**PhenoMATRIX®** 

# **PhenoMATRIX®**

# AI-powered plate interpretation and workup



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# Shifting the plate interpretation paradigm

PhenoMATRIX<sup>®</sup> suite of algorithms combines Artificial Intelligence, LIS information, and lab custom rules to analyze colony features and automatically interpret, segregate, tag, and release bacterial culture plates.

> "PhenoMATRIX® Plus is the last cherry on the pie of the larger WASP® and the WASPLab® ecosystem and through these suites of algorithms, we are now finally capable of taking the responsibility, of taking on board the decision, and essentially of the diagnostic. It is a milestone for Copan because it finally signs the official entrance of Copan into the diagnostic field.

> > Mario Savarese, Copan Wasp CEO

#### **Benefits**

#### More than just a step in your workflow



#### Full Time Equivalent optimization

Shrink to zero the time wasted on negative plates and colony tagging. Allow your staff to focus on what matters and let them express their full potential.



#### Workflow refinement

Make the most of the nighttime through WASPLab<sup>®</sup> standardized incubation protocols. Avoid manual touchpoints and let PhenoMATRIX<sup>®</sup> easily route your plates to the right place.



#### **Reduced Time To Result**

Thanks to automated processing, you can forget about downtime. Thanks to digitalization and AI, you can detect bacterial growth earlier. All this allows you to deliver a quicker diagnosis and provide better service to your patients.



#### Improved quality of results

What's the result of improved standardization of plate processing, incredible imaging capabilities, and top-notch interpretation software? The answer is simple: not only faster, but also better-quality results.

**99%** 

Specificity

#### Letting numbers speak for us

PhenoMATRIX<sup>®</sup> Artificial Intelligence project was up and running twelve years ago, when AI seemed just like science fiction. Since then it grew from algorithms to a diagnostic tool, tested in routine on millions of plates, with performances that speak by themselves.



**100%** Sensitivity

# *How it works* The AI interpretation mastermind

#### Digital microbiology starts from data

Thanks to the WASPLab<sup>®</sup> connection to your lab LIS, PhenoMATRIX<sup>®</sup> can access all the sample and patient data behind the plate. Everything is there, ready to be processed by AI algorithms.



#### Your knowledge, above all

Think once! PhenoMATRIX<sup>®</sup> mimics your thoughts, applying your expert rules to interpret each plate and decide what to do with them.

#### Let PhenoMATRIX<sup>®</sup> organize your routine

PhenoMATRIX<sup>®</sup> automated sorting gathers data and images in the correct folder for a smooth and efficient consultation, suggesting a follow-up for each plate according to your custom rules.



#### What matters in the spotlight

PhenoMATRIX<sup>®</sup> is more than a way to order your digital plates rationally. With it, you can automatically sort positive plates and discard negative plates, allowing you to focus on what truly deserves your attention.

#### **Push it further**

By automatically validating the culture result, the most advanced PhenoMATRIX<sup>®</sup> configurations stop being simple process enhancement instruments and become proper diagnostic tools.



#### **Configurations**

## Choose how far you want to leap

PhenoMATRIX<sup>®</sup> suite of A.I. algorithms comes in different configurations to meet the needs of every laboratory.

|  | PhenoMATRIX®<br>Basic<br>configuration | PhenoMATRIX®<br>TAG<br>configuration | PhenoMATRIX®<br>PLUS<br>configuration | <b>PhenoMATRIX®</b><br>TAG - PLUS<br>configuration |
|--|--|--------------------------------------|---------------------------------------|--|
| PhenoMATRIX <sup>™</sup>                     | The microbiology<br>Brain              | Tag, send,<br>pick!                  | Out of sight,<br>out of mind          | Consider<br>it done!                               |
| Plate Classification                         |  |                                      |                                       |  |
| Pickpoints automated selection               | ⊗                                      |                                      | ⊗                                     |  |
| Automatic plate routing without confirmation | ⊗                                      | $\bigotimes$                         |                                       |  |



# No-touch interpretation for a true full lab automation

The combination of PhenoMATRIX<sup>®</sup> with TAG PLUS configuration and the WASPLab<sup>®</sup>-physically connected Colibrí<sup>™</sup> represents the pinnacle of interpretation and workup automation available today. WASPLab<sup>®</sup> images your plates to let PhenoMATRIX<sup>®</sup> analyze their features. Negative results are automatically discarded without needing operator confirmation, and positive ones are tagged and routed to Colibrí<sup>™</sup> on a dedicated conveyor.

