Clinical Microbiology Automation

Streamline Laboratory Workflow

Copan
innovating together
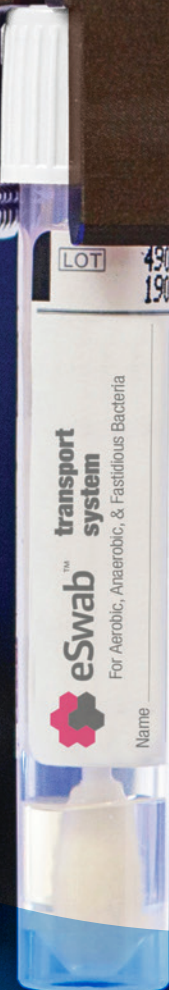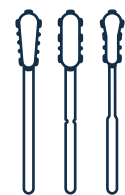
Collection

Transport

Processing

Artificial Intelligence

Comprehensive Preanalytics, from Sample to Interpretation

Today's Microbiology Laboratory is facing tough challenges. Increased workloads, labor shortages and the impending retirement boom of Medical Technologists and laboratory professionals have compelled laboratories to look for more efficient, cost-effective ways to process the influx of samples.

Technology that Serves the Laboratory

COPAN is committed to providing comprehensive solutions for preanalytics.

With unsurpassed innovation and relentless collaboration, COPAN offers solutions to laboratories around the world, helping laboratory professionals face challenges head on. From the first automated specimen processor prototype to more than 1,000 instruments worldwide, COPAN has solicited input from the Microbiology community. As a result, COPAN's full laboratory automation systems are designed to be open, modular, and forward compatible, to meet the needs of each unique laboratory today and tomorrow.

Innovation to

Improve Outcomes

MICROBIOLOGY IS ONE OF THE MOST LABOR-INTENSIVE DISCIPLINES WITHIN THE CLINICAL LABORATORY FIELD, and its role is of vital importance to overall healthcare.

It is well established that laboratory professionals are asked to do more with fewer resources and to consistently demonstrate the value of laboratory medicine in clinical outcomes.

The automation and Artificial Intelligence (A.I.) algorithms developed by COPAN combine the unparalleled human intelligence of the Microbiology community, with the invaluable asset of A.I. to help laboratories amplify their resources to provide faster actionable results to clinicians.

Increase Productivity and Decrease Cost

According to a recent multi-center study[1], Full Lab Automation can almost double microbiology labs' productivity and halve the cost-per specimen, regardless of the laboratory size, specimen load or location. In addition, data show that the turn around time (TAT) for urine cultures can be improved from 16% finalized within 24 hours to almost 60% finalized within 24 hours using WASPLab® with PhenoMATRIX® (Figure 1).
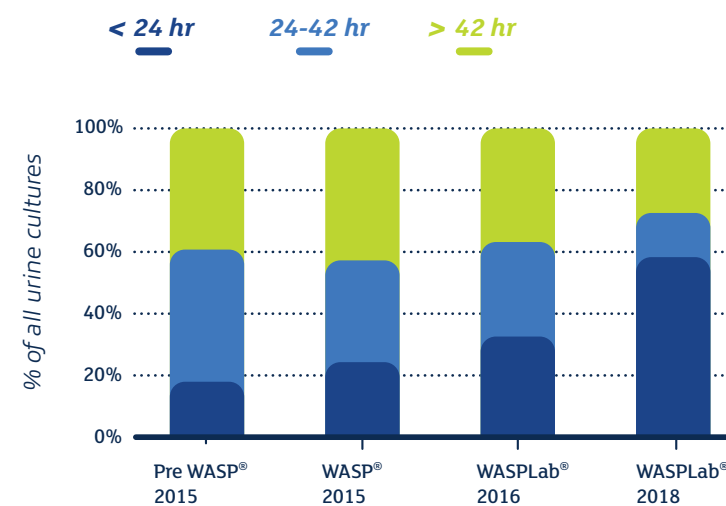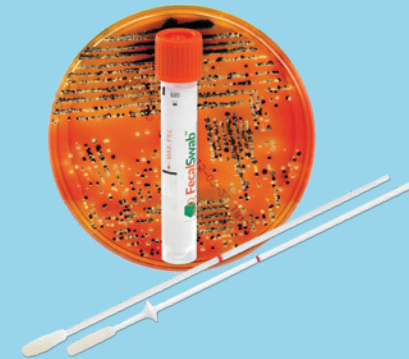

< 24 hr   24-42 hr   > 42 hr

% of all urine cultures

| Pre WASP® 2015 | WASP® 2015 | WASPLab® 2016 | WASPLab® 2018 |

Figure 1: TAT frequency distribution with WASP® and Full Lab Automation

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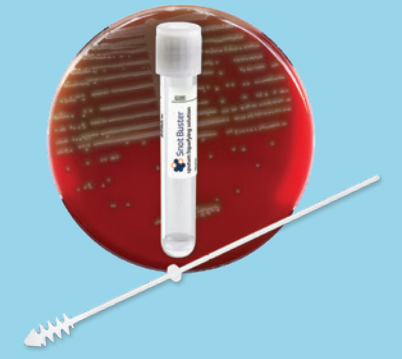*A Liquid Solution for Microbiology Samples*

Full Laboratory Automation Begins at the Sample

eSwab®
SWABS

FecalSwab®
STOOL

SnotBuster™
SPUTUM

Maximize Automation Investment

Developed by COPAN in 2006, Liquid Based Microbiology (LBM) combines state-of-the-art flocked swabs with media, transforming challenging samples into easy-to-process, multi-purpose liquid samples which are easily processed on WASP® Walk- Away Specimen Processor.

