International Association for Food Protection® WEBINAR

# A Comparison Between Manual and Automated Microbial Testing Methods

**Organized by:** Neutec group

**Moderator**: Dr. Brady Carter, Neutec Group, Senior Application Scientist

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- It is important to note that all opinions and statements are those of the individual making the presentation and not necessarily the opinion or view of IAFP.

- All attendees are muted. Questions should be submitted to the presenters during the presentation via the Questions section at the right of the screen. Questions will be answered at the end of the presentations.

- This webinar is being recorded and will be available for access by IAFP members at www.foodprotection.org within one week.

# Moderator Bio

Brady Carter
Neutec Group

Dr. Brady Carter is a Senior Application Scientist with Neutec Group. He specializes in Water Activity and Moisture Sorption applications.
Dr. Carter earned his Ph.D. and M.S Degree in Food Engineering and Crop Science from Washington State University and a B.A. Degree in Botany from Weber State University. Dr. Carter has 20 years of experience in research and development has been the instructor for water activity seminars in over 23 different countries and has provided on-site water activity training for companies around the world.
He has authored over 20 white papers on water activity, moisture sorption isotherms, and complete moisture analysis. He has participated in hundreds of extension presentations and has given talks at numerous scientific conferences.
He developed the shelf life simplified paradigm and hygrothermal time shelf life model and is the leading expert in applying water activity to shelf life prediction.

# Presenter Bio

Blanca Ruiz
University of Georgia

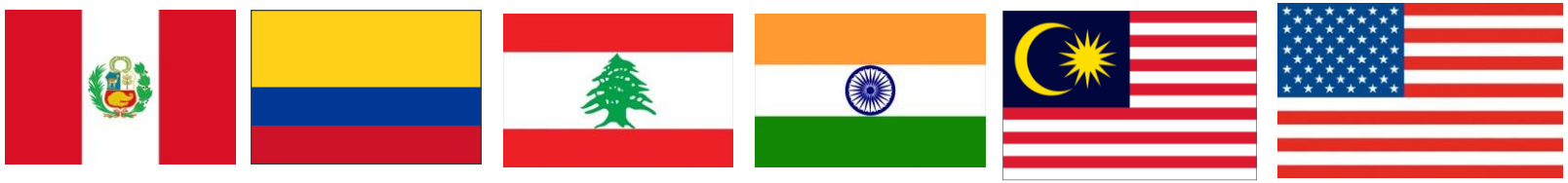
Blanca Ruiz is a Research Coordinator at the University of Georgia in the Department of Food Science & Technology.
Prior to that, she was an Associate in research at Washington State University working with fresh produce safety.
She also got her master's degree at Washington State University focusing on environmental monitoring programs to control Listeria in apple packinghouses.

College of Agricultural & Environmental Sciences
UNIVERSITY OF GEORGIA

# Food Microbiology lab – Department of Food Science and Technology

## Principal investigator: Dr. Faith Critzer

**Research Coordinator:** Blanca Ruiz-Llacsahuanga
**Postdoctoral Researcher:** Martha Sanchez
**Graduate students:** 1 PhD, 4 MS , 2 undergraduate students



Peru Colombia Lebanon India Malaysia USA

# Food Microbiology lab
# (Biosafety level II)

Microbiological and molecular analysis related to bacterial foodborne pathogens to improve fresh-produce safety:

- Ongoing projects:

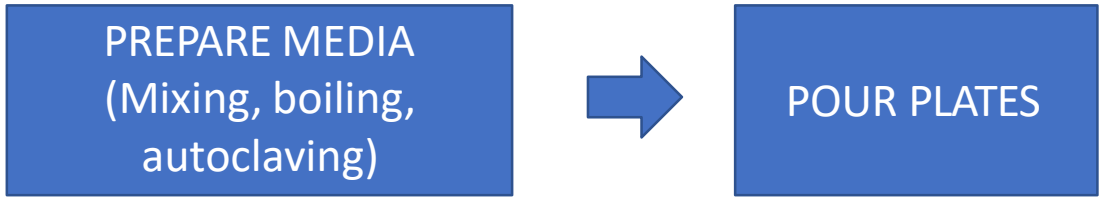
1. Evaluating the efficacy of commercially available sanitizers in reducing *Escherichia coli* and *Salmonella* in dump tank water used in packinghouses.

