LED TAILOR®

Blue is Clean™

Blue is Clean™

TECHNOLOGY

PATENT PENDING

LED TAILOR

LED Tailor is a Finnish company specializing in the development and manufacture of chemical-free disinfection solutions based on blue LED light. Our solutions contribute to better surface hygiene and air quality in healthcare facilities, industrial premises and sites with indoor air quality issues.

All our products are developed and manufactured in Finland. Our continuous R&D is conducted within an extensive international network of expertise. We are the first European company to supply disinfection solutions based on blue light.

Our solutions are used for effective disinfection of spaces and objects, and they also work on antibiotic-resistant bacteria (incl. MRSA, EHEC, ESBL). In addition to contributing to a cleaner and safer environment, they create significant savings in the consumption of chemicals, water and energy, as well as in sick leave and healthcare costs.

Blue is Clean™

2018

Quality Innovation Award of the Year, potential innovation, Excellence Finland

2017

Productive Idea 2017, honorable mention, A region, Junior Chamber International Finland

Quality Innovation Award, potential innovation, Excellence Finland

Quality Innovation Award, micro and startup series, Excellence Finland

Innoaura – Creative Innovation in Southwest Finland, 1st prize, Regional Council of Southwest Finland

2016

Productive Idea 2016, honorable mention, A region, Junior Chamber International Finland

Seal of Excellence Member, European Comission

Salo Business Idea of the Year 2016, Juho Leino Foundation

ANTiBAC - white general light

ANTiBAC produces a flicker-free and energizing pure white light. ANTiBAC also functions as part of the LED Tailor photon disinfection system, restricting the growth of microbes and activating the purifying properties of Catalytic coating much more efficiently than ordinary lights.

The white ANTiBAC light is designed to replace traditional general lighting. Existing fluorescent tubes can be replaced with LED tubes without having to change the lighting fixture. Special luminaires with greater luminous flux are also available.