WASP® requires no manual intervention for specimen processing procedures. While non-liquid samples or traditional swabs can be managed using streak only function, COPAN recommends Liquid Based Microbiology (LBM) product line to maximize your automation investment.

Ready to make the switch to better Microbiology with LBM? COPAN can help with change management, workflow analysis, verification guidance and training.

COPAN Full Laboratory Automation

WASPLab®
Digital Microbiology

Radian®
Automated Kirby Bauer Set up and Interpredation

WASP®
Walk-Away Specimen Processor

PhenoMATRIX® and PhenoMATRIX® TAG
A.I. Enhanced Software for Clinical Microbiology

Colibrí™
Fully Automated Sample Workup

WASP-FLO™
Bulk Specimen Sorting

WASP®

Automated Specimen Processor

Automation with Proven Scientific Techniques

WASP® follows the Manual of Clinical Microbiology and Clinical & Laboratory Standards Institute (CLSI) recommendation to use 1µL to process routine urine specimens.
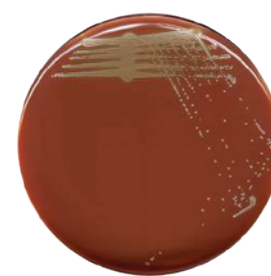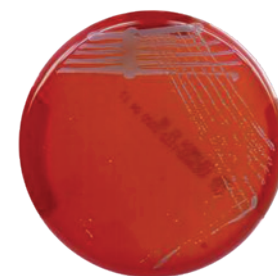
Plates inoculated using COPAN WASP® 1 µl loop[2]

Plates inoculated using competitor automated specimen processor, 10 µl pipet[2]

WASP® ALLOWS THE REASSIGNMENT OF VALUABLE LABORATORY STAFF without compromising the quality of Microbiology cultures. The system is designed to mimic a technologist, utilizing best practices for planting and streaking for every patient specimen.

Standardized, High Quality Planting and Streaking
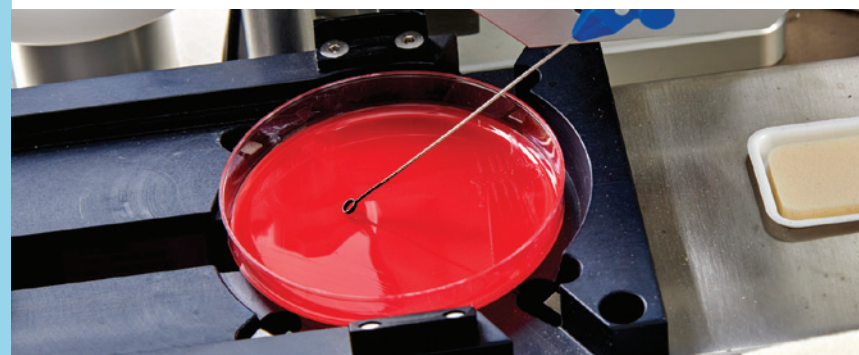
✓

Image analysis check confirms inoculum in loop

Automatically selects appropriate loop size (1µl, 10µl or 30µl)

Available loop sterilization between quadrants, for optimal colony isolation

Up Front Specimen Processing

### Modular, Open Platform for Complete Specimen Processing Automation

- Ensure traceability through labeling and reading

- Reduce sample set up consumables management, and environmental costs

- Scalable system adapts to any laboratory size and workflow

Minimize Operational Costs

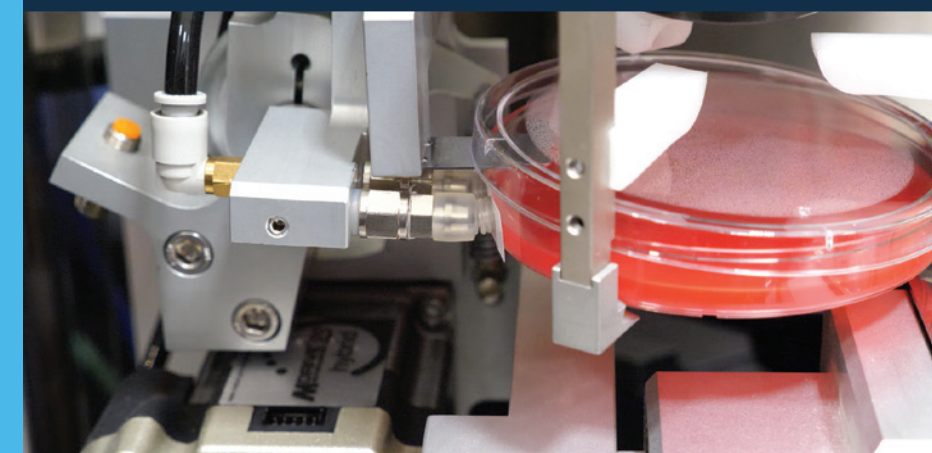WASP® uses reusable metal loops reducing operational and hazardous waste disposal costs.

Fully electric system eliminates the need for a compressor and additional or additional utility costs.

Open platform accommodates any manufacturers' media, allowing users a choice in their culture plates.

Barcode Driven System Improves Specimen Traceability

- Smart 360° scan technology reads specimen barcode labels anywhere on the container.

- Multiple labels and barcode languages on a single tube can be differentiated, discerned and read by the software.

- Labels on completed plates, gram slides, and inoculation tubes are reconciled to the patient specimen barcode.

WASP®: Walk-Away Specimen Processor

Warehouse Carousel
Optional module to manage enrichment broths and antibiotic disk dispensing

Incinerator and HEPA Filter
Ensures a clean and safe enviornment free of cross contamination risks

Inoculation Verification Camera
Checks sample presence and loop integrity

Gram SlidePrep™ EVO
Optional module prepares gram slides with laser etch printing of patient identification

Specimen Handling Robots
Manage samples individually to eliminate cross contamination risk

Automatic Loop Change
Choose from 10, 20 or 30 µl reusable metal loop

Open Platform Media Carousel
Holds 378 plates in 9 separate media carousels. Utilize any manufacturer's plated media.

