Q-linea ASTar® System

Rapid Antimicrobial Susceptibility Testing of Blood Cultures

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Introduction

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Chief Medical Officer, Q-linea

- More than 16 years of experience in clinical practice, research, and clinical affairs positions in the microbial diagnostic industry.
  - CMO at Q-linea since 2019

  Formerly:
  - Head of Clinical Development EMEA at Accelerate Diagnostics
  - Clinical and Scientific Affairs Manager EMEA at Abbott Point of Care
  - Regional Medical Affairs Manager at Abbott Molecular

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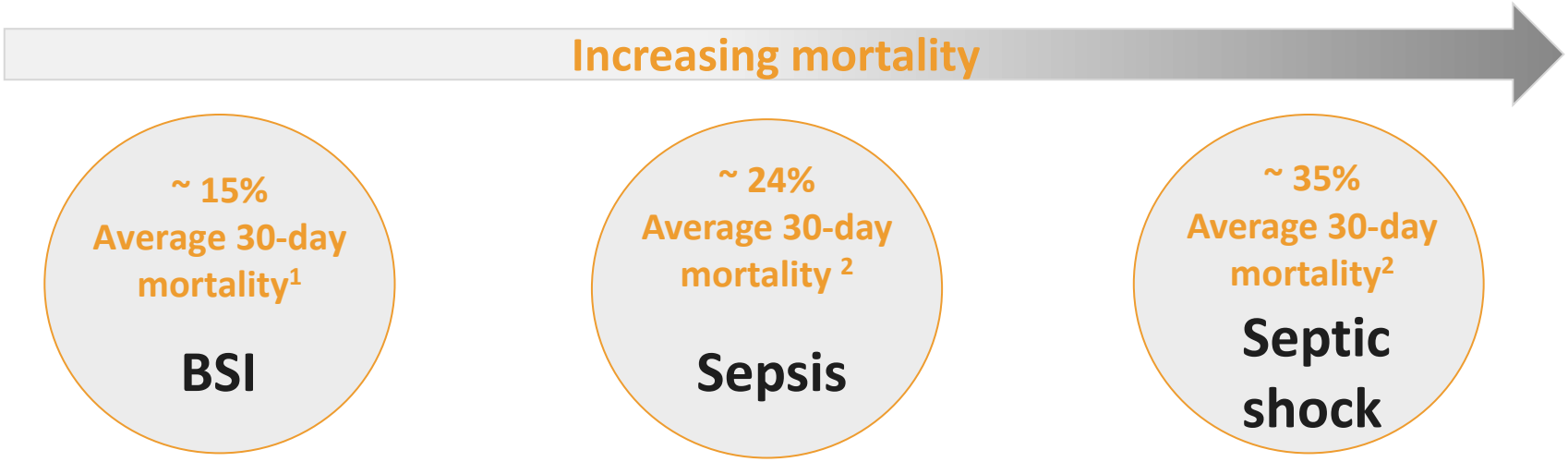
Background



BSI = blood stream infection

- Sepsis affects approximately **1.7 million adults** in the United States each year and potentially contributes to more than **250 000 deaths**[3].

1. Hattori H, Maeda M, Nagatomo Y, Takuma T, Niki Y, Naito Y, Sasaki T, Ishino K. Epidemiology and risk factors for mortality in bloodstream infections: A single-center retrospective study in Japan. Am J Infect Control. 2018 Dec;46(12):e75-e79. doi: 10.1016/j.ajic.2018.06.019. Epub 2018 Aug 29. PMID: 30172607.
2. Bauer, M., Gerlach, H., Vogelmann, T. et al. Mortality in sepsis and septic shock in Europe, North America and Australia between 2009 and 2019— results from a systematic review and meta-analysis. Crit Care 24, 239 (2020). https://doi.org/10.1186/s13054-020-02950-2
3. Rhee C, Dantes R, Epstein L, et al; CDC Prevention Epicenter Program. Incidence and trends of sepsis in US hospitals using clinical vs claims data, 2009-2014. JAMA. 2017;318(13):1241-1249. doi:10.1001/jama.2017.13836

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ASTar®

- ASTar® is used in the inpatient setting to provide a rapid, fully automated antimicrobial susceptibility test (AST) from a positive blood culture
- Patients with blood stream infections can deteriorate very rapidly and are typically treated with antibiotics in a so-called empiric therapy
- A rapid AST result can either confirm the initial therapy or guide changes to escalate/de-escalate to other antibiotics or dosage and lead to an optimal therapy sooner than current methods