2. Inactivation of foodborne pathogens on organic apples by application of antimicrobial waxes containing essential oils.

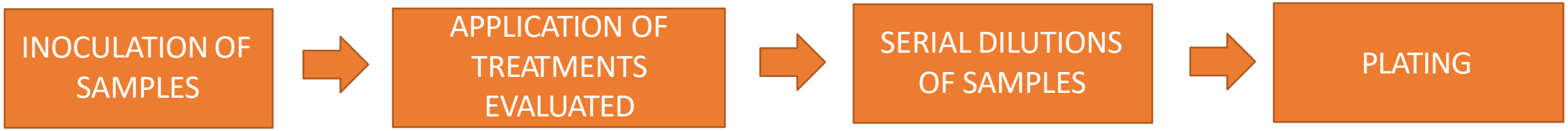
3. Effective strategies to sanitize apple harvesting supplies against *Listeria monocytogenes, STEC* and *Salmonella*.

# Microbial testing procedures overflow

**Prepping for experiments:**




**Day of experiment:**




**24h, 48h after:**

# Types of automation implemented in our lab

1. **Media preparation**

- To prepare up to 9 L of media (around 500 plates at once)

**2. Media filler**

- Faster plate pouring
- Keeps consistency in the amount of media poured in each plate.

**3. Spiral plating**

- To reduce the amount of media plates and dilutions used.

