



# **Multi-Wavelength, High-Intensity (MWHI) - blue light technology**

Touch-free, chemical-free & UV-free disinfection with visible blue light



SPECTRAL L100 disinfection device

# Decontaminates air and surfaces

Safe for humans and animals,  
gentle on your materials and  
sustainable for the environment

Save time and money by substituting manual disinfection with automatic blue light disinfection.

## Security

The touch-free Spectral Blue™ disinfection technology uses Multi-Wavelength, High-Intensity (MWHI) blue light (visible light, no ultraviolet light) which is 100% safe for people and materials. The antimicrobial effect of blue light is based on activating light-absorbing compounds found in microbial cells but not in human or animal cells.

## Sustainability & workplace health

The LED devices with blue light utilise validated technology, are energy efficient and have a long service life (50,000 hours). They contain no mercury and do not require tube replacement. Blue light does not cause allergies or asthma, leaves no chemical residue and does not form ozone. You can reduce the use of harmful chemicals and UV light and make your workplace more sustainable and healthier.

## Efficacy

Spectral Blue can kill all bacteria, yeast and mold, including **multi-resistant strains such as MRSA and VRE**. It can inactivate viruses such as SARS-CoV-2 and Influenza-A. It works through transparent materials and can also penetrate biofilm. It does not promote the development of antimicrobial resistance.

## Continuous disinfection

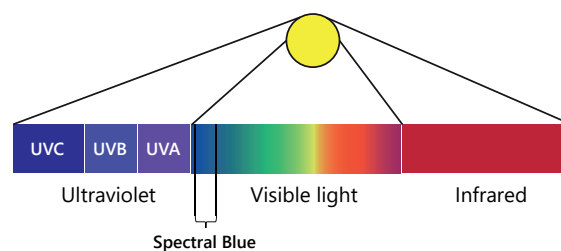
Chemical disinfectants, UV and hydrogen peroxide misting are episodic; they can be used typically once per day and the effect does not last. Spectral Blue you can set to automatically turn on whenever the room is unoccupied, providing many disinfection cycles during the day. This way it prevents microbial growth and keeps your facilities clean 24/7.

# How it works

## Introduction to Multi-Wavelength, High-Intensity (MWHI) antimicrobial blue light technology

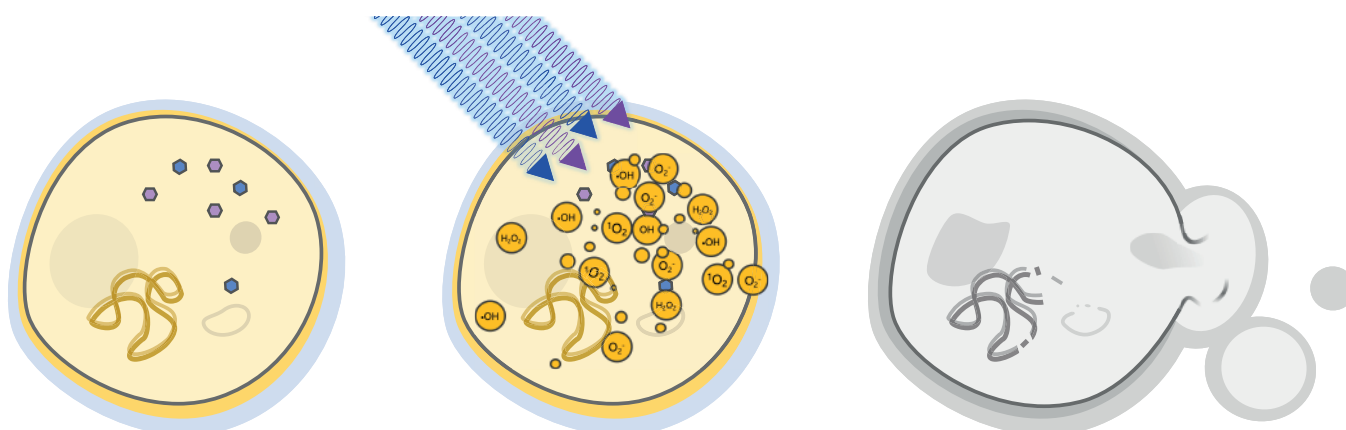
Spectral Blue disinfection devices emit antimicrobial visible blue light. Whereas harmful ultraviolet radiation damages DNA on all organisms, the antimicrobial effect of visible blue light is completely different. It is based on activating light-absorbing compounds that are found inside all microbial cells but not in human cells. Examples of these compounds are porphyrins and flavins.