Consumables – Cartridge with a snap-in Frozen Insert and Disk

ASTar® Instrument

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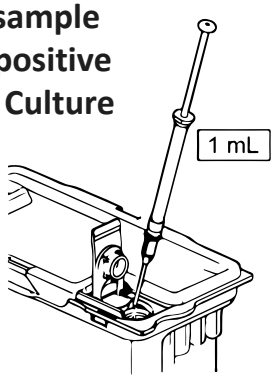
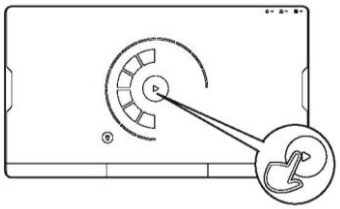
ASTar® is very easy to use and provides rapid results

Add sample from positive Blood Culture

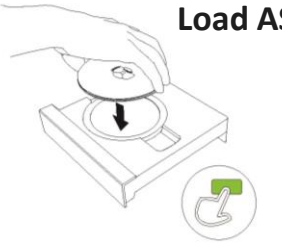


Click "Start"

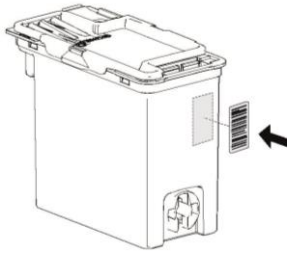


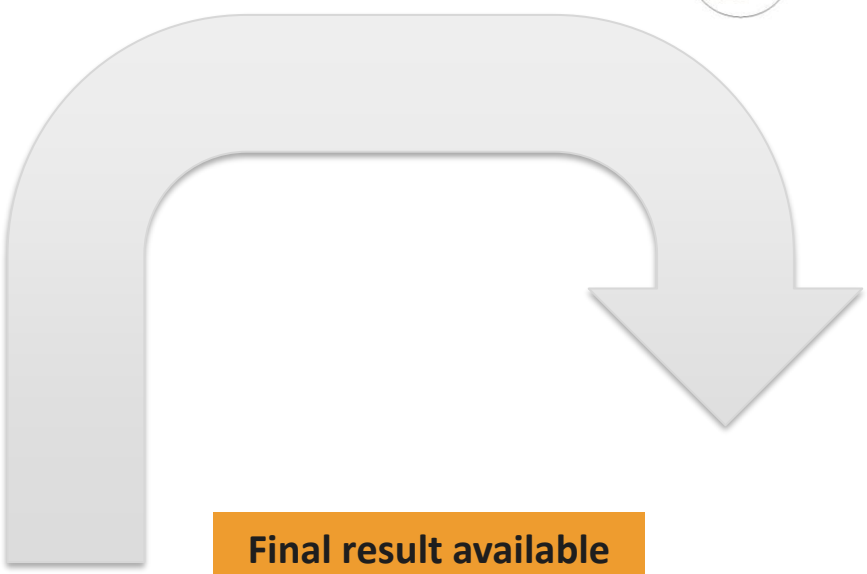
Scan barcode and load Cartridge into Instrument

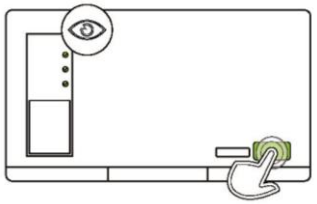
Load AST disc



Add sample barcode







Click "Start run"

