Hygienic-microbiological evaluation of the germ-reducing efficacy of Spectral Blue MWHI blue light technology under organic load

1. General

In Summer 2023, LED Tailor commissioned University Clinic of Bonn (*Institut für Hygiene und Öffentliche Gesundheit, Prof. Dr. Nico T. Mutters, Dr. Marvin Rausch, Dr. Jürgen Gebel*) to perform an efficacy test on Spectral Blue disinfection technology against selected microbes.

The basis for the investigation was the conduct of hygienic-microbiological studies on the germ-reducing efficacy of blue light irradiation against *Candida albicans, Escherichia coli, Salmonella typhimurium and Staphylococcus aureus*.

The investigation was designed to follow applicable EN standards and to simulate real-life conditions such as in healthcare or ambulance use, where organic load can be present.

The results of the investigation demonstrate that Spectral Blue MWHI technology has a germ-reducing effect on all the tested micro-organisms.

2. Used materials and methods

Blue light source:

- Spectral Blue L100 blue light disinfection device, LED Tailor Oy
- 100 W input power
- Multi-Wavelength, High-Intensity (MWHI) blue light technology (405 nm + 430…470 nm)

Detection of the germ-reducing effectiveness of blue light irradiation using deliberately contaminated carriers:

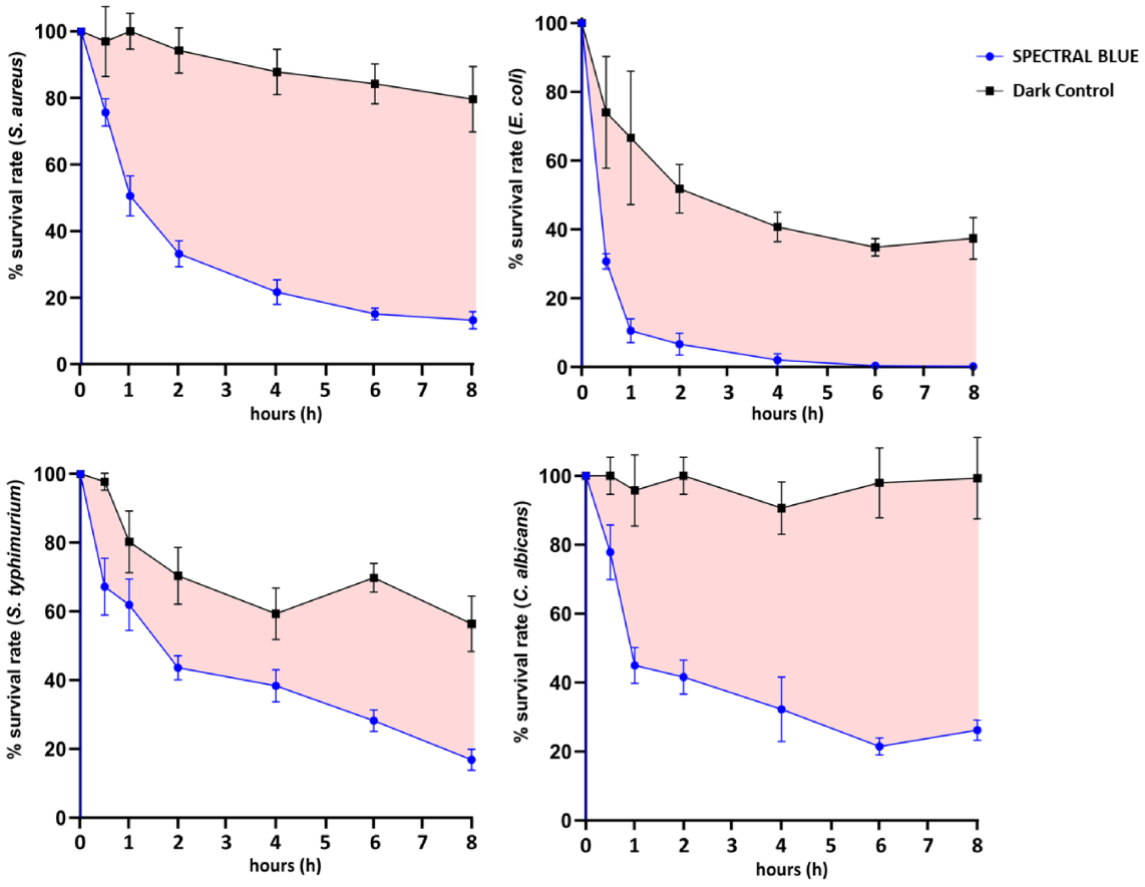
- The enrichment of the test organisms and the preparation of contaminated carriers were conducted following standard EN 17387, however, with significantly lower initial concentrations.
- *Salmonella typhimurium*, which is not specifically listed in the DIN standard EN 17387, was also enriched on TSA (Tryptone Soya Agar) at 37°C for 24 hours of incubation.
- 50 µL of test microbial suspension with a microbial count of 10^5 CFU/mL (*C. albicans, Salmonella typhimurium, and S. aureus*), or 10^6 CFU/mL (*E. coli;* a higher initial concentration was chosen for *E. coli* due to increased inactivation during drying).
- Low organic load was used: 0.3 g/L BSA (bovine serum albumin).
- Suspension was applied to metal discs (round, Ø 20 mm, made of stainless steel 1.4301, according to EN 10088-1) and dried completely before being used for irradiation experiments within 1 hour.

Testing was conducted at different irradiation times, excluding daylight, with a distance of 50 cm between the light source and the carrier with microorganisms. Recovery and evaluation of the carriers followed the procedures outlined in DIN standard EN 17387.

To calculate the reduction factor, the colony forming units (CFU) per carrier of the irradiated samples were compared with the CFU per carrier of the untreated control samples for respective irradiation times. Temperature and humidity were measured during the experiment both in the surrounding environment and beneath the light source to exclude potential nonspecific effects. All experiments were performed with independent replicates, each with duplicate determinations.

3. Results

The survival rates shown in the graphs below indicate how many of the initial CFUs could be recovered after the respective irradiation time. The difference (highlighted in red) between the survival rate after blue light irradiation and the survival rate of the dark controls can be attributed to the germ-reducing efficacy of the blue light irradiation.



The results demonstrate that blue light irradiation of Spectral Blue MWHI technology has a germ-reducing effect on all of the tested organisms. The reduction values vary depending on the irradiation time and the test organism, with longer irradiation times resulting in higher reduction values. This indicates the germ-reducing efficacy of blue light irradiation.

The test was commissioned by LED Tailor Oy and performed independently by the University Clinic of Bonn.