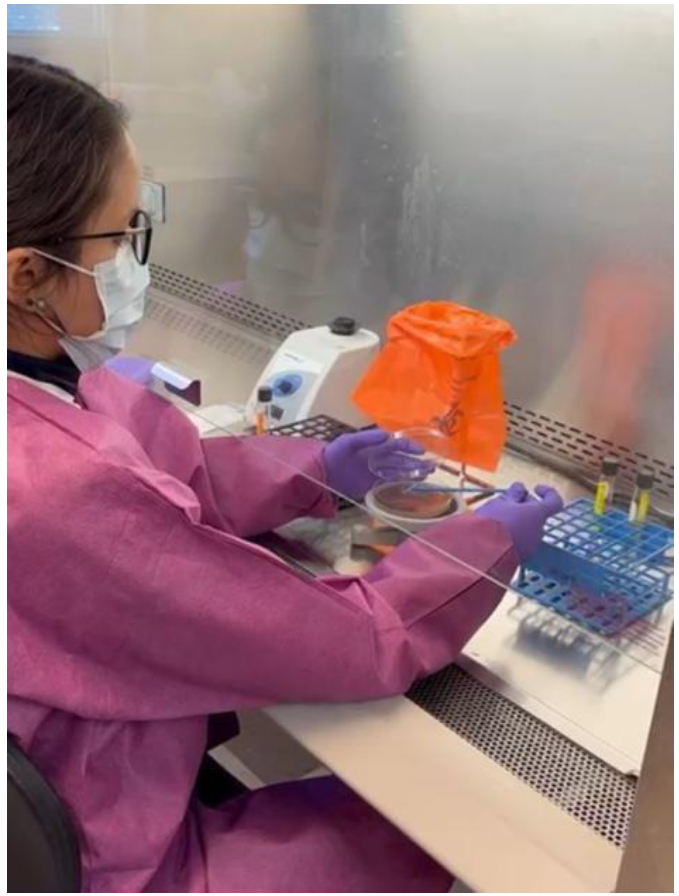
**4. Automated colony counter**

- Keep consistency , reduce labor hours

# Media preparator and filler

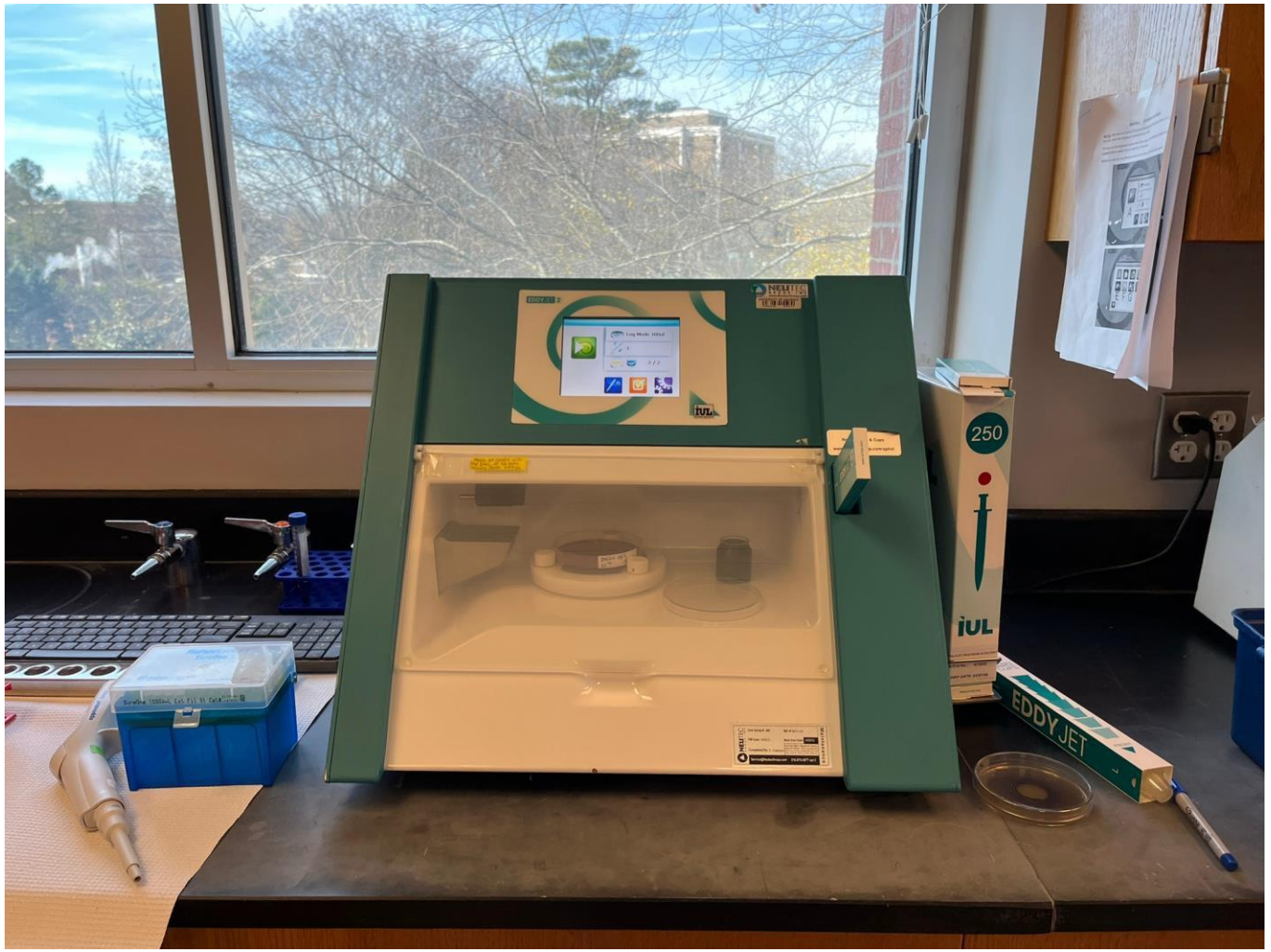


## Spread plating

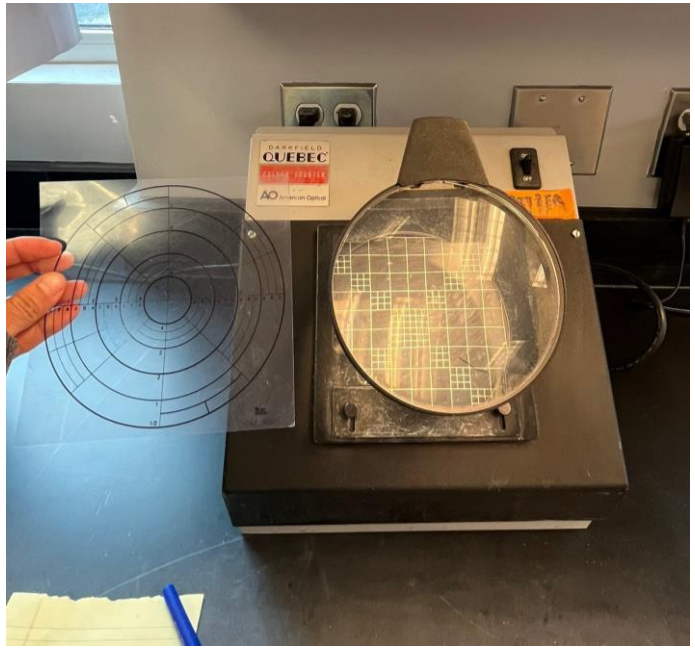