Enter Pathogen ID at any point during the run

Final result available in ~6 hours

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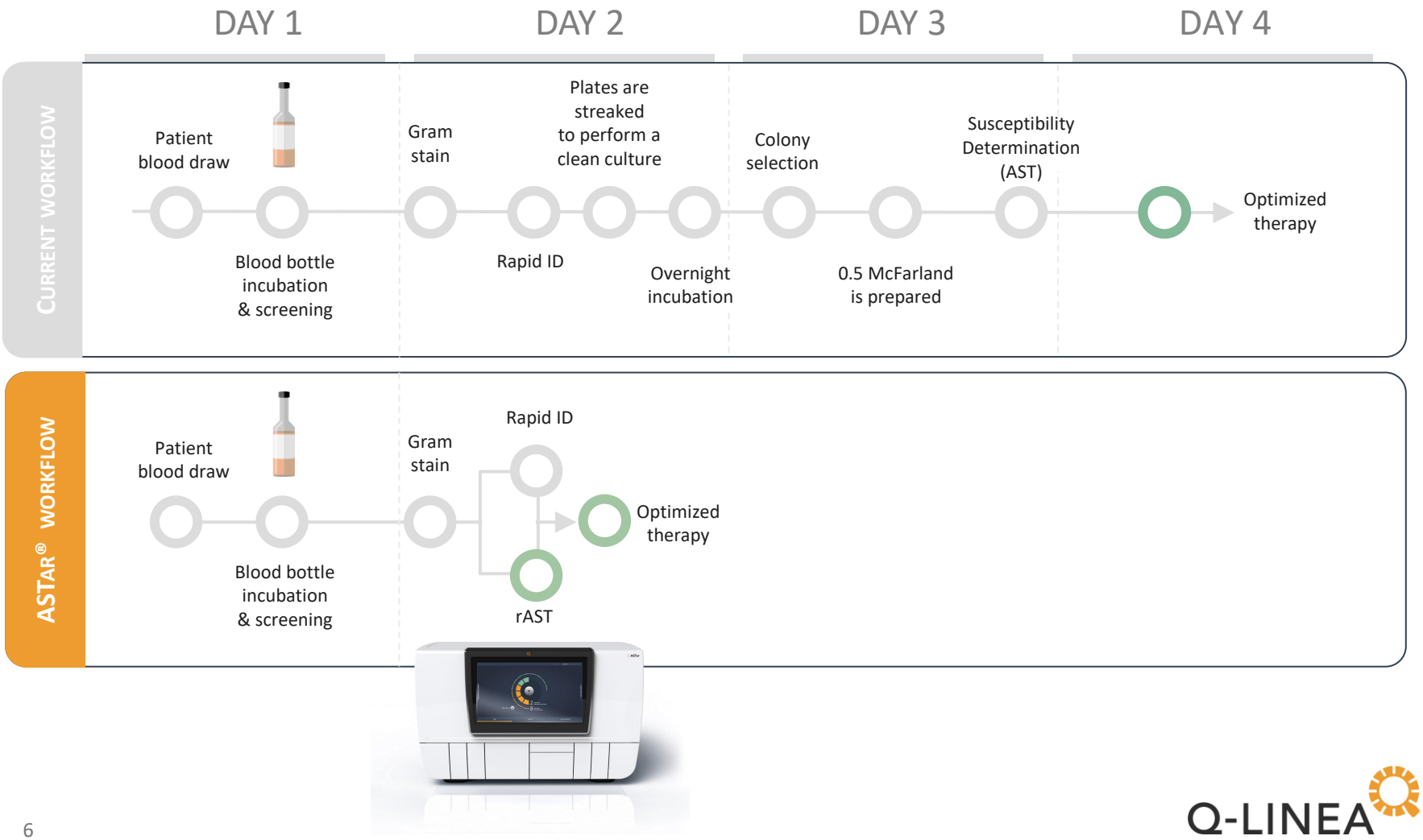
Actionable results up to 48 hours faster



The AST Landscape – Some examples

Phenotypic

- Rapid (TAT<7hrs)
  - Providing MIC → Provides rapid MIC results → Rapid AST, providing MIC results enable faster escalation when initial empiric therapy provides inadequate coverage and faster de-escalation when empiric therapy is inappropriate, as well as MIC driven antibiotic dosage adjustments.
  - Providing SIR → Does not enable MIC-driven antibiotic treatment decisions.
- Conventional
  - Manual (TAT~24hrs)
    - Providing SIR → Disc diffusion, rAST → Slow, Does not enable MIC-driven antibiotic treatment decisions.
    - Providing MIC → Manual BMD, E-test → Slow. Delayed antibiotic therapy optimisation.
  - Semi-automated (4hrs<TAT<36hrs, after +12-24 h isolate growth) → Slow compared to rapid methods. Current general SOC.

Genotypic

(TAT 1-2hrs)

→ Fast, but limited info, only shows resistances, not susceptibility. Cannot detect unknown resistance mechanisms.

