratory Technical Manager.

The lab has improved turnaround times from order entry to confirmation by between 8% and 42%, depending on the type of sample. For instance, negative results on wound samples are now available within 38 hours on average instead of 66.6 hours. Microbiologists have begun rescheduling their agenda to adapt to the lab's new service, authorizing results late at night, thus enabling doctors to make quicker decisions regarding patient stay and treatment.

Leveraging automation to run a 24/7 microbiology laboratory

Engaged in a continuous improvement process, the microbiology lab at St Elisabeth hospital in Tilburg has been deploying lean management principles since 2006. "Our objective is to consistently provide top quality in the shortest possible time", explains Marco Janssens, Laboratory Technical Manager.

Although automated since 2010, the microbiology lab in Tilburg was still dealing with situations that would slow down processing of samples. The lab was operating from 8am to 5.30pm. At the start of the day, analysts would have to inoculate the samples delivered earlier in the morning, and at the same time read and interpret the plates that had finished incubating during the night.

Tackle delays

As of April 2014, the lab underwent two major changes to tackle the factors responsible for delays in the analysis process: peaks of activity during the day, and the waiting time in between different phases in the process.

Firstly, it deployed the next generation BD Kiestra™ Total Lab Automation (TLA) solution. This helped to automate a larger volume of tasks, including inoculation, which previously required manual handling. The lab also increased its capacity with the addition of a second incubation/digital imaging ReadA Compact unit. Now it has one unit for O_2 environments and one for CO_2. The improved quality of the second generation digital imaging software has helped to reduce visual plate reading ten times, from 25-30 to just 2-3 a day. "With increased automation and a reduction in manual handling, analysts can focus on where they primarily bring value – growth interpretation", explains Marco Janssens.

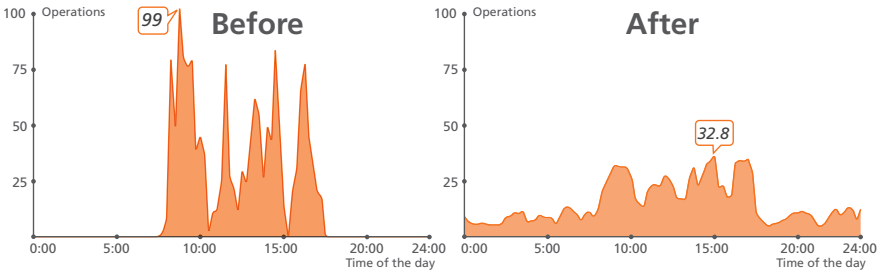
Polyvalent analysts

Secondly, the lab moved to a 24/7 organisation, with three shifts: 8.00am-5.30pm (4-5 FTE analysts), 1.30pm-11pm (1 analyst), and 10.45pm-8.15am (1 analyst). Since all the analysts are able to perform each stage in the process, and because there is always someone on duty, there is no delay in moving samples on to the next phase. A dashboard divides the process into 30 minute time slots and indicates the volume of plates in each phase. This allows the re-allocation of staff to appropriate tasks as necessary.

The organisation has eliminated peaks and this has led to a more balanced workload in the lab. Last but not least, analysis turnaround time has also been reduced.

"The reasoning behind the 24/7 service is simple: more often than not, the samples we inoculate are ready for reading after incubation in the middle of the night. Waiting until the 'normal' workday starts just doesn't make sense. The question was not 'should we move to 24/7?' but rather 'when do we move to 24/7?'. And to achieve this, we needed automation", explains Marco Janssens.

A better balanced load



Lab workload over 24 hrs: cumulated operations (inoculation, reading, culture proceeding) by 15 minute time slots, before and after the new solution.

Marco Janssens,
Laboratory
Technical Manager

« The question was not 'should we move to 24/7?' but rather 'when do we move to 24/7?'. And to achieve this, we needed automation. »

A snowball effect within the hospital

The decision to make the move towards increased automated processes and a 24/7 service came from the lab itself - driven by its continuous improvement efforts. As an outcome, the lab reduced its turnaround time between order entry and result confirmation, which is the final step in the process carried out by the lab's analysts.

An effective impact on patient care

Analysis results can now be released earlier (potentially at any time during the day or night) for authorization by microbiologists… provided that the rest of the organisation is in line. Is this the case? "The rest is starting to follow as word spreads about our capabilities, and this is leading to improvements in patient care", Marco Janssens observes.

Microbiologists now do a late round of authorizations at 10pm from home. "The microbiologists that we meet with daily to talk about specific cases, say that our new organisation is having an impact", reports Analyst Natalie Timmers. ICU doctors are rescheduling their agendas to make earlier decisions regarding patient stay and treatment. "Early feedback from microbiologists has enabled paediatricians to send children home on a Friday instead of the following Monday for example", explains Marco Janssens. This obviously reduces the cost of stay in the hospital.