#### Adaptable to you

Your routine, workflow, and rules make your lab unique. That's why we adapt every PhenoMATRIX<sup>®</sup> based on your needs. We'll help you tailor the software and algorithms to make the most of your lab.





## **WASPLab**<sup>®</sup>

#### What makes PhenoMATRIX<sup>®</sup> possible

WASPLab<sup>®</sup> automation and imaging suite, including the telecentric optic and the multi-robot automation, is the technology on which PhenoMATRIX<sup>®</sup> was conceived.

- 48 MP RGB telecentric trilinear camera
- 1600 pixel/mm resolution
- Less than 0.1 mm colony size detection
- 9 mm depth of field
- More than 1000 light combinations
- 24-bit color depth





Colibrí<sup>™</sup> automatically picks colonies previously selected by PhenoMATRIX<sup>®</sup> or a WASPLab<sup>®</sup> reading station operator.

The instrument spots targets for microbial identification through MALDI-TOF technology and prepares microbial suspensions for Antibiotic Susceptibility Testing (AST). This combines perfectly with PhenoMATRIX<sup>®</sup>, which analyses the digital plate, automatically marks significant colonies for picking, and tells Colibri<sup>™</sup> what to do.

#### The components

#### **Synergy for efficiency**

#### Image analysis

PhenoMATRIX<sup>®</sup> and WASPLab<sup>®</sup> digital imaging software inspects the plate's key features for a superior microbiological interpretation\*.



**Growth and Count**, to detect growth and perform a semi-quantitative count of colonies for each classified type or group



**Pure Growth** to classify colony growth based on the presence of a single, predominant, or heterogeneous morphology type



**Chromogenic Detection** to detect the presence of different colony colors. Multichromatic detection is also possible!



Additional morphology analysis based on plate-specific features (for example, swarming detection, specific morphology detection, etc.)



 $\pmb{\beta}\text{-}\text{Hemolysis}$  to detect the presence of  $\beta$  hemolysis.



**Colony Morphology** to classify the growth according to morphological characteristics

### LIS

Bi-directional communication between the system and the lab LIS ensures that all relevant clinical data are included in the analysis, supporting the microbiologist in making efficient, patient-oriented decisions.



Hospital ward

Sample and plate type

Leucocyte counts

#### Algorithms

Your game, your rules: PhenoMATRIX<sup>®</sup> algorithms finally combine and analyzes data from digital images and LIS, applying your lab's custom rules for a flexible and tailored workflow.

\* The ability to classify the growth according to morphological characteristics and perform a semi-quantitative count for each classified type or group, validated isolate morphologies and groups may differ from each plate and brand.

# *Output* Let PhenoMATRIX<sup>®</sup> take care of it

NEG

Negative plate images are automatically segregated in specific folders or, depending on the software configuration, automatically discarded, and the results are reported in the LIS.

POS

PhenoMATRIX<sup>®</sup> can sort positive plates by custom parameters such as colony count and desired follow-up. Moreover, based on the classification group, it can propose suitable pick points for colony picking or even automatically detect and tag the best colonies to be automatically picked by Colibri™ to perform the proper workup (ID or AST) for each colony according to your custom rules.

#### **Scientific studies**

#### Let real users talk

Many studies have already validated PhenoMATRIX® performance.

#### Full Time Equivalent optimization

Automated Detection of Streptococcus pyogenes Pharyngitis by Use of Colorex Strep A CHROMagar and WASPLab Artificial Intelligence Chromogenic Detection Module Software

Tam T. Van, et al. J Clin Microbiol. 2019 Oct 23;57(11):e00811-19.