SPIRAL PLATER

## Spiral plating



## Manual counting



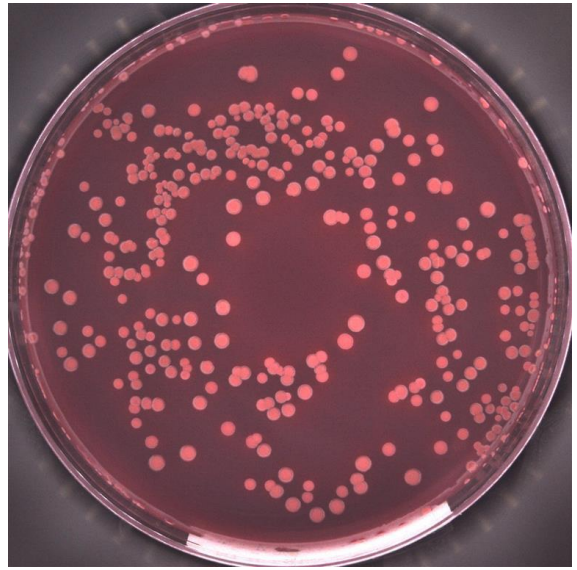

## Automated colony counter

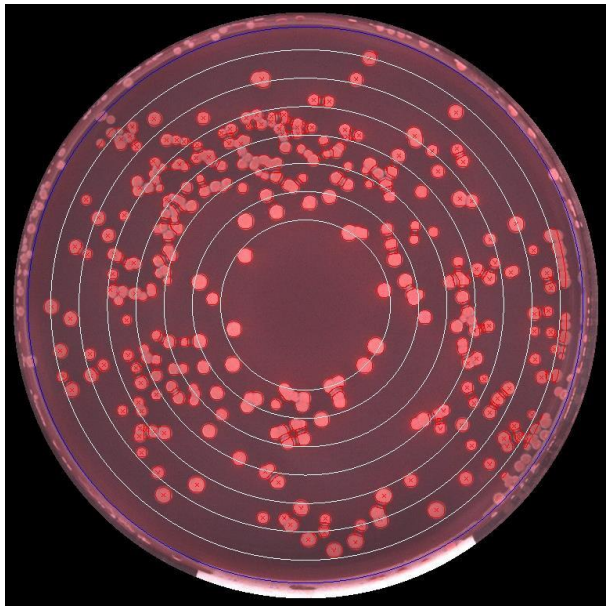


COLONY COUNTER

Example: Excel spreadsheet and plate captures.

