SeLux Diagnostics Developing AST System That Provides Single-Day Results

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NEW YORK (360Dx) – SeLux Diagnostics is developing an antimicrobial susceptibility (AST) platform that it anticipates will meet clinicians' requirements allowing them to quickly prescribe the correct antibiotics to patients.

The AST system, using a microplate-compatible bacterial surface area assay and standard microbiology lab technology, is expected to provide results within the first day following a sample culture to enable clinicians to accordingly prescribe the most suitable antibiotic for their patients' medical conditions, the firm said.

The SeLux system, first developed four years ago by cofounders Eric Stern and Aleksandar Vacic, is expected to deliver up to 50 AST tests per day, exceeding the workflow needs of labs and matching the throughput of the highest output systems currently in the market, the firm said.

An optimal AST platform would further enable menus of greater than 30 antibiotics to be tested per patient sample, a goal that is unmet by some existing phenotypic AST platforms, the firm's CEO Steve Lufkin said in an interview. The SeLux system leverages standard microbiology processes so that labs can easily integrate it and increase efficiency, he added.

At the end of September, the Boston-based firm said that it inked a milestone-based contract worth up to $45 million with the Biomedical Advanced Research and Development Authority, a division of the US Department of Health and Human Services.

The firm will receive $9.3 million upfront to fund a clinical trial for its next-generation phenotyping platform. SeLux is eligible for an additional $36 million, contingent on it meeting certain milestones, for the development of a second-generation rapid sepsis diagnostic platform.

Its first-generation system trims the timetable to getting an appropriate treatment to a patient by one to four days, Lufkin said, adding, "The BARDA funding enables us to take the next jump forward" so that a treatment decision can be made in one day.

Selux completed an undisclosed but "material" Series B round of financing earlier this year that will be directed at the commercialization of its platform, he said. The firm anticipates entering clinical trials for the first-generation platform in the second half of next year and then submitting a 510(k) application to the US Food and Drug Administration for clearance to market the system in the US. It is evaluating "a host of potential partnerships and collaborations for commercialization and product launch," Lufkin said, including distribution and co-promotion agreements.

Ultimately, he said, the firm anticipates launching the system outside the US because antibiotic resistance is a global crisis. "If we can meet the need of the US market, it will open up other opportunities for us," he said. "With the nature of bacteria and how they

evolve in unique ways in different regions, we will need to do some customization to enable rolling this out on a global basis."

Product positioning

The firm is positioning its diagnostic platform as an alternative to existing antimicrobial susceptibility systems that can take between three and six days to provide an AST result.

"If clinicians can get patients on correct therapies sooner, they get them out of the hospital quicker and the patient recovers faster," Lufkin noted.

Among competing ID-AST systems currently in the market, the FDA-clearedPheno Blood Culture Detection System from Accelerate Diagnostics also promotes its speed to result as a differentiator over older systems.

Andrew Chasteen, head of global corporate and marketing communications for Accelerate, said that it is "difficult to foreshadow the way a new entrant [such as SeLux] might change the market without a bit more available research, certainty around the testing device and final product available to laboratories, and ... experience in a clinical setting."

The Accelerate system can identify bacteria or yeast from a positive blood culture in about 1.5 hours. For some organisms, the test provides crucial information to guide treatment recommendations in about 6.5 hours after the organisms are detected from blood cultures. The system provides antibiotic sensitivity information on 18 selected antibiotics for a subset of identified organisms.

The Accelerate Pheno system uses genotypic technology to identify infectious pathogens and phenotypic technology to conduct antibiotic susceptibility testing.

At IDWeek, currently taking place in San Francisco, researchers will present findings on the impact of the Accelerate Pheno Blood Culture Detection System on laboratory and clinical outcomes in bacteremic patients. The researchers report that compared to the standard of care, the Accelerate system shortens mean antibiotic duration of therapy, time to optimal therapy, and length of hospital stay. Further studies are needed to verify these findings, however, the researchers said.