Spinner and Vortex
Ensures homogeneous sample

Printer
Automatically labels plates, tubes, and gram slides

Smart Barcode Reader
Guarantees traceability of every sample

Rejection Bin
Segregates rejected samples

Sample Entry Conveyor
Load continuously – no need to batch samples

Universal Decapper
Automatically decaps and recaps tubes

Sample Exit Conveyors
Processed samples and plates are unloaded

Optional Pipettor Module
for customizable volume inoculations

Up Front Specimen Processing

WASPLab®

Digital Microbiology

WASPLAB® IS A HIGHLY EFFICIENT, MODULAR, SCALABLE AND CUSTOMIZABLE SPECIMEN PROCESSING AND CULTURE WORK-UP SYSTEM FOR CLINICAL MICROBIOLOGY. Samples move from front-end processing, to Smart Incubation, Digital Microbiology and Artificial Intelligence and Interpretive Algorithms for plate reading.


Full Laboratory Automation

From Plate Image to Interpretation

- Standardize optimal incubation conditions for better and faster results*[3]

- Improve laboratory productivity and quality through automated culture sorting and automated recognition of some common clinical bacterial isolates

- Enhance reading performance, allowing lab technicians to make the most accurate workup-decisions

- Modular, scalable, and adapts to every workflow

* Based on user experiences. Varies based on validation and user preference.

Image Acquisition System[b]

A sophisticated lighting and camera system acquires the image of each plate clearly and accurately.
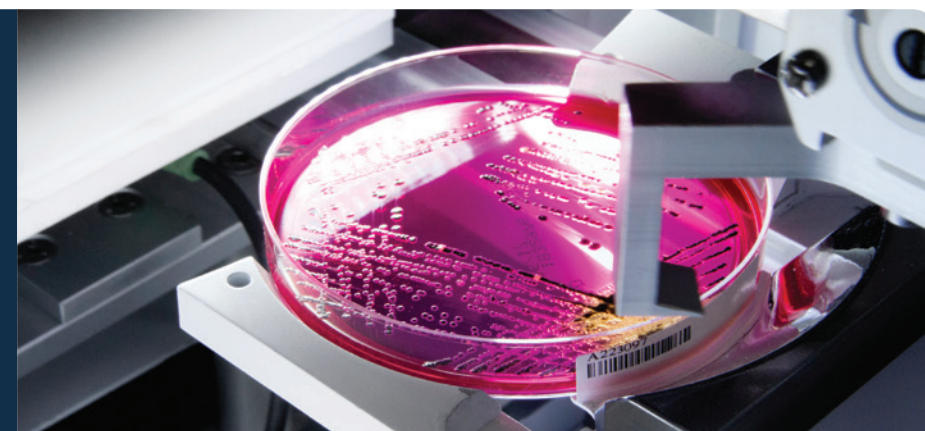
| >1000	1600 pixel/mm	9 mm	24 BIT	48MP
Lighting combinations	Resolution	Depth of field	Color depth	RGB telecentric Trilinear camera

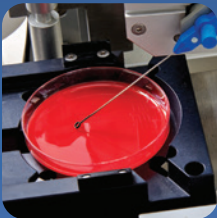### User Interface Centralizes Laboratory Workflow

The WASPLab® user interface is designed as the main access point to all laboratory tasks, ensuring an easy and user-friendly interaction.

Perform All Laboratory Tasks

Sitting at the workstation, users can perform all actions usually performed by rushing from one side of the lab to another, without touching samples.
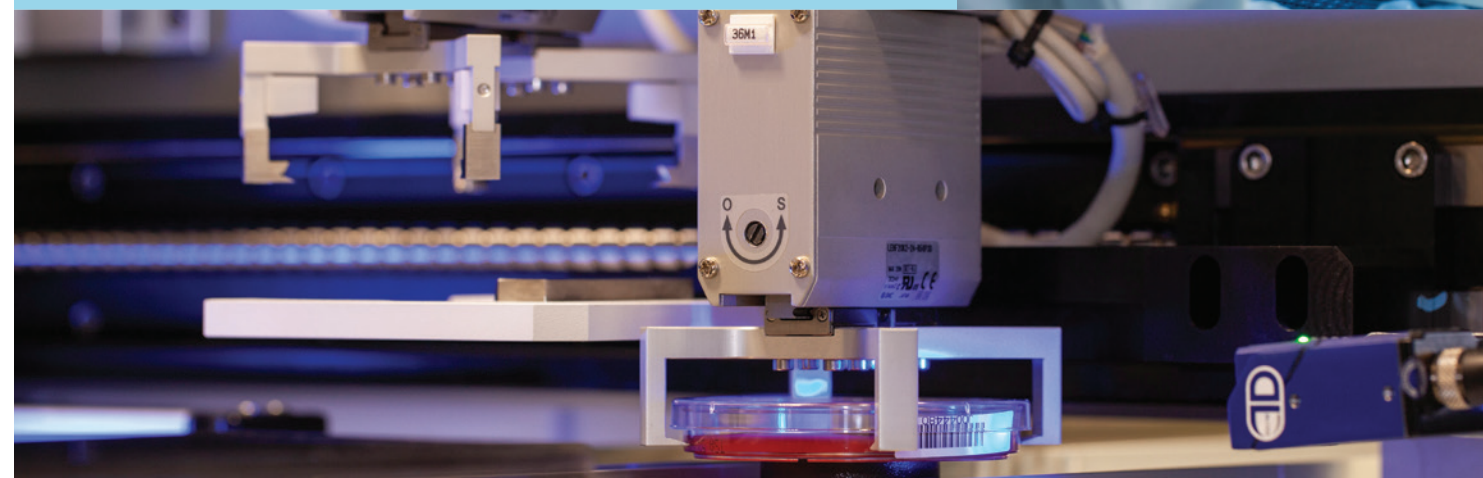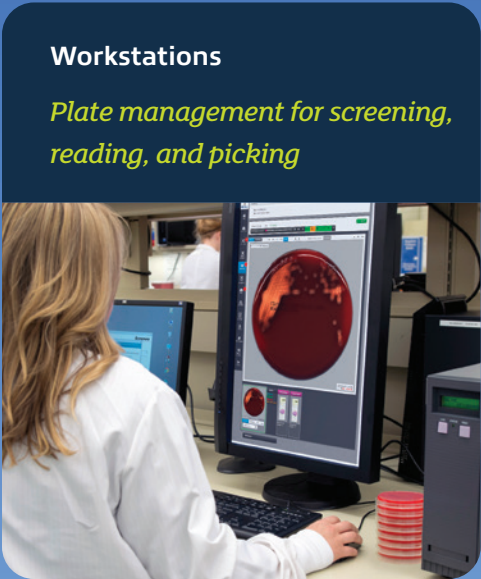
WASPLab®: Technology Leader in Full Laboratory Automation and Digital Microbiology