FLICKER-FREE

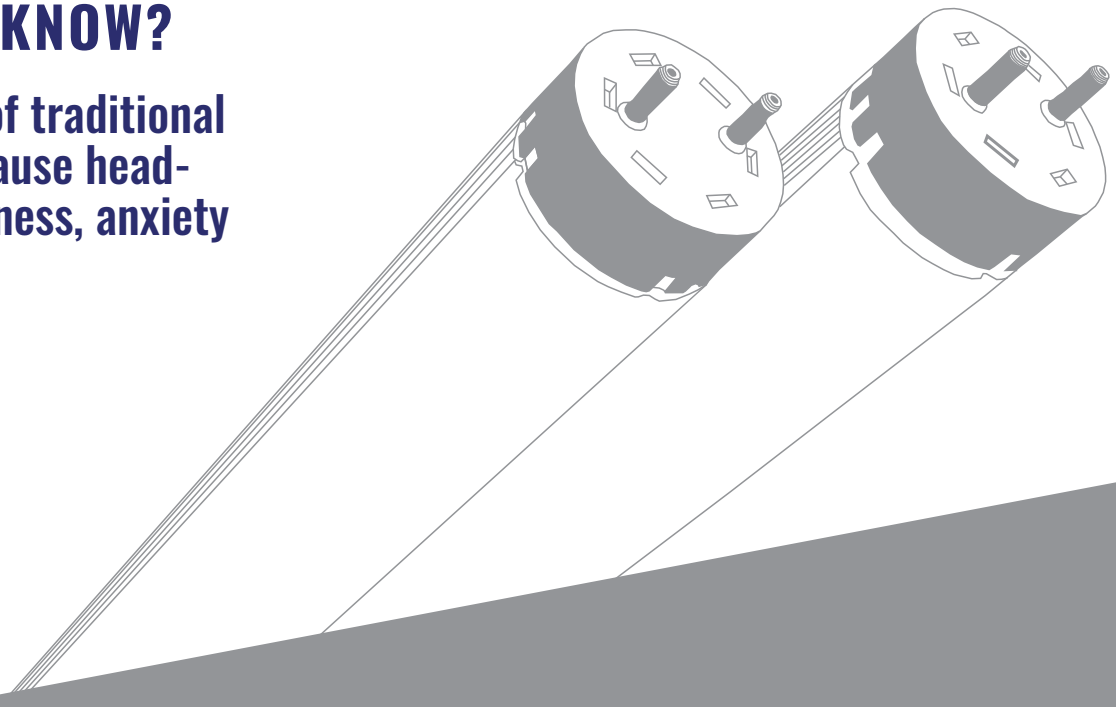
IMPROVES VITALITY

PURE WHITE LIGHT

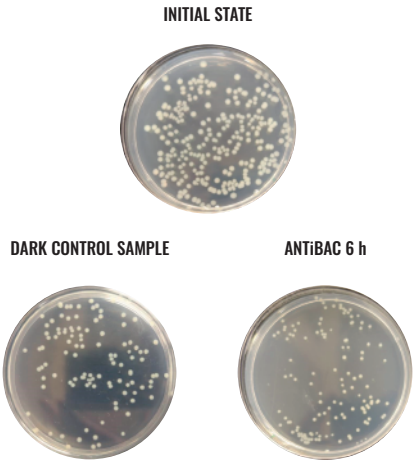
50 % LESS ENERGY CONSUMPTION OVER STANDARD TUBES

DID YOU KNOW?

The flicker of traditional lights can cause head-aches, tiredness, anxiety and stress.



The antimicrobial effect of ANTiBAC on E.Coli



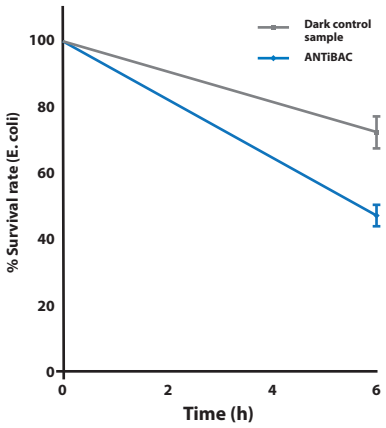


Fig. 1.
Survival of E. coli on agar plate after 6 hours.

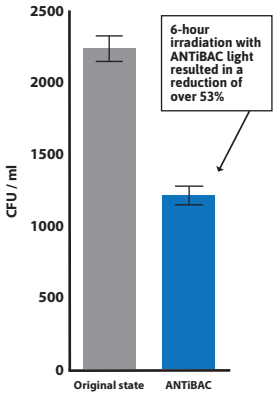
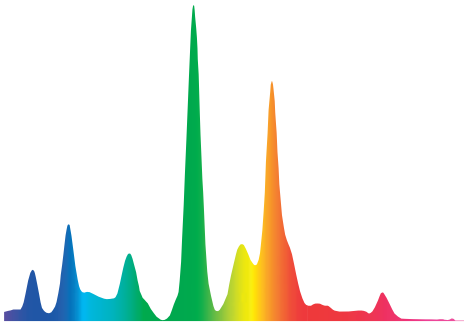
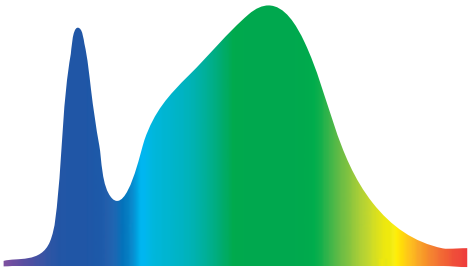


Fig 2.
Comparison of number of colonies between original state and a sample irradiated with ANTiBAC, after 6 hours.

In spring 2018, laboratory tests were conducted at the Turku University of Applied Sciences to determine the efficiency of LED Tailor's ANTiBAC light in the inactivation of Escherichia coli. The bacteria were plated on agar and irradiated at an intensity corresponding to standard office lighting (500 lux). The results were confirmed by conducting three separate tests, with each test utilizing three parallel samples from each point of analysis.