| Plate Id | Counted Colonies | Counted Volume | Concentration | Dilution Factor | Inoculated Volume | Inoculation mode |
|---|---|---|---|---|---|---|
| 200 ppm –R1 plate 2 | 162 | 0.098400004 | 1646341.393 | 1000 | 0.0984 | Log Mode 100ul |
| 200 ppm R1 - plate 1 | 236 | 0.059999999 | 3933333.421 | 1000 | 0.0984 | Log Mode 100ul |
| 200 ppm R2 - plate 2 | 161 | 0.021119999 | 7623106.505 | 1000 | 0.0984 | Log Mode 100ul |
| 200 ppm R2- plate 1 | 269 | 0.036399998 | 7390110.343 | 1000 | 0.0984 | Log Mode 100ul |
| 200 ppm R3 - plate 2 | 249 | 0.036399998 | 6840659.76 | 1000 | 0.0984 | Log Mode 100ul |
| 200 ppm R3 - plate 1 | 175 | 0.021119999 | 8285985.332 | 1000 | 0.0984 | Log Mode 100ul |





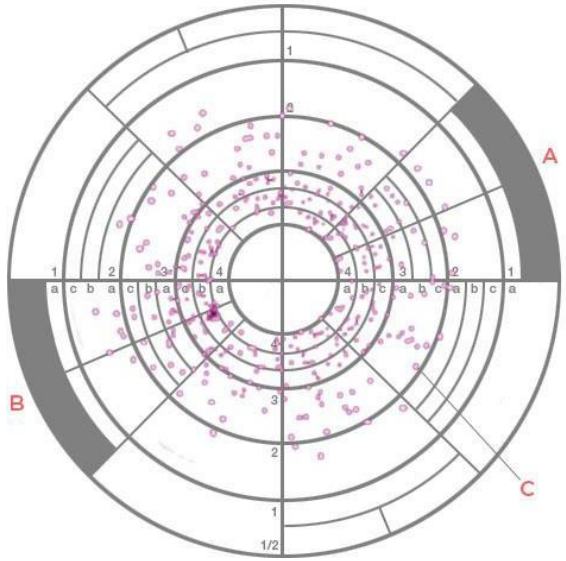
*E. Coli* – Macconkey agar plates

## COLONY COUNTER - RESULTS

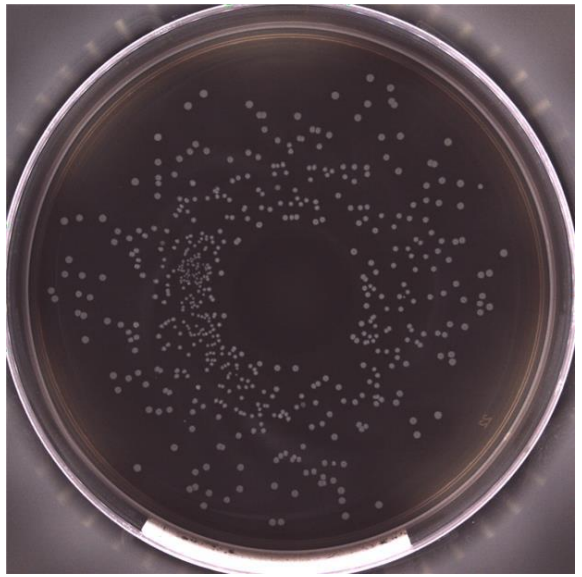
**Challenge:**

- Setting up methods for each microorganism and type of media.