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Inpatient Coding for ASTar®

- Several ICD-10-CM codes exist, covering traditional and rapid sepsis diagnosis. The ASTar® BC G- Kit tests certain Gram negative non-fastidious bacterial species. Current ICD-10-CM codes are the diagnoses codes for sepsis and other infections associated with the bacterial species included in the ASTar® System's Breakthrough Device designation and 510(k) application indications for use.

- ICD-10-PCS codes are not coded for laboratory tests performed by the hospital laboratory during inpatient stays. Many inpatient discharges may include the same ICD-10-CM codes that would be used to document the conditions prompting the use of the ASTar® System. We are applying for a unique ICD-10-PCS code to differentiate cases where the ASTar® System is used. Having a unique code will make this Breakthrough Device accessible to patients.

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Inpatient Use of ASTar®

- NTAP
  - Q-linea applied for NTAP for FY 2025

- Documentation
  - The AST results report is an integral part of treatment decisions and can be documented in the medical report either as a printed hardcopy, electronically as a PDF or transferred to the Hospital LIS (Laboratory Information System). Results may be documented in patient lab test results in the electronic health record (EHR) and/or discussed by physicians in progress notes of discharge reports

- Use of ASTar® with Other Technologies
  - ASTar® requires a Gram-stain procedure from positive blood culture bottles to ensure that the Gram-negative panel is suitable and the sample is monomicrobial. The system also requires the identification of the pathogen to be able to generate the result report with the respective breakpoints. All of these procedures/technologies are usually a standard part of the laboratory workflow for bloodstream infections

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ASTar® European Clinical Performance Study

Design

- ASTar® was assessed against broth microdilution (BMD), as the reference method (Sensititre).
- Testing performed across three sites, utilising 412 contrived blood samples and 74 clinical patient samples.
- 23 tested antimicrobials and 14 Gram-negative bacterial species generated a total 222 antimicrobial-species combinations.

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ASTar® European Clinical Performance Study

Key findings

- ASTar® demonstrated good performance for a wide range of non-fastidious Gram-negative bacteria.
- The accuracy data set resulted in 8,650 data points, demonstrating an overall essential agreement (EA) of 95.8% and categorical agreement (CA) of 97.6%.
- Overall major discrepancies were 0.9% and very major discrepancies were 2.4%.
- Reproducibility was shown to be 99.5% for a best-case calculation, and 97.5% for a worst-case calculation.

Antimicrobial	EA (%)	CA (%)
Ampicillin	96.7	98.3
Amoxicillin-clavulanic acid	95.5	93
Piperacillin-tazobactam	95.4	97.7
Cefazolin	96.5	91.6
Cefepime	97.3	98.6
Cefotaxime	95.3	98.9
Cefoxitin	NA	NA
Ceftazidime	97.5	97
Ceftazidime-avibactam	91.6	98.4
Ceftolozane-tazobactam	97.7	98.1
Ceftriaxone	96.6	99.1
Cefuroxime	95.9	96.9
Ertapenem	94.7	99.8
Meropenem	94.6	95.8
Aztreonam	98.6	98.6
Ciprofloxacin	96.4	96
Levofloxacin	98.1	96.6
Amikacin	92.2	98.7
Gentamicin	95.6	98.1
Tobramycin	94.9	99.3
Tigecycline	96.4	99.5
Colistin	94.4	100
Trimethoprim-sulfamethoxazole	95.3	96.9

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FDA Approval Pathway

- Device Class:
  - Class II

- Breakthrough Device:
  - Granted Breakthrough device designation April 7, 2022. “The ASTar® BC G- Kit is a multiplexed, in vitro diagnostic test utilizing quantitative, AST methods and intended for use with the ASTar® Instrument. It is performed on positive blood cultures confirmed for Gram- bacilli by Gram stain. Results are only reported once species identification is input.”

- Timeline:
  - FDA 510(k) submission – June 8, 2022

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Glossary of Terms

Term	Definition
AST	Antimicrobial Susceptibility Testing
ASTar® BC G- Kit	ASTar® proprietary “Blood Culture Gram Negative” kit
BMD	Broth Microdilution
CA	Categorical agreement
EA	Essential agreement
E-Test	A common MIC method using test strips
MIC	Minimum Inhibitory Concentration
rAST	Rapid Antimicrobial Susceptibility Testing
SIR	Sensitive (S), Susceptible, increased exposure (I) or Resistant (R)
SOC	Standard of Care
TAT	Turn Around Time

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