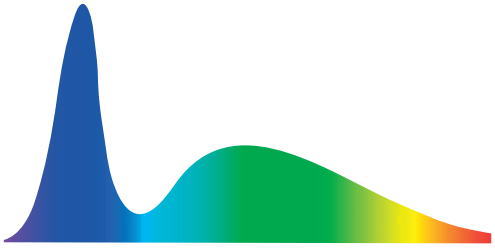


Traditional 4000K fluorescent tube



Traditional 4000K LED light

The exceptional properties of ANTiBAC light are the result of its precisely controlled spectrum. Although the light is perceived as being pure white, it contains multiple amount of blue wavelengths than typical fluorescent or LED lights, thereby also activating the cleansing action of catalytic coating much more efficiently than ordinary light.

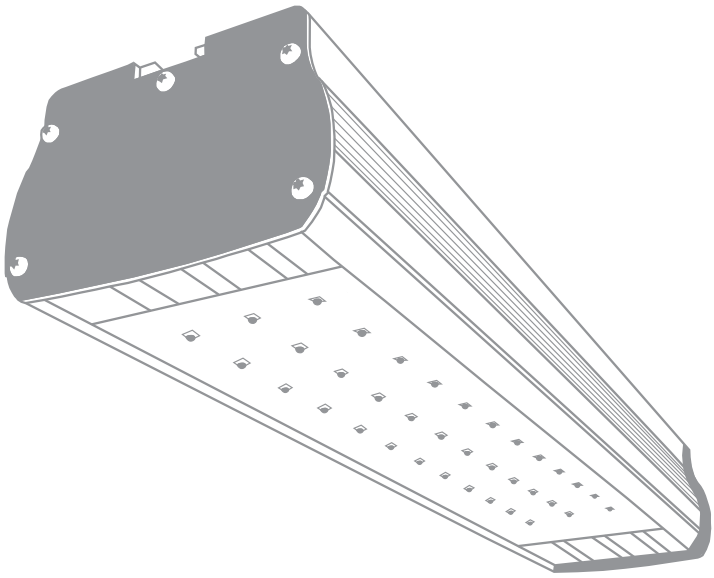


ANTiBAC

WiSDOM AiR - blue disinfection light

Blue light has been shown to destroy bacteria, molds and fungi with high efficiency. Its power can be enhanced to destroy also viruses and endospores. The antimicrobial properties of blue light have been known for decades, but only the latest developments in LED technology have made disinfection with blue light a cost-effective solution.

LED Tailor photon disinfection system deploys blue light at night or whenever the targeted space is not in use. WiSDOM AiR photon disinfection luminaires are harmless to humans and materials. The lights are typically controlled either manually (with a switch) or automatically (with a timer or a presence detector).



Extremely well-studied subject

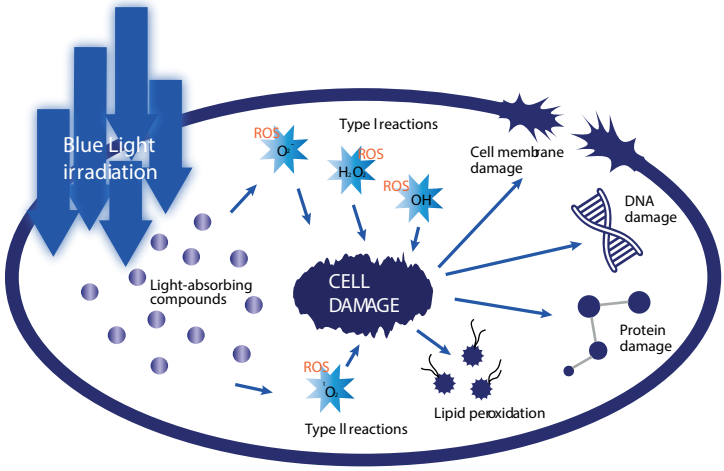
more than 1,500 scientific publications

Source:
05/2018 PubMed service with search terms:
"antimicrobial" and "blue" and "light."

Penetrates even biofilm,

unlike common disinfectants and biocides.

Source:
Raquel Ferrer-Espada, Yanyan Fang, Tianhong Dai, "Antimicrobial blue light inactivation of biofilms formed by clinical isolates of multidrug-resistant microorganisms", Proc. SPIE 10479, Light-Based Diagnosis and Treatment of Infectious Diseases, 104790N (8 February 2018); doi:10.1117/12.2288520



The ability of blue light to destroy microbes is based on its ability to energize naturally light-sensitive compounds inside the microbe so that they start producing reactive oxygen species (ROS) inside the cell. Oxygen species are extremely reactive and destroy vitally essential components of the cell (cell membrane, DNA/RNA, protein structures).