When these compounds are illuminated with certain blue wavelengths and high enough intensity, they become activated. This in turn starts a reaction cascade which leads to the forming of highly reactive oxygen molecules inside the microbial cells. These so called '**Reactive Oxygen Species**' (ROS) break down vital cell structures like DNA and RNA strands, proteins, lipids and the cell membrane. One widely known example of ROS is hydrogen peroxide.



*Spectral Blue devices use two or more UV-free visible blue light wavelengths between 405 and 470 nm.*

The Multi-Wavelength, High-Intensity (MWHI) blue light technology can activate several light-absorbing compounds at the same time. This capability makes it much more efficient and allows it to target a much wider range of microbes than legacy single-wavelength 405 nm applications or blended blue-white light applications. MWHI disinfects rooms in just hours, not days or weeks, and is effective against multi-resistant microbes.



1. A typical microbial cell containing light-absorbing compounds such as flavins and porphyrins.

2. Illumination with MWHI blue light activates the light-absorbing compounds. This starts a reaction cascade that leads to the forming of reactive oxygen species (ROS) inside the cell.

3. The ROS damage the cell's vital structures (DNA, RNA, lipids, proteins and cell membrane). The microbe is first inactivated, and as the light dose becomes large enough, the microbe dies.

▶ Watch the video presentation on: <https://spectral.blue/science>

# Continuous disinfection

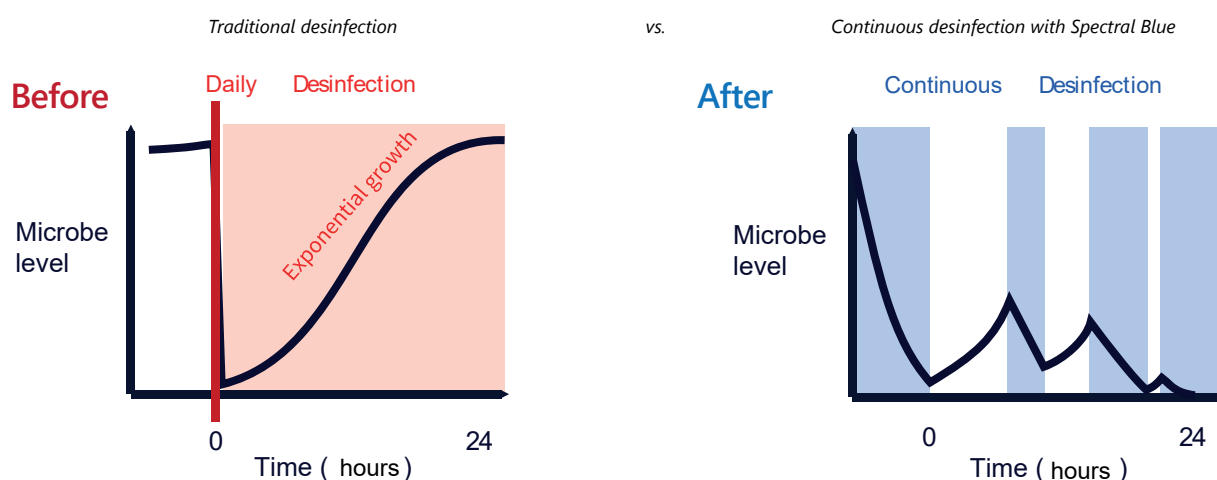
## Works around the clock

Continuous disinfection is a game changer. It allows you to go from episodic and inefficient manual disinfection work to keeping your premises clean around the clock with automation.

Traditional disinfection methods like chemical disinfectants, UV radiation and hydrogen peroxide misting cannot be used continuously because they are highly dangerous for people or animals and damage materials too. They often also require significant manual effort. They are therefore used episodically – once per day or once per week. Unfortunately the effect of such methods is also short-lived and recontamination happens as soon as people enter the room again.

Because Spectral Blue is completely safe for people, patients, animals and materials, it can be used without restriction, even when people are present. It disinfects the air and surfaces tirelessly, day after day and with constant effectiveness.

Due to its brightness, working under blue light can be unpleasant. For this reason, and to make it easier to control the cycles, Spectral Blue devices are often used automatically to switch between normal room lighting and blue light depending on the occupancy of the room. This means that several disinfection cycles can be run automatically even outside the daily rest periods.