Incubators

Available with O_2 or CO_2, double or single incubators

Robotic Incubation and Storage

Dual robot system efficiently loads plates media side down onto individual shelves ensuring uniterupted, homogeneous incubation conditions

WASP® Walk Away Specimen Processor

Open platform, modular instrument addressing all aspects of specimen set up

Offline Carousel

Allows user to manually load plates that have have been manually processed processed onto the system
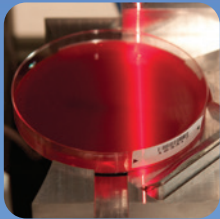
Workstations

Plate management for screening, reading, and picking

Endline Canister System

Plates are automatically sent to removable canisters or can be directed to an end-line disposal bin

Full Laboratory Automation

Conveyor System

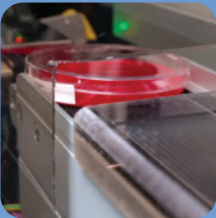*Customizable conveyors move plates from up front processing to full laboratory automation*

Image Acquisition

Telecentric camera acquires 48 megapixel image with multiple lighting combinations to optimize image quality depending on media type

PhenoMATRIX®

## Artificial Intelligence for Microbiology

Never Touch a Negative Plate Again

PhenoMATRIX® TAG

PhenoMATRIX® TAG automatically interprets growth based on the laboratory's custom rules, presumptively identifying colonial morphology, and pre-selects the best isolated colonies for workup.

The software highlights isolated colonies as well as aggregated colonies; colonies which are not fully isolated but determined by the software to be identical and thus pure. Next, PhenoMATRIX® TAG communicates the colony coordinates to the Colibri™ for reliable and accurate picking.
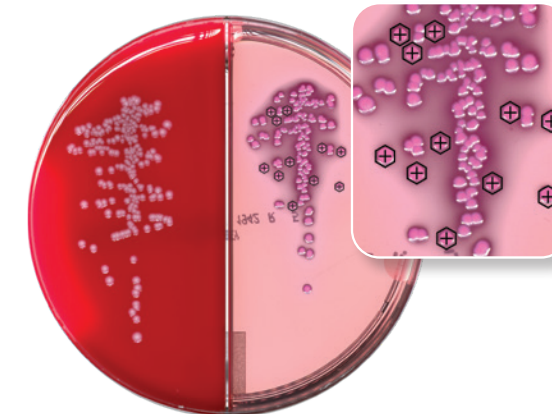
UNPARALLED IN THE INDUSTRY, PHENOMATRIX® USES ARTIFICIAL INTELLIGENCE COMBINED WITH CLINICAL INFORMATION FROM THE LIS with rules customized by the laboratory to automatically read, interpret, and sort bacterial cultures with the click of a button.* Adding the PhenoMATRIX® suite of algorithms to WASPLab® automation system eases the interpretation of patient results and gives microbiology labs the ability to shorten their time to results.
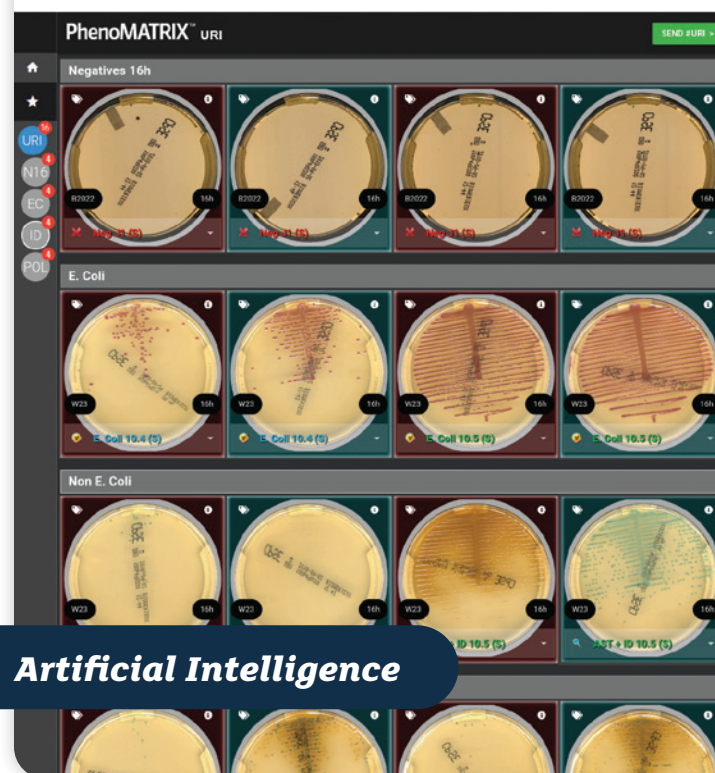
Automated Reading, Interpretation & Segregation of Bacterial Cultures