Safe for materials and humans

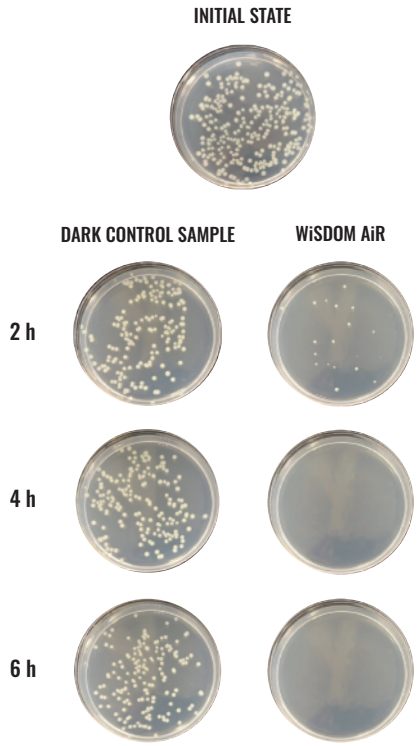
STUK

The Finnish Radiation and Nuclear Safety Authority (STUK) tested WiSDOM AiR photon disinfection luminaires in its laboratory on 12 April 2017. The test report shows that the radiation is non-ionizing.

The effects of blue light on human cells have been tested at high dosages. Even doses ten times higher than that used in LED Tailor's solutions caused no harmful or toxic changes to the cells.

Source: Liebmann et al., 2010. Blue-Light Irradiation Regulates Proliferation and Differentiation in Human Skin Cells. J Invest Dermatol. 2010 Jan;130(1):259-69. doi: 10.1038/jid.2009.194.

The antimicrobial effect of blue light on E. Coli



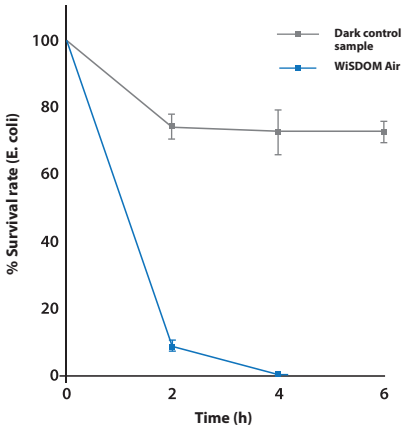


Fig 1.
Survival rate of E.coli on agar plate after 2, 4 and 6 hours.

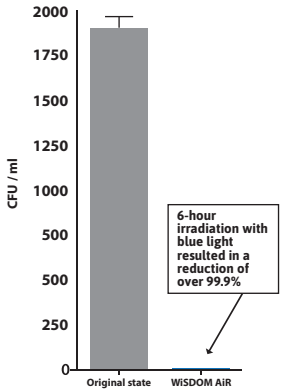


Fig 2.
Comparison of number of colonies between control sample kept in the dark and a sample irradiated with blue light, after 6 hours.

In spring 2018, laboratory tests were conducted at the Turku University of Applied Sciences to determine the efficiency of LED Tailor's WiSDOM AiR photon disinfection light in the inactivation of Escherichia coli. The bacteria were plated on agar and irradiated at low intensity (0.7 mW/cm2). The results were confirmed by conducting three separate tests, with each test utilizing three parallel samples from each point of analysis.