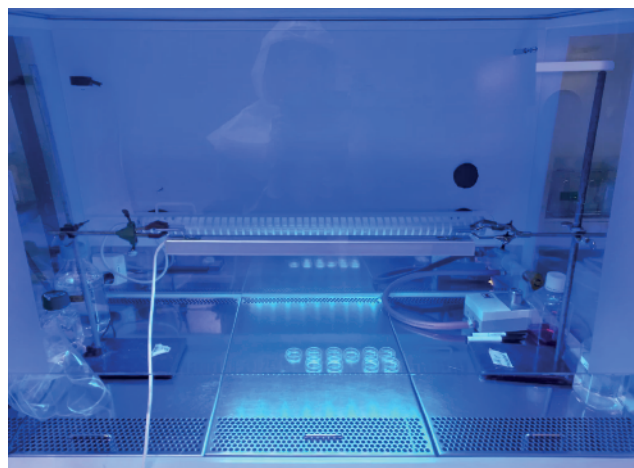
**Turning the contamination curve upside down.** With a chemical disinfectant it takes a few minutes to kill microbes, but the effect does not last. Recontamination starts as soon as people enter the room. Spectral Blue is not as fast in disinfecting surfaces as chemicals, but it switches on whenever the room is unoccupied. You get several disinfection cycles each day which first bring down the contamination level and then keep it down permanently.

# Efficacy

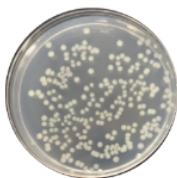
The antimicrobial effect of visible blue light has been shown in over 2000 peer-reviewed articles and verified by accredited laboratories.

Antimicrobial blue light has been studied for decades and its effect on different microbes is well-known. There are over 2000 peer-reviewed scientific articles in which a large variety of microbes have been tested.

The Multi-Wavelength, High-Intensity (MWHI) blue light technology used by Spectral Blue is even more efficient and works against a wider range of microbes than old single-wavelength applications. Its effect has been verified by accredited laboratories: Tests show that Spectral Blue devices are highly effective against common hospital pathogens, environmental microbes found in cleanrooms as well as foodborne pathogens.



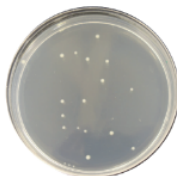
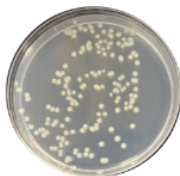
Laboratory test with *Escherichia coli*:  
Initial state



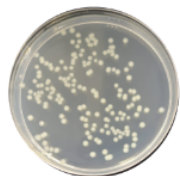
Dark control samples

Samples illuminated with Spectral Blue

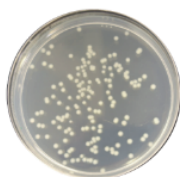
2 h



4 h



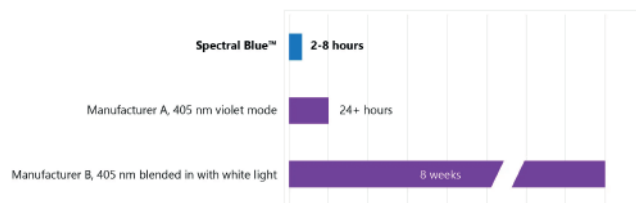
6 h



*The inactivation of Escherichia coli. The bacteria were plated on agar and irradiated at a low intensity (0,7mW/cm<sup>2</sup>). The results were confirmed by conducting three separate tests, with each test utilizing three parallel samples from each point of analysis. 6-hour irradiation with Spectral Blue resulted in reduction of over 99,9%.*

Disinfection time:

Spectral Blue is 5-10 x faster than legacy blue light systems



## Spectral Blue is effective against:

- All bacteria, yeast and mold, incl. multi-resistant strains
- Lipid-enveloped viruses (e.g. SARS-CoV-2, Influenza A)
- Biofilm

Spectral Blue inactivates microbes in just hours, whereas legacy systems blending blue light in general white lighting require many weeks for statistically significant reduction in microbe levels.

MWHI light does not promote the development of antimicrobial resistance, and its effectiveness can be further enhanced by treating surfaces with a photocatalytic titanium dioxide (TiO<sub>2</sub>) coating.

Please visit <https://spectral.blue/science> for the latest studies and test results.

# Workplace health & safety

No chemicals, no UV radiation, no ionising radiation, no ozone in the workplace and no photobiological risk to the eyes, lungs or skin of your employees or customers.

All traditional disinfection methods cause health risks for employees and are also environmentally unfriendly and unsustainable.

**UVC radiation** and the severe damage it causes to employees' eyes and skin is well-known. Its degrading effect on materials also makes it unusable for room disinfection. From environmental point of view, UVC is problematic because UVC tubes must be replaced often and the tubes contain mercury, so they become hazardous waste after their short lifespan.