- Create custom filters to group plates in a folder-style interface, based on the laboratory rules

- Plates are grouped by colony count – no growth, growth, mixed growth, etc. according to laboratory workup needs

- Results are sorted using the custom filters and may be sent to LIS with a single click of a button[c]

- Sorts your plates images according to laboratory rules and LIS data

Artificial Intelligence

PhenoMATRIX® Software Suite
Comprehensive Solutions for Laboratory Processing and Work-Up

PhenoMATRIX® Essentials

Comprehensive A.I. software package to manage all urine culture reading and interpretation

- Colony counting and morphological recognition
- Presumptive identification capabilities
- Colony detection on validated chromogenic media plates
- Expert Rules and LIS data mining using patient information for interpretation and sorting

PhenoMATRIX® SELECT

Includes the complete Essentials package plus additional chromogenic, wound and blood culture protocols

- Chromogenic detection for MRSA, VRE and other MDRO surveillance cultures , Group A Strep, Group B Strep and *Candida auris*
- Beta hemolysis detection on blood agar for segregation of cultures with suspected Group A or B Strep
- Wound protocols* for segregation of cultures with suspected *Staphylococcus aureus* growth
- Blood culture protocols* for early detection of growth from subcultures

* May require additional equipment and development time
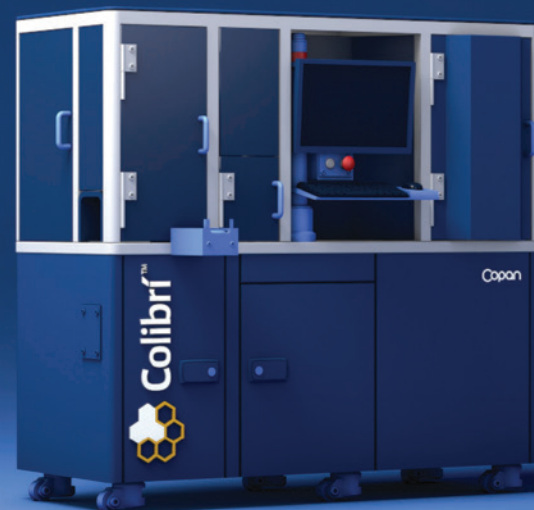
PhenoMATRIX® TAG

The most advanced software suite includes Essentials and Select and PhenoMATRIX® TAG

- Automatic predetermination (tagging) of colonies for picking by the Colibri™ for ID and AST work up.

Contact your local distributor or COPAN representative for more details and pricing.

Colibrí™

Automated Specimen Workup
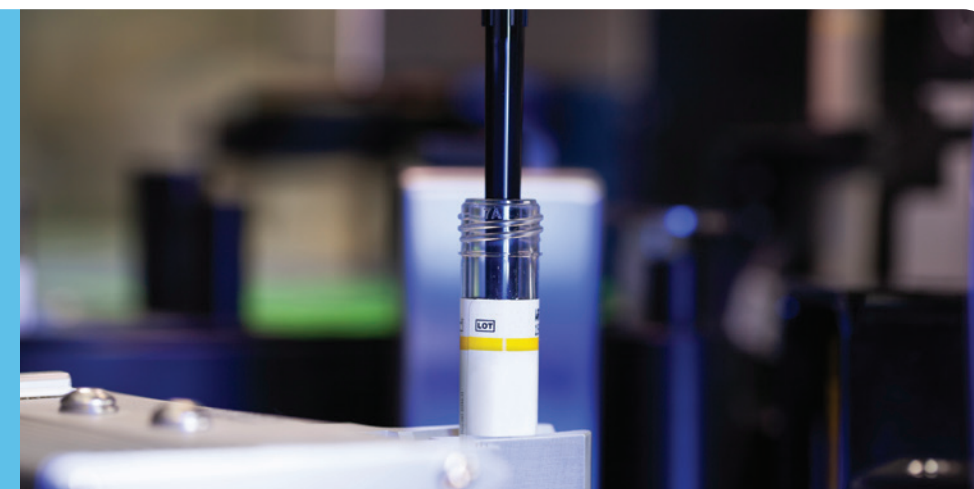

Accurate Pipetting

Synchronization of nephelometer and pipettor to maximize standardization and ensure the highest precision.

Simplified, Automated Prep for MALDI and AST

Colibrí™ automatically picks colonies previously selected by PhenoMATRIX® TAG or by an operator at the WASPLab® reading station.

The instrument spots targets for microbial identification through MALDI-TOF technology and prepares microbial suspensions for Antibiotic Susceptibility Testing (AST).

FDA Colibrí™ is the first instrument in its class to receive 510(k) clearance for the preparation of MALDI-TOF slides and McFarland AST suspensions.