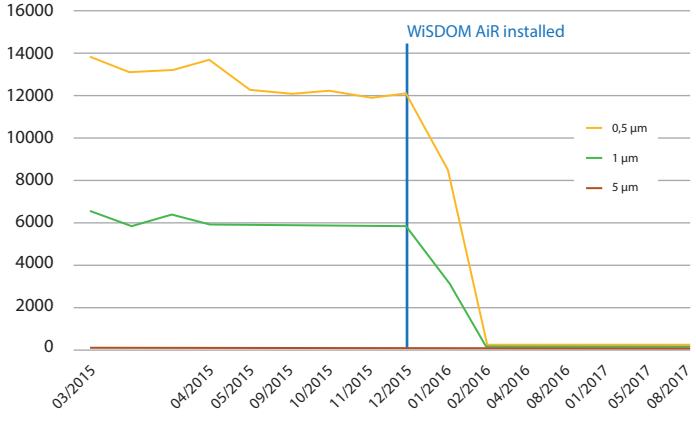
Efficiency on different microbes

Cause of infection in ECDC study (% of all cases)	Microbe tested in blue light study	Wavelength	Dose	Reduction		Reference
Escherichia coli (15.9%)	*Escherichia Coli*	405 nm	65 J/cm^2	> 99.9 %	3.6 $\log_{10}$	(Barneck et al., 2016)
Staphylococcus aureus (12.3%)	MRSA	470 nm	55 J/cm^2	> 99.999 %	> 5 $\log_{10}$	(Bumah et al., 2015; Bumah, Masson-Meyers and Enwemeka, 2015)
Enterococcus spp. (9.6%),	*Enterococcus faecalis*	405 nm	886 J/cm^2	> 99.99 %	4.7 $\log_{10}$	(Gupta et al., 2015)
Pseudomonas aeruginosa (8.9%)	*Pseudomonas aerunginosa*	405 nm	55 J/cm^2	> 99.9 %	3.6 $\log_{10}$	(Barneck et al., 2016)
Klebsiella spp. (8.7%)	*Klebsiella pneumoniae*	405 nm	180 J/cm^2	> 99.9 %	3.9 $\log_{10}$	(Maclean et al., 2009)
Coagulase-negati ve staphylococci (7.5%)	*Staphylococcus epidermidis*	405 nm	118 J/cm^2	> 99.999 %	5.1 $\log_{10}$	(Gupta et al., 2015)
Candida spp. (6.1%)	*Candida albicans*	415 nm	70 J/cm^2	> 99.999 %	5.4 $\log_{10}$	(Zhang et al., 2016)
Clostridium difficile (5.4%)	*Clostridium difficile*	405 nm	48 J/cm^2	> 99.99 %	4 $\log_{10}$	(MacLean et al., 2013)
Enterobacter spp. (4.2%)	*Enterobacter cloacae*	400 nm	92 J/cm^2	> 90 %	1 $\log_{10}$	(Halstead et al., 2016)
Proteus spp. (3.8%)	*Proteus vulgaris*	405 nm	144 J/cm^2	> 99.99 %	4.7 $\log_{10}$	(Maclean et al., 2009)
Acinetobacter spp. (3.6%).	*Acinetobacter baumannii*	405 nm	108 J/cm^2	> 99.99 %	4.2 $\log_{10}$	(Maclean et al., 2009)

This table lists the most common causes of health-care-acquired infections in Europe, according to the European Centre for Disease Prevention and Control (ECDC). The ECDC conducted a study from 2011–2012 on vectors of healthcare-associated infections in 273,753 patients in 1,149 hospitals in 29 European countries.

The table also contains data on the efficiency of blue light inactivation of microbes collected from different sources. Although different microbes respond differently to blue light, it is nevertheless fatal to all of them.

Reduces the amount of airborne particles



The data is based on measurements conducted by Salofa Oy in their own cleanroom. The number of particles less than 1.0 µm in size was reduced by more than 98% and those of 1.0–5.0 µm by over 60%. The system has been in use at Salofa for more than two years. The current level of airborne particles was attained in the first month, and the situation has been stable ever since. Apart from the installation of WiSDOM AiR photon disinfection luminaires, no other changes were made in the cleanroom or the work carried out there.