# Manual counting (Grid and formulas)

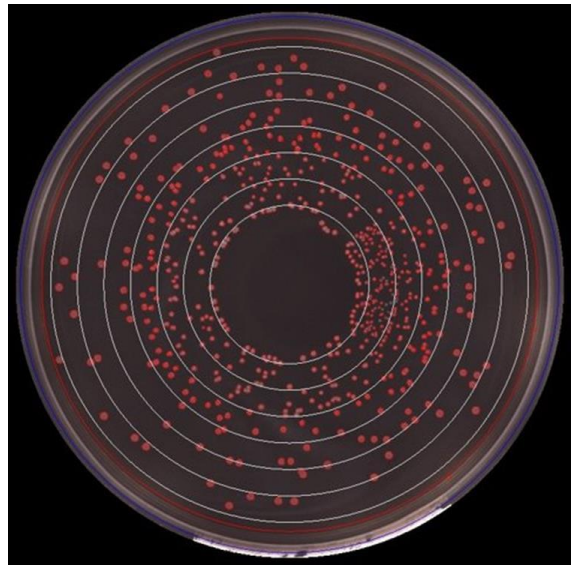



| ID | Dilution | Section | N' | N'' | N'+N'' | V/4 | Concentration | Log (CFU/ml) |
|---|---|---|---|---|---|---|---|---|
| R1 - plate 1 | 0.001 | 3cba | 37 | 27 | 64 | 0.01932 | 3312629.4 | 6.56 |
| R1 - plate 2 | 0.001 | 3cba | 22 | 15 | 37 | 0.01932 | 1915113.872 | 6.35 |
| R2 - plate 1 | 0.001 | 3cb | 22 | 22 | 44 | 0.01932 | 2277432.712 | 6.41 |
| R2 - plate 2 | 0.001 | 3cb | 20 | 16 | 36 | 0.01932 | 1863354.037 | 6.34 |
| R3 - plate 1 | 0.001 | 3cba | 24 | 20 | 44 | 0.01932 | 2277432.712 | 6.41 |
| R3 - plate 2 | 0.001 | 3cba | 30 | 19 | 49 | 0.01932 | 2536231.884 | 6.45 |



## Automated colony counter

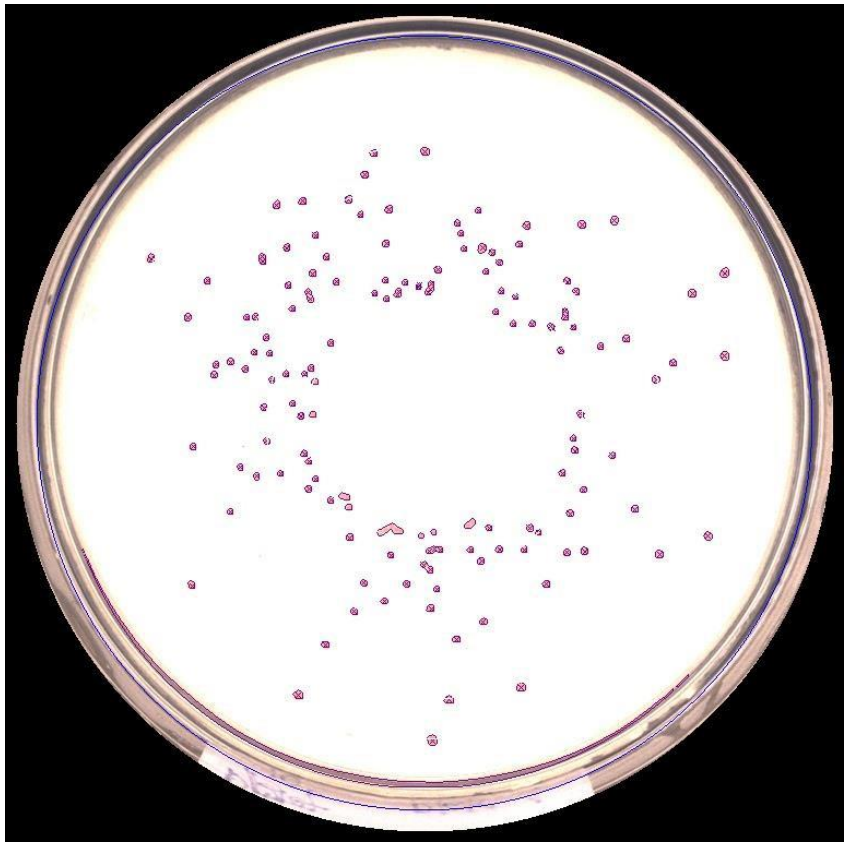
| ID | Automated colony counter Log (CFU/ml) |
|---|---|
| R1 - plate 1 | 6.88 |
| R1 - plate 2 | 6.86 |
| R2 - plate 1 | 6.83 |
| R2 - plate 2 | 6.84 |
| R3 - plate 1 | 6.82 |
| R3 - plate 2 | 6.76 |