Automated Specimen Workup

ID	AST
colony picking	colony picking
target spotting	McFarland suspension
deposit matrix	turbidity check
isolate data	AST tube preparation

Automating Steps in Microbiology Testing for Time and Labor Savings

○ **Robotic pipettor**
Handles both colony picking and liquids transfer with precision [a]

○ **Containers table**
Holds up to 16 target McFarland suspension tubes and AST tubes for the preparation of the microbial suspension [a]

○ **Onboard Nephelometer**
Checks the turbidity of the microbial suspension to guarantee precision and standardization

○ **Printer and barcode system**
Automatically labels tubes and purity plates for traceability and label reconciliation

○ **Vision system**
Controls pipette alignment and retrieves the colony coordinates from WASPLab®, matching them for accurate picking

○ **Loading and unloading carousel**
Checks the turbidity of the microbial suspension to guarantee maximum precision and standardization

Direct communication with WASPLab® and PhenoMATRIX® TAG

The automation software highlights isolated colonies and aggregated ones with different colors. PhenoMATRIX® TAG selects the optimal colonies communicating the coordinates with Colibrí™ for a reliable picking.
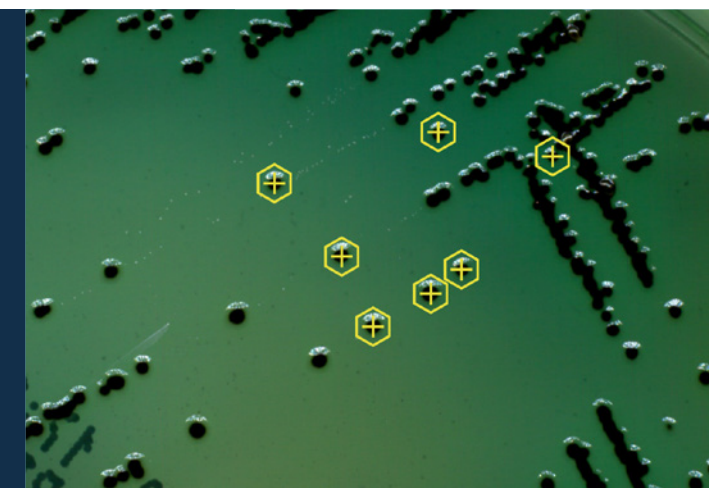
Radian®

Automated AST

Radian® Expert System

A flexible, customizable, and user-friendly platform to interpret sensitive, intermediate, or resistant results. Digital interpretations are made with the specialized imaging capabilities in combination with Halo Recognition Algorithms used by Radian® Expert System.

Expert system hints
Keep everything in sight while working directly on the plate

Halo-reading interface
With direct communication to the rules database

Rule editor
Adapt or completely customize your own interpretation rules

RADIAN® IS A FULLY INTEGRATED WASPLAB® MODULE that automates the seeding of Mueller Hinton plates, application of antibiotic discs, robotic transfer of prepared plates to incubators, plate imaging, zone measurement, zone interpretation, and result output using the Halo Recognition Algorithms, which are part of the Radian® Expert System A.I.

Increase Productivity, Decrease Operational Cost

- Streamline AST workflow using automation and A.I. allows for standardization, labor savings, and improved turnaround time

- When validated by the laboratory, Radian® has the potential of early susceptibility reading, allowing for more timely results

- Automatically applies CLSI guidelines for use with direct blood culture AST[d]

Radian® In-Line Carousel

- **Parallel redirection line**
  The Radian® module sits along the WASPLab® track, easily ingratiating AST tasks into the laboratory workflow

- **50 cartridge carousel**
  Ensures maximum flexibility in choosing antibiotic discs

- **Dual HEPA filtering system**
  High-capacity antimicrobial carousel allows the system to randomly select from up to 50 antibiotics for protocols using up to 8 discs per 100mm plate.

- **Quality check**
  Dedicated vision system assures the ATB disk has dispensed from the cartridge. The system also checks that the disk matches the selected protocol.

Automated AST

WASP-FLO™

Moving Microbiology

WASP-FLO™ IS FOR MICROBIOLOGY LABORATORIES with multiple WASPLab® lines, to streamline sample loading and unloading. WASP-FLO™ automatically sorts samples[a], drives them to the appropriate WASP®, and batches the tubes in output racks after processing.

Workflow Efficiency

○ **Dual SCARA robots**
The Pick-and-Place robots sort tubes in RFID-driven pallets and unload completed samples onto dedicated racks

○ **Hopper module**
Holds up to 600 samples per batch

○ **Completed specimen output**
Holds 792 samples divided into eight output racks

○ **Manual specimen loading**
Includes four columns composed of eleven RFID pallets

○ **Manual user interface**
Backup manual loading system for special containers

Bulk Specimen Sorter
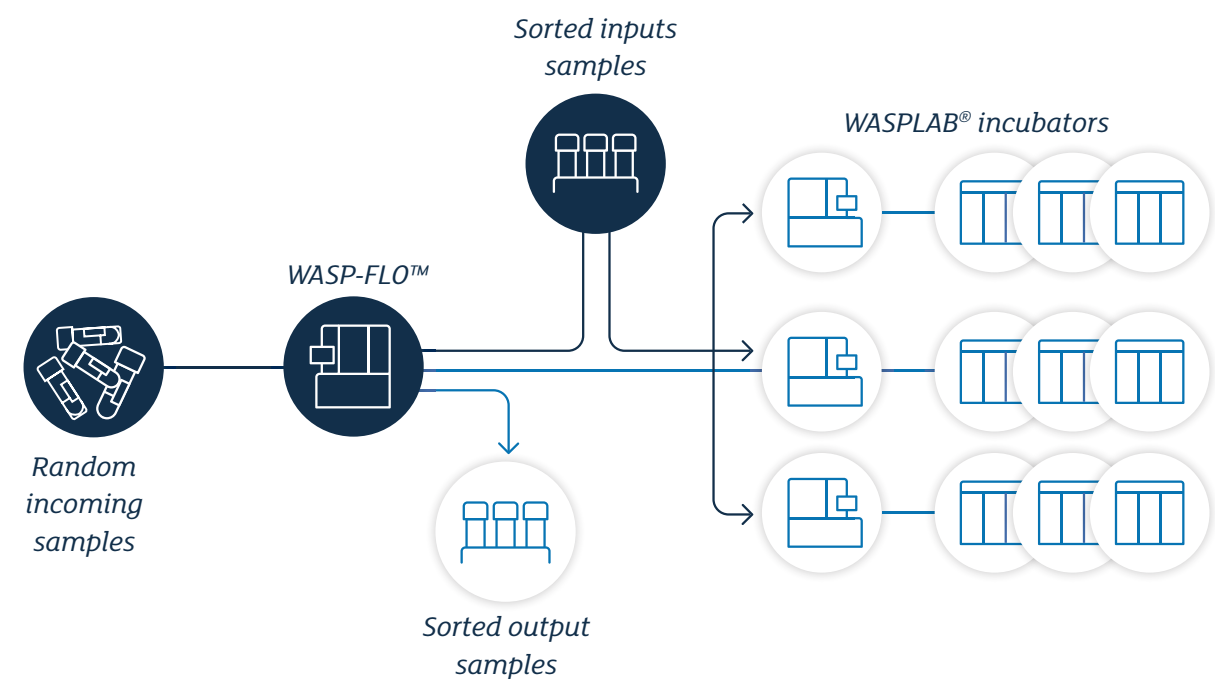
Streamline Sample Loading