**Chemical disinfectants** have several problems too. Studies show that healthcare workers repeatedly exposed to chemical disinfectants are more susceptible to work-related health issues such as:

- Asthma
- Allergies
- Skin irritation
- Chronic obstructive pulmonary disease (COPD).

These health problems can lead to frequent and long periods of sick leave and early retirement. The resulting understaffing leads to an additional burden on the remaining workforce, which in turn can lead to a lack of time and a deterioration in the quality of care.

The environmental risks of chemicals are related to both their manufacturing and their use; for example, if the residues end up in sewage waters, they may damage delicate aquatic ecosystems.

Using an automatic, continuous and safe disinfection method like Spectral Blue can help organizations to reduce the use of harmful chemicals. This will in the long term have a positive effect on the workplace health and sustainability.

**Spectral Blue is 100% safe for people and materials and the most sustainable disinfection method**

MWHI blue light inactivates microbes indirectly by activating light-absorbing compounds found inside microbial cells. Human cells do not contain these compounds and blue light does not harm human cells or DNA. Therefore there is no risk to employees' skin. There is therefore no risk to the skin of employees, patients or animals.

The photobiological eye safety of Spectral Blue devices has been tested according to IEC 62471:2006, IEC TR 62778:2014 (Blue Light Hazard test). Spectral Blue devices are classified as RG1 (low risk) or RG2: (moderate risk). They cause no risk to employees' eyes in normal use. However, as with any LED light source, the bright devices must not be looked at directly.

- Some people may find the bright blue light as distracting or tiring, which is why a presence sensor is often installed to automatically switch between regular lighting and blue light.

Spectral Blue light has lower energy than ultraviolet light and it does not have a degrading effect on surface materials like plastics, wood, metal, glass or paints. Therefore it does not damage room surfaces or delicate healthcare or laboratory equipment. In fact, Spectral Blue is already being used in surgical operating rooms, ambulances, laboratory equipment and 3D bio-printers.

From environmental point of view, LED-based Spectral Blue devices are energy-efficient and have a long lifetime (50.000 hours). They do not require tube changes or generate waste. The devices can be recycled after their lifespan.

The only disinfection method without any harmful side-effects.

# Produkte & OEM-Lösungen

## Es gibt eine Lösung für jedes Problem

We have specialised in automatic disinfection with blue light in the following areas:

- cleanrooms,
- food production,
- pharma,
- laboratories,
- healthcare, care facilities or ambulances,
- dentists, vets or similar practitioners.

Spectral Blue devices are available in several form factors for every use case. They can be installed on ceilings or walls, or you can get mobile plug&play devices that have wheels under them. You can install low-power devices for overnight disinfection or get a high-power system to disinfect facilities between customers or patients.

On <https://spectral.blue> you will find all Spectral Blue devices.

We also provide tailor-made blue light disinfection kit to OEM customers that wish to integrate the technology inside their own product.

Examples of such collaborations include operating room ventilation, cleanroom HEPA diffusers, 3D bio-printers, continuous-flow shaft dryers, ambulances and biosafety cabinets.

Would you like to get to know references from your industry?

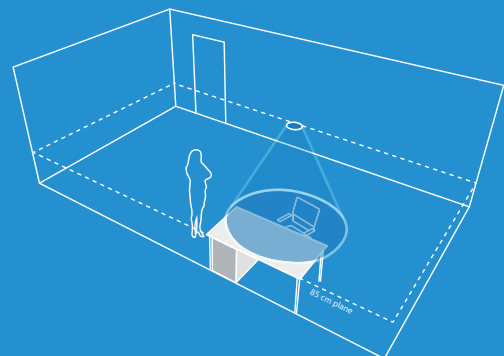
On <https://spectral.blue> you will find solutions for many industries, if yours is not included, write to us at [info@p12medical.ch](mailto:info@p12medical.ch) or call us on +41 44 5003434!

## How many devices do I need?

Choosing the right device type and amount depends on the distance to target surfaces and how large an area we wish to cover.

Ceiling-mounted devices are meant for 1.5–2 meter distances and smaller devices can operate at shorter distances. A good start is often to take one of our L100 ceiling/wall units (illustrated on page 2) or M200 mobile units to cover a desk, working area or machine.

For whole room deployment, we can make a computer-aided 3D disinfection plans for your target rooms and optimize the power so that we meet the desired disinfection time.





# Do you value safety, control and sustainability?

## Then find out about our latest technology for automatic decontamination.

Are you interested in finding out more?

Please call us at [+41 44 5003434](tel:+41445003434) or send an e-mail to [info@p12medical.ch](mailto:info@p12medical.ch) so that we can discuss your requirements or your project!



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