COLONY COUNTER - RESULTS

*Listeria monocytogenes – MOX plates*

# *Salmonella* – CHROMagar plates



*Salmonella* Newport concentrations (Log CFU/ml)

| ID | Colony counter | Manual counting |
|---|---|---|
| R1 | 9.128 | 9.117 |
| R1 | 9.147 | 9.158 |
| R2 | 8.833 | 8.799 |
| R2 | 8.598 | 8.613 |
| R3 | 8.484 | 8.415 |
| R3 | 8.405 | 8.301 |

SPIRAL PLATER MODE: Log mode 100 uL

COLONY COUNTER - RESULTS

# Take away message:

- Automation in our lab has shown significant great benefits reducing labor hours, keeping consistency during experiments, and less use of resources.
- SOPs for a correct use of the devices is always needed. Training of personnel using equipment is essential.
- Maintenance and calibration of equipment are essential.
- As anything in science challenges will still be present.

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# Questions

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February 1, 2023 *Journal of Food Protection (JFP)* Open Forum

February 7, 2023 *Journal of Food Protection (JFP)* Open Forum

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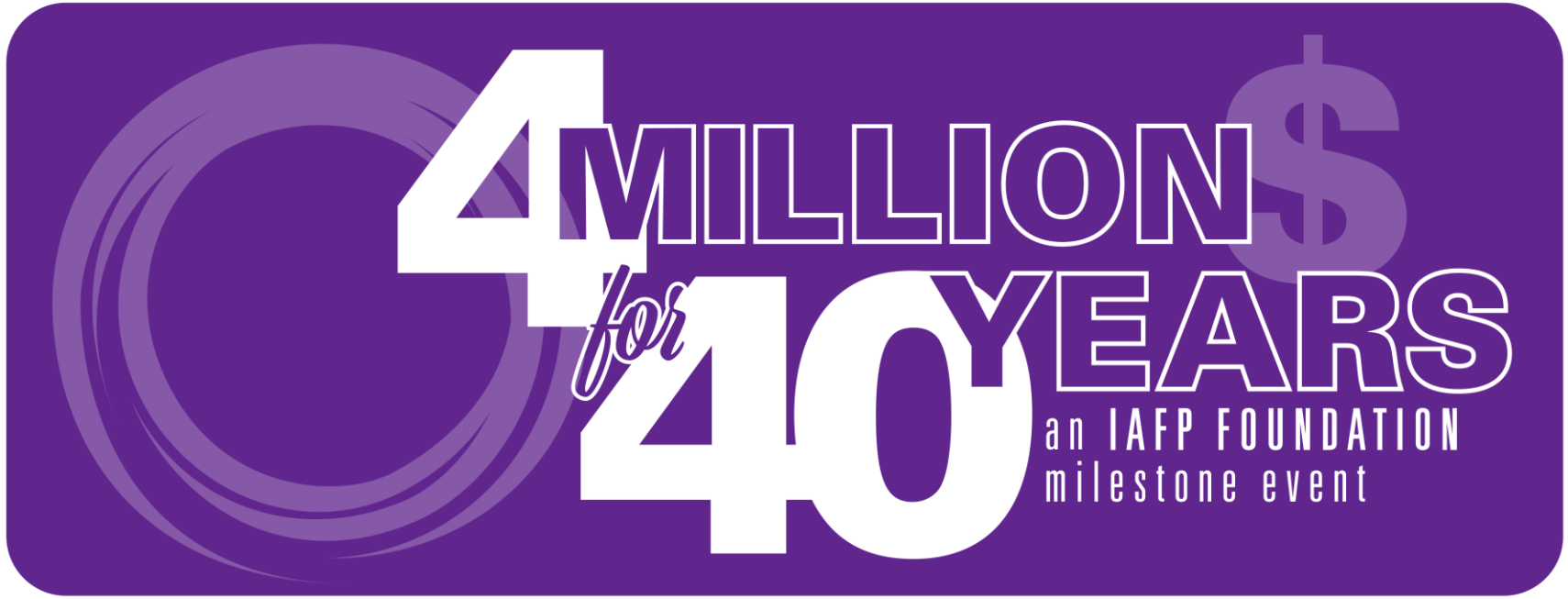


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