Automatic Disinfection of *Listeria monocytogenes* on a Sushi Production Line Using Multi-Wavelength High-Intensity (MWHI) Blue Light

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BACKGROUND

- *Listeria monocytogenes* is a critical food safety concern in ready-to-eat (RTE) sushi production.
- Standard hygiene protocols and chemical disinfectants could not fully control *L. monocytogenes* contamination in a Central European sushi production site.
- Persistent *L. monocytogenes* hotspots were found near a 8-meter long packaging conveyor line where meal ingredients were handled.
- At the problem area, the share of positive *L. monocytogenes* samples ranged from 10% to 47% in environmental swabs (Jan–Sep 2024).
- Operators' shoes likely contributed to bacterial spread in the area.

Objective of the case study
To evaluate the effectiveness of Spectral Blue MWHI® antimicrobial blue light (aBL) in reducing *L. monocytogenes* contamination in an operational sushi production environment.

MATERIALS & METHODS

Location: Central European sushi production site making RTE meals.

Test area: Conveyor line used for manual packaging of sushi into plastic containers.

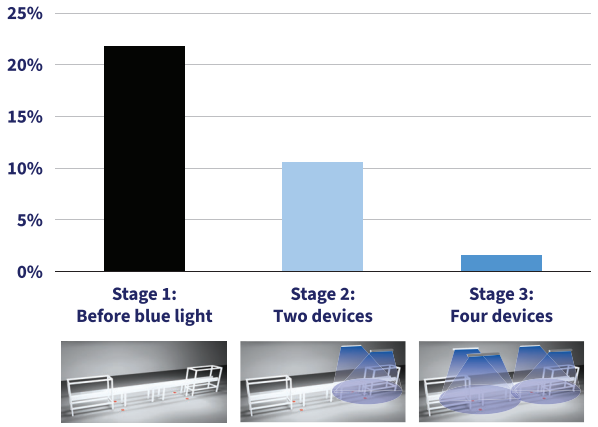
Disinfection system:
- Spectral Blue L200 devices (200 W, multi-wavelength 405 nm + 450 nm blue light).
- Daily exposure: ~14 hours during non-production time, ~26 J/cm^2 per day at floor level.

Sampling protocol:
- 4 sites on the floor near the conveyor line: Initially 2 sites treated with blue light and 2 untreated "dark" controls.
- Swabs collected during production, 2–5 times per week over 32 weeks.
- Analyzed using *NEMIS rapid Listeria monocytogenes* test.

Installation timeline:
- Jul 2024: Stage 1 - Sampling frequency increased, no blue light.
- Oct 2024: Stage 2 - Two blue light devices installed above one end of conveyor line.
- Mid-Jan 2025: Stage 3 - Two additional devices installed above conveyor line.

RESULTS & CONCLUSIONS

Percentage of positive *L. monocytogenes* samples before and after installing MWHI blue light disinfection devices



Stage 1 (no blue light, n = 128):
- 22% of samples were *L. monocytogenes*-positive.

Stage 2 (two devices, partial coverage, n = 218):
- Significant reduction in *L. monocytogenes*-positive samples.
- Positive findings still observed at untreated sites (dark).

Stage 3 (four devices, full coverage, n = 184):
- Several *L. monocytogenes* -free weeks across all sampling sites.
- Monthly positive detection rate dropped to 2–4%.
- Weekly data demonstrated a sustained decrease in positive findings.

Conclusions
Spectral Blue MWHI® antimicrobial blue light proved highly effective in reducing the presence of *L. monocytogenes* in the test area. This case study highlights the innovative technology's potential as a valuable tool for enhanced hygiene management within the food industry.

REFERENCES

1. *WHO/FAO. Risk assessment of Listeria monocytogenes in ready-to-eat foods.*
2. *NEMIS Technologies AG. N-Light™ Listeria monocytogenes test product manual.*

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