○ Optimizes sample management with real time evaluation of the workload

○ Boosts laboratory productivity by automatically sorting and routing samples

○ Data management system monitors the path of each sample for full traceability

Workflow example

Sorted inputs samples

WASPLAB® incubators

WASP-FLO™

Random incoming samples

Sorted output samples

Administrative and Financial Considerations

THE RETURN ON INVESTMENT (ROI) for automation will differ for each laboratory. Sample volume, sample types, operating and peak hours and future growth goals will all impact the final analysis. A good practice is to begin by looking at the following factors

Factors to Consider

Total specimen volume for bacteriology samples that are manually plated

What times during the day do specimens arrive in the lab?

Planting protocols, the amount and types of plates inoculated per specimen type; bi-plate versus whole plate; incubation parameters (O_2 or CO_2 etc)

How many full-time equivalent (FTE's) are needed to process the specimens arriving into the lab?

Staffing schedules

Example Time Savings with Automation and A.I.

Time (seconds)

Legend:
- Reincubate negative/ ongoing cultures
- Prepare McFarland susension
- Prepare purity plate
- Spot maldi target plate
- Read and Identify work up for postive plates
- Release NG/NSG urine to LIS
- Rescreen plated
- Screen and sort plates according to workup needs
- Sort according to bench protocol
- Transport plates to bench
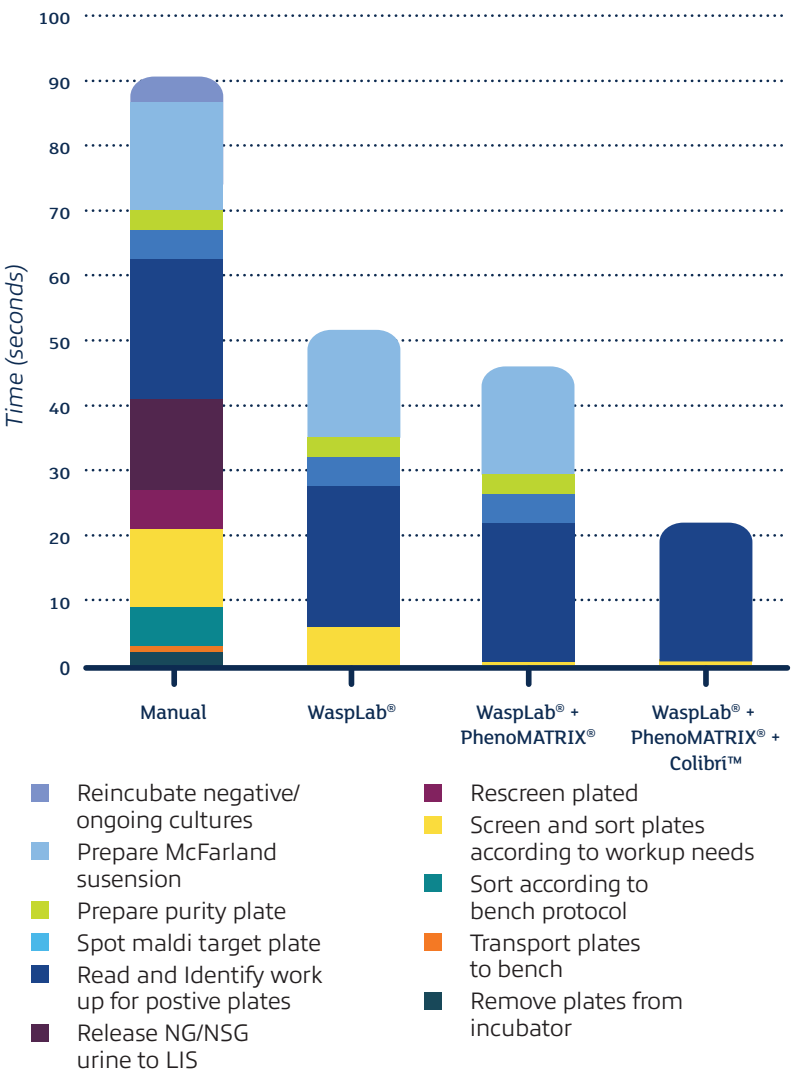- Remove plates from incubator

Figure 2: FTE hands-on time savings associated with automation, based on a singular urine culture and using average times from customer data collected by COPAN at over 100 U.S. and Canadian laboratories

Beyond the ROI: Additional Automation Considerations

FTE Reallocation

Is there potential to expand the scope of the lab testing by automating the upfront processing? For example, can trained lab technicians perform more molecular testing or can the lab increase volume of routine testing?

