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Background. To prevent the spread of drug-resistant bacteria, a rapid and accurate antimicrobial susceptibility test (AST) is necessary. Recently, morphokinetic microscopy approaches have been reported as a rapid AST method. However, these still require several hours to obtain a minimum inhibitory concentration (MIC). Adenosine triphosphate (ATP) luminescence has also been reported as a rapid AST method that can detect bacterial growth more rapidly than morphokinetic approaches, since ATP in bacteria increases prior to bacterial division. In this study, we designed a new machine learning-based algorithm that predicts MIC rapidly, using a dataset that contains ATP luminescence patterns and conventional MICs determined by turbidity. Essential agreement (EA) rates between rapid and conventional MICs were then evaluated.

Methods. Sixty-three strains of E. coli (ATCC 25922 and clinical isolates from Toyama University Hospital) were tested. Bacterial suspensions were diluted 500-fold in Mueller–Hinton broth from 0.5 McF solutions, and the final concentration of bacteria was 3×10^7 CFU/mL. The suspensions were dispensed into a 96-well microplate, which had 12 antimicrobials in two-fold dilution series, and the microplate was incubated at 35°C. At each measurement time point, the amount of ATP in a 10 μL aliquot from each well was evaluated by our original measurement system, which can sensitively detect ATP luminescence to a single bacterium. After 22 hours, MIC was determined conventionally by measuring turbidity. A rapid MIC for each bacterium was calculated by using the algorithm based on the dataset consisting of the rest of the 62 strains (leave-one-out cross validation).

Results. Table 1 shows the EA rate for the 12 antimicrobials; EA rates > 90% were achieved for 7 antimicrobials in 2 hours and for 12 antimicrobials in 3 hours. In 6 hours, an average EA rate > 97% was achieved.

Conclusion. Using the dataset, our new machine-learning-based algorithm predicted MIC rapidly within 2 hours with an EA rate > 90% for 7 antimicrobials. The rapid AST detected by the ATP luminescence method will contribute toward both appropriate antimicrobial treatment and reduction in medication charges. In the future, other species of bacteria will be evaluated by our ATP method.

Table 1 EA rate (%) by ATP luminescence and machine learning

| Antimicrobial | MIC 0.5 | MIC 1.0 | MIC 2.0 | MIC 5.0 | MIC 10.0 | MIC 20.0 |
|-------------|-------|-------|-------|-------|-------|-------|
| ABR | P | T | ABR | P | T | ABR | P | T | ABR | P | T | ABR | P | T | ABR | P | T | ABR | P | T | ABR | P | T |
| 8Bas | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 |
| 4Bas | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 |
| 2Bas | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 | 108 | 95.2 |

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2137. Impact of Accelerate Pheno™ Rapid Blood Culture Detection System with Real-time Notification vs. Standard Antibiotic Stewardship on Clinical Outcomes in Bacteremic Patients

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Background. Accelerate Pheno™ blood culture detection system (AXDX) provides identification (ID) and antimicrobial susceptibility testing (AST) within 8 hours of growth in blood culture. We previously reported length of stay (LOS), time to optimal therapy (TTOT), and fasting time to optimal therapy (FTOT) for AXDX results in the setting of an already active ASP in our institution. Addition of real-time notification (RTN) for AXDX results in the setting of an already active ASP did not further improve these metrics. However, compared with historical arm, AXDX with RTN did significantly impact specific subsets of antibiotic use while AXDX alone did not. This may be due to earlier vancomycin de-escalation. These results support the benefit of integration of AXDX into healthcare systems with an active ASP even without the resources to include real-time notification.

Table 1 Clinical Outcomes comparing historical, intervention 1, and intervention 2 arms

| Clinical Outcomes | Historical | Intervention 1 | Intervention 2 |
|------------------|-----------|----------------|----------------|
| LOS, days (mean ± SD) | 11.89 (10.0) | 6.39 (5.4) | 5.55 (4.5) |
| ICU LOS, days (mean ± SD) | 5.17 (3.6) | 3.03 (2.0) | 5.23 (3.9) |
| TRF, days (mean ± SD) | 2.48 (1.8) | 1.58 (1.5) | 1.41 (1.8) |
| Optical Te, achieved (% | 59.8 (6.7) | 45.0 (10.6) | 58.0 (6.5) |

2138. Follow-up Investigation of Antibody Titters and Diagnostic Antibody Cut-Off Values in Scrub Typhus Patients in Korea

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Background. Scrub typhus is a mite-borne infectious disease caused by Orientia tsutsugamushi. There have been few follow-up studies assessing antibody titers using serologic tests from various commercial labs.

Methods. A prospective investigation to assess antibody titers of scrub typhus patients and seroreversion for health checkup individuals were evaluated. The antibody titers of former patients diagnosed with scrub typhus at least 1 year and a maximum of 13 years were also investigated. The following tests were performed simultaneously: (i) immunofluorescence antibody assays (IFAs) that detect immunoglobulin (Ig) M and IgG, (ii) IFA that detects total Ig by a commercial lab, (iii) antibody tests using two commercially available kits.

Results. In prospective analyses with cutoff values set to ≥1:40 for IgM, ≥1:256 for IgG on the KCDC's criteria, and ≥1:40 for total Ig. The antibody positive rates of 162 confirmed scrub typhus patients were 44%, 33.5%, and 57.6%, respectively, in the first week after symptom onset. Among 91 former patients recovered, the follow-up IgM, IgG, and total Ig positivity rates were 38.5% (35/91), 22.0% (20/91), and 76.9% (70/91), respectively. In overall cohort of 216 health checkup subjects, 4.2% (9/216) IgM and 0% (0/216) IgG seroprevalence was observed.

Conclusion. The IFA from KCDC and commercial lab, and rapid commercial kits cannot differentiate between former patients recovered from scrub typhus and current scrub typhus. In Korea and other countries where low antibody cut-off titer values have been used as criteria for diagnosing and reporting scrub typhus, upward adjustments of cut-off values may be necessary.