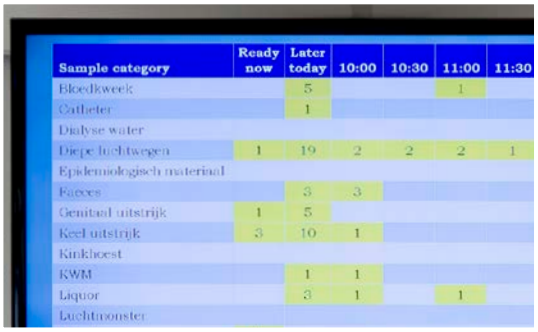
Natalie Timmers,
Analyst

« Earlier result publication has enabled paediatricians to send children home on a Friday instead of the following Monday. »

Challenge
Eliminate peaks and delays in the microbiology lab process in order to issue quality-consistent results in the shortest possible time

Solution
Second generation TLA with BD InoqulA™ and two ReadA Compact, combined with a 24/7 organisation

Benefits
Turnaround time reduced by between 8% and 42%. Results available earlier, enabling faster patient stay/ treatment decisions by doctors



Sample category	Ready now	Later today	10:00	10:30	11:00	11:30
Bloedkweek		5			1	
Catheter		1				
Dialyse water						
Diepe luchtwegen	1	19	2	2	2	1
Epidemiologisch materiaal						
Faeces		3	3			
Genitaal uitstrijk	1	5				
Keel uitstrijk	3	10	1			
Kinkhoest						
KWM		1	1			
Liquor		3	1		1	
Luchtmonster						

Less stress for analysts

The atmosphere at the Tilburg hospital microbiology lab is resolutely calm. A better balanced workload has reduced stress on analysts. "Most of the activity peaks have been eliminated. We also rush less to finish everything before the 5.30pm deadline", explains Analyst Natalie Timmers. Now that the lab runs 24/7, analysts know that someone will be there to take over and ensure that the analysis process keeps going.

Safer work environment

The deployment of the new Total Lab Automation solution is bringing tangible benefits. Automated inoculation and digital reading has helped reduce manual handling. "It makes our life easier. As well as increased productivity, this translates into a safer work environment with less direct manipulation of bacteria", Natalie adds. Digital imaging is now widely accepted for reading and interpretation – a key competency of analysts. "We see more on the picture than with a manual reading", Natalie says.

The 24/7 service has led to change. On the day shift, analysts perform the same task throughout the day - sample processing of ID/AST for example, which can be somewhat repetitive. On the evening or night shifts, the analyst on duty performs all the different tasks: "We feel that we have more responsibility then."

Clearly defined priorities

If samples are waiting at different stages in the analysis chain, the microbiology lab has defined clear priorities for analysts who work in full autonomy, especially during the evening and night shifts:

1. Inoculation (specimen processing)
2. Reading (interpretation)
3. Sample proceeding (colony picking and ID/AST preparation)

Placing trust in a single supplier

The Tilburg hospital microbiology lab relies fully on BD solutions and equipment for its entire process.

Blood culture is performed with a BD BACTEC™ unit. The Total Lab Automation (TLA) solution covers a large part of the overall microbiological analysis process: inoculation (plate streaking), incubation, plate imaging and reading. The Bruker MALDI Biotyper™ (a BD partner product) contributes to speed up microbial identification. Finally, antibiotic sensitivity tests are conducted on BD Phoenix™ AP / BD Phoenix™ systems.

The BD EpiCenter™ middleware ensures connectivity between these systems, thus managing the overall workflow. "Each system must not only be efficient, productive and deliver consistent quality, it also has to fit into the lab's overall organisation", Marco Janssens explains.

« It's not an issue having a single supplier, as long they listen and understand our expectations. »

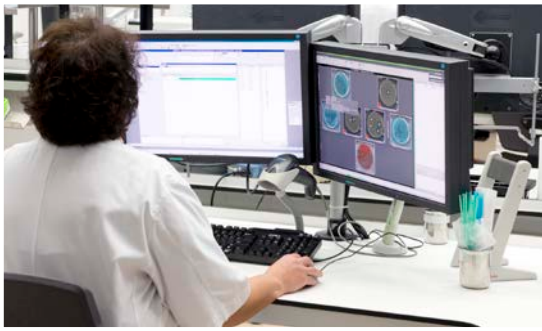
The technical lab manager had high expectations specifically with regards to the TLA setup. "TLA is not plug and play, like a blood culture unit for instance. Adjustments, settings and fine tuning are part of the normal introduction process", Marco adds. Interaction with suppliers is therefore a key factor for success. "BD listens to the lab technicians, discusses their needs, and involves the users. I like the way they handle feedback. It's not an issue having a single supplier, as long they listen and understand our expectations."

BD'S SOLUTION

- Blood culture system: BD BACTEC™
- Inoculation, plate streaking: BD InoqulA™
- Specimen processing, incubation, imaging and reading: BD Kiestra™ Total Lab Automation (TLA) solution
- Antibiogram: BD Phoenix™ AP / BD Phoenix™
- Microbiology data & workflow management system: BD EpiCenter™

Partner products

- Microbial identification: Bruker MALDI Biotyper™



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