In addition to Accelerate, Luminex is targeting faster AST results, and in a recent five-year study, the Luminex Verigene gram-positive blood culture panel enabled more effective management of antimicrobial therapy by detecting the presence or absence of genes reflecting resistance to antibiotics, according to clinicians at the Children’s Hospital Los Angeles.

The SeLux platform, like all currently-available phenotypic AST platforms, requires bacterial incubation. It is being developed to perform AST either from an isolated colony, similar to the operation of conventional systems, or from a positive blood culture, similar to the operation of the Accelerate Pheno system. "The ability to operate from either of these sample types is important to meet laboratory testing requirements," said Mary Jane Ferraro, a microbiologist at Massachusetts General Hospital and a paid consultant to SeLux Diagnostics.

SeLux said that its AST system is a microplate-compatible bacterial surface area assay that tracks how pathogens are responding to antibiotics before other systems. Bacteria change shape and size in an attempt to evade death, Lufkin said, and the SeLux system tracks these activities giving an early indication of whether an antibiotic will be successful.

In practice, a cultured patient sample has its pathogen identified by standard, MALDI, or PCR-based methods, and the SeLux platform completes AST testing.

The core technology for providing AST results is an end-point surface area assay. The SeLux platform operates by first incubating 384 different drug-bug combinations for three hours. It determines that incubation is complete when a “sentinel” well on the plate shows sufficient bacterial growth. The SeLux surface area assay commences ooperation, and molecular probes designed to bind bacterial surfaces are added to each well. The probes amplify the bacterial surfaces, in turn enabling accurate bacterial antimicrobial susceptibilities to be reported with a standard microplate reader using time-resolved fluorescence.

In a poster prepared for presentation at IDWeek, researchers associated with the firm describe the assay as "an automated, rapid, phenotypic AST platform that utilizes standard 384-well microplates as consumables, sufficient to allow simultaneous testing of both newly-approved antibiotics and broad selections of generic antibiotics."

The platform has returned definitive susceptibility results within five hours from greater than 90 percent of the isolates tested to date, the researchers said. As a result, by speeding the reporting of AST results, SeLux’s platform could enable hospitals to simultaneously improve patient care, decrease lengths-of-stay, and meet antibiotic stewardship goals, it said.

The surface binding assay concept is based on the capability of antibiotics to induce morphological changes, including filamentation and swelling, in susceptible bacteria. Detection of bacterial surface area allows differentiation between organisms that are susceptible and filamentous and those that are resistant and dividing, the firm said.

The system provides automated classifications of isolates with minimum inhibitory concentration (MIC) and susceptible, intermediate, or resistant (SIR) calls that are uploaded to a laboratory information system.

Ferraro said that "the capability to quickly test a very large number of antimicrobial agents at the same time on the same test panel and provide detailed MIC results may be beneficial."

The firm's 384-well panel could allow labs to test "both older, standard, and proven antimicrobial agents, [and] also to test more potent and newer agents at the same time," she said. When resistance is recognized, the system aims to give the lab answers about the resistance to all antibiotics without requiring that a laboratorian set up another test, and to send results immediately to physicians caring for the patient and to the antimicrobial stewardship teams, she added.

Ferraro noted that SeLux is a new player in the microbiology space, which in addition to Accelerate includes Becton Dickinson, marketer of the Phoenix automated identification and susceptibility testing system; BioMérieux, marketer of the Vitek microbial identification and antibiotic susceptibility test system; and Beckman Coulter, marketer of the MicroScan microorganism identification and susceptibility testing system.

"The SeLux system may be able to deliver something that the other current systems cannot provide, [which is] full-dilution MIC results that are nearly a surrogate for the Clinical and Laboratory Standards Institute reference broth microdilution test, which takes 16 to 24 hours," she said. "For those labs still using manual, overnight methods, such as the CLSI disk diffusion method, the SeLux system could potentially provide an opportunity to automate and speed the time to results while overcoming what they view as shortcomings of current commercial systems."

Getting the right drugs to patients is "particularly important for patients with serious infections and for infections caused by the ever-increasing number of bacteria with newly recognized mechanisms of resistance," Ferraro said.