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Implementation, Validation and Streamlining the Workflow of a Total Lab Automation – a One Year Experience

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Background

Microbiology as we know it today is dominated by manual work. This includes labeling, inoculation and transport of media. For some years now solutions for partial automation exist. However, total lab automation (TLA) using one machine for labeling, inoculation, transport, incubation, reading, work-up and disposal of plates is a new development. In April 2015 a TLA (BD Kiestra) was assembled at our institution. It consists of a 24 slot SorterA, a BarCodA, an InoculA with a safety hood, 4 ReadA Compacts and 7 work places directly attached to the system. Here we describe how we validated the machine, adjusted our workflows and accelerated reporting and what limitations we encountered during implementation.

Methods

After assembly the performance of the TLA was reviewed. This included tests with plates from 4 different manufacturers, temperature consistency in the incubators during one week, potential spilling from sample to sample and growth curves for MRSA, VRE and MRGN using selected ATCC strains as well as patient isolates. According to the results from the growth curves incubation and imaging programs for different kinds of media were determined for the TLA. 525 screening samples (nose swabs, rectal swabs) were inoculated in parallel classic way and TLA and results compared. After go-live results with patient samples were reviewed to determine the indispensable incubation times for MRSA, VRE and MRGN. Imaging time points were optimized to current workflows and working hours.

Results

1. The TLA is capable of working with plates from all manufacturers tested.
2. The TLA hardware is capable of running 2500 plates in a row.
3. Temperature is extremely consisted over a period of one week.
4. We have no evidence for spilling from one sample to the other.
5. Current selective media support the growth of MRSA/MRGN within 20 hours and VRE within 36 hours.
6. The comparison between classic inoculation and reading with inoculation and reading using the TLA revealed an overall higher positivity rate with the TLA (about 10% more positives).
7. Current data allow a final read for nose swabs at 20 hours after start of incubation and a final read for rectal and wound swabs at 36 hours.

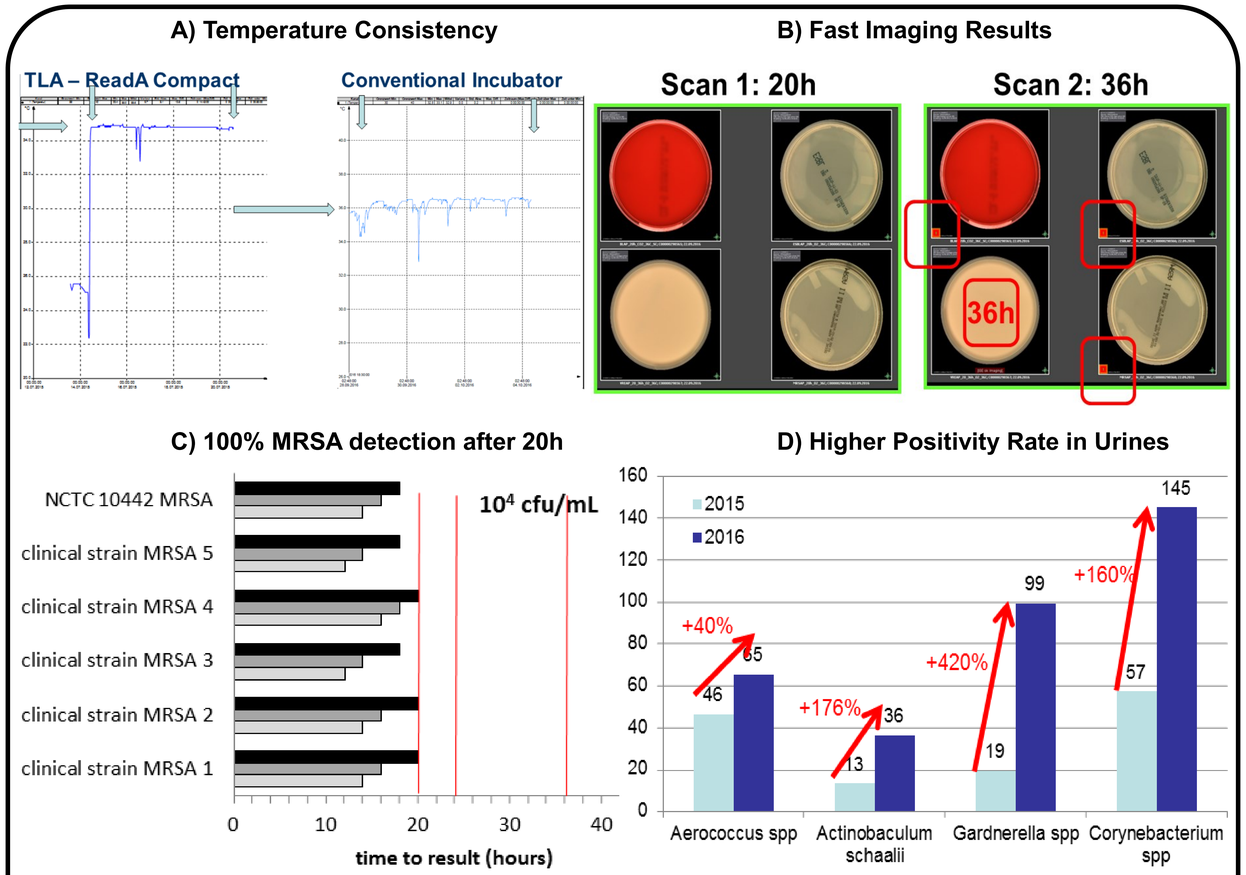

Fig.: A) External temperature logging

B) Single plate reading MRSA/MRGN after 20h
[only chromogenic VRE needs 36h image]

C) MRSA growth on chromo. BD MRSA II agar

D) Comparison rare UTI pathogens (07-12/15 to 16)
[mainly *A. urinae, G. vaginalis & C. urealyticum*]

Conclusions

Implementation of a TLA into a microbiology lab is a demanding process using a lot of human and financial resources. It necessitates a review of current protocols and continuous adjustments of work-flows and protocols as well as training and education of staff. This effort is rewarded by:

a high quality of inoculation, a standardized incubation , higher detection rates and speeding up of the reporting process.

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