Recruiting and Retention

Could automation allow the lab to recruit employees more readily or retain employees in this competitive market? Consider employee engagement, removal of the repetitive non-value added tasks like manual planting and streaking.

Cost of Quality

How much rework must happen in your lab? Can savings be realized by having more consistent and reproducible specimen preparation?

New Business

Can the lab receive more business from outreach clients if they adopt state-of-the art technology such as automation, digital Microbiology, and automatic plate reading?

Turnaround Time

Added efficiencies of incubation, reading, set-up and reporting with automation can all contribute to faster turnaround time to results.

Can faster turnaround time help to shorten hospital stays and improve antibiotic stewardship?

The Laboratory Workforce is Shrinking

It is widely known that the laboratories across the world are struggling to fill open vacancies in the laboratory. Laboratories face an aging population of laboratory personnel that will soon retire, a decrease in the number of graduates from laboratory educational programs and increase in testing volumes.[4]

Automation and A.I. Can Help Laboratories Manage Current Challenges

Streamline Routine Tasks

Improve Efficiency and Accuracy

Optimize Workflow

Training and Education

Preserve Institutional Knowledge

Product Specifications

WASP®

Dimensions:	43.5 inches wide x 81.5 inches long x 76 inches high
Weight:	Approximately 1,300 lbs
Input Voltage:	220V, 20Amps
Network Ethernet:	100 MB
Interface:	LIS interface available upon request
Peripherals:	Touch screen monitor, external barcode reader, label printer
Certifications:	CE, UL, CSA
Electrical Receptacle Plug:	HBL2321 250V / 20A (for USA and Canada)

GRAM SLIDEPREP™ EVO

Dimensions:	28 inches wide x 23 inches long x 49.5 inches high
Weight:	Approximately 221 lbs

INCUBATORS

Dimensions Single:	45.1 inches wide x 33.7 inches long x 91.1 inches high
Dimensions Double:	68.5 inches wide x 33.7 inches long x 91.1 inches high
Weight:	Approximately 1,000 lbs (Single) Approximately 2,000 lbs (Double)
Input Voltage:	220V, 20Amps
Atmospheric Conditions:	CO_2 and Aerobic
Capacity Single:	795 plates
Capacity Double:	1,590 plates
Electrical Receptacle Plug:	HBL2321 250V / 20A (for USA and Canada)

COLIBRÍ™

Dimensions:	39.2 inches wide x 78 inches long x 75.2 inches high
Weight:	Approximately 1,700 lbs (according to the configuration)
Power Supply:	208-240 VAC~50/60 Hz, 1500 W max (peak)
Minimum Differential:	Magneto thermic differential swith D-16A 300mA
Connection:	Interlocked plug like IEC 60306 or NEMA L6-20P
Remote Control:	Ethernet 100Mb
Environmental Working Conditions:	15˚C-32˚C, 30%-60% Humidity
Thermal Output:	4760 Btu/1.4 Kw
Noise Emission:	Max 67.4 dB
Connected Peripherals:	Touch Screen, Mouse, Keyboard, Printer, 2XBarcode, Readers, Vision System

WASP-FLO™

Dimensions:	Hopper module: 39.1 inches wide x 45.2 inches long x 67 inches high Loading module: 89.3 inches wide x 69.2 inches long x 81.4 inches high Conveyor: According to specific layout
Weight:	Hopper module: Approximately 855 lbs Loading module: Approximately 2165 lbs Conveyor: Weight variable according to layout, approx 100 kg/m per single conveyor
Electrical Specifications:	208-240 VAC, 50/60 Hz, 2000 W max (800 W WASP-FLO Loading Module+ 1200 W WASP-FLO Conveyor)

OPERATING CONDITIONS

Height:	Up to 78.7 inches
Humidity:	From 0 to 95%
Temperature Range:	From 5˚C to 40˚C

Scientific References

[1] Karissa Culbreath, Heather Piwonka, John Korver, et al. Benefits Derived from Full Laboratory Automation in Microbiology: a Tale of Four Laboratories. Journal of Clinical Microbiology, 2021.

[2] Babady NE, Bourassa L, Burnham C-AD, Fisher M, McElvania E, Polage CR, Ribes J. 2021. Multicenter evaluation of processing and analysis of College of American Pathologists (CAP) proficiency testing samples by laboratory automation. J Clin Microbiol 59:e03233-20.

[3] A. Cherkaoui, G. Renzi, N. Vuilleumier, et al. COPAN WASPLab automation significantly reduces incubation times and allows earlier culture readings Clinical Microbiology and Infection, 2019.

[4] Lack of Trained Laboratory Personnel Makes Automation Critical. https://perkinelmer-appliedgenomics.com/2020/04/20/the-laboratory-workforce-is-shrinking/

Notes

Please consult COPAN for the availability of these products in your Country

a   To grant the reliability of results and allow the instruments safe and correct functioning, spare parts and technical support must be provided by COPAN (or its authorized distributors). Any third party's containers, culture plates and consumables to be used on the instruments must be approved in writing by COPAN. Limitations may apply: Please refer to COPAN's official technical documentation.

b   The WASPLab® imaging system is patented (AU2014259028B2, JP6460421B2, IT1417398) and patent pending (EP2989470A1, US2016083686A1).

c   Subject to final reporting performed by qualified personnel.

d   For Research Use Only in USA.

e   Plate compatibility and strain compatibility are in continuous development. Please contact COPAN for the latest updates.

COPON

innovating together

🌐 **COPANUSA.com**   📱 **800.216.4016**   🐦 **@COPANUSA**   ✉ **CommunicationsUS@copangroup.com**   f **/COPAN.USA**

COPAN Diagnostics, Inc.
26055 Jefferson Avenue | Murrieta, CA 92562 USA