"The PhenoMATRIX CDM software in combination with the Colorex Strep A agar could dramatically improve the workflow by reducing turnaround times and hands-on times currently necessary for the reporting of throat culture results, allowing the redirection of laboratory personnel to other, more complex tasks."

#### Workflow refinement

Evaluation of the WASPLab Segregation Software To Automatically Analyze Urine Cultures Using Routine Blood and MacConkey Agars

Faron ML, et al. J Clin Microbiol. 2020 Mar 25;58(4):e01683-19.

"In our clinical laboratory, up to 350 urine specimens are processed each day, and using this software to read culture images would remove or reduce the workload by 151 cultures a day. Over a year, this would be a reduction of 55,000 urine cultures that would not need individual technologist review. Urine cultures are a large workload for clinical laboratories, so this reduction in analysis could improve overall workflow. If a technologist takes approximately 15 seconds to read and report a negative plate, the addition of this software could save 229 technologist hours."

#### Reduced Time To Result

Automatic Digital Analysis of Chromogenic Media for Vancomycin-Resistant-Enterococcus Screens Using Copan WASPLab

Faron ML et al. J Clin Microbiol. 2016 Oct;54(10):2464-9.

"[...] the software was 100% sensitive in differentiating negative from "nonnegative" plates, [...] ensuring that plates with negative results can be accurately sorted to reduce the time and cost required for laboratories to perform large-volume screens."

#### Performance of PhenoMatrix for the detection of Group B Streptococcus from recto-vaginal swabs

Foschi C et al. Diagn Microbiol Infect Dis. 2021 Sep;101(1):115427.

"[...] the use of WaspLab system followed by PhenoMatrix digital imaging analysis software can significantly improve the management of GBS culture in terms of diagnostic performances, hands-on time, and turn-around time (TAT)."

#### Improved quality of results

# Automated Scoring of Chromogenic Media for Detection of Methicillin-Resistant Staphylococcus aureus by Use of WASPLab Image Analysis Software

Faron ML et al. J Clin Microbiol. 2016 Mar;54(3):620-4.

"Interestingly, the CDM software identified 153 specimens that were positive after a second review of the digital image. These data suggest that the CDM software may be more sensitive than manual observation."

#### Use of artificial intelligence for tailored routine urine analyses

Dauwalder O et al. Clin Microbiol Infect. 2021 Aug; 27(8):1168.e1-1168.

"The evaluation of two versions of PHM on respectively 4295 and 3419 urine samples showed a high level of performance, with more than 90% of results in agreement with those of the LT. The same high level of performance was confirmed by routine study, with 92% of PHM results validated by the LT, suggesting its reliability."

#### Hierarchical AI enables global interpretation of culture plates in the era of digital microbiology

Signoroni A et al. Nat Commun. 2023 Oct 28;14(1):6874.

"DeepColony can effectively classify and enumerate organisms to be combined with laboratory-based rule systems to augment the microbiologists' clinical decisions on the interpretation of clinically significant cultures."

"DeepColony is a unique framework for improving the efficiency and quality of massive routine activities and high-volume decisional procedures in a microbiological laboratory, with great potential to refine and reinforce the critical role of the microbiologist."

# Evaluation of PhenoMATRIX and PhenoMATRIX PLUS for the screening of MRSA from nasal and inguinal/perineal swabs using chromogenic media

Cherkaoui A et al. J Clin Microbiol. 2024 Jan 17;62(1):e0115223.

"The sensitivities of PhenoMATRIX and PhenoMATRIX PLUS were 99.8% [95% confidence interval (CI), 99.2%–99.9%] and 100% (95% CI, 92.1%–100%), respectively. The specificities of PhenoMATRIX and PhenoMATRIX PLUS were 99.1% (95% CI, 99.0%–99.2%) and 95.2% (95% CI, 93.8%–96.1%), respectively. All the 1,297 MRSA-negative specimens analyzed by PhenoMATRIX PLUS were automatically released and sent to the LIS immediately after availability of the culture image on the WASPLab (100% accuracy). All negative media plates were automatically discarded. [...] More importantly, the software was able to detect 153 additional MRSA-positive specimens that were classified as negative by manual reading."

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