Catalytic coating

The catalytic coating is activated by ANTiBAC white light and blue WiSDOM AiR disinfection light, multiplying the efficiency of the photon disinfection system

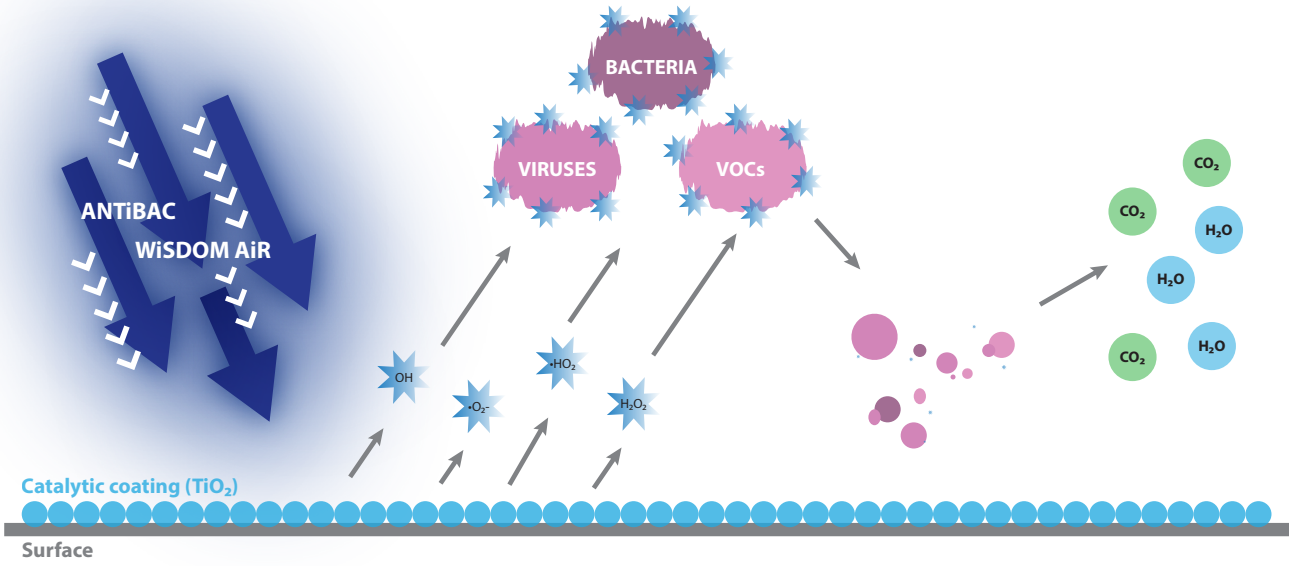
Destroys harmful VOCs

The efficiency of the LED Tailor photon disinfection system can be enhanced by applying a Catalytic coating to surfaces. The coating utilizes a phenomenon known as photocatalysis, in which the energy on light triggers a chemical reaction that produces short-lived reactive oxygen species. The reaction is produced by a catalyst, which in the LED Tailor coating is titanium oxide (TiO2).

Clears organic compounds from surfaces and air

Photocatalysis has been known for decades but only came into wider use in the 2000s. Today, photocatalytic finishes are used on self-cleaning façades, windows and in air-purifier filters. Previously, the main obstacle in using photocatalysis was that it could be activated only with UV wavelengths, which meant that sunlight or UV lamps were needed to trigger the cleansing reaction.

New catalytic compounds arrived on the market in the 2010s that can also be triggered into action with wavelengths of visible light. The coating used in the LED Tailor photon disinfection system can be activated both with white ANTiBAC light and blue WiSDOM AiR disinfection light. The catalytic coating multiplies the purifying effect of the system.



1. The coating is activated by light with suitable wavelength and intensity.
2. The activated coating produces reactive oxygen species, ROS (superoxide radicals (•O2-), hydroperoxide radicals (•HO2), hydroxyl radicals (•OH) and H2O2).
3. The ROS are extremely short-lived, reacting with the microbes and VOCs on the surface.
4. Microbes and VOCs disintegrate, and ROS are neutralized into water and carbon dioxide.

Durable

Because the catalyst is a nanocoating, it penetrates microscopic pores in the surface and will not come off even with heavy mechanical wear.

We have tested the durability of the coating with dry wipes as well as wipes moistened with water and with ethanol. The coating did not cease to react with the light even after several thousand wipes.

If some area of the surface becomes excessively worn, more coating can easily be applied with a spray can, sold separately.

Colorless and invisible surface coating

The nanocoating is applied with an extremely fine spray, resulting in an ultra-thin layer. Since the coating does not create a paint-like membrane, the permeability of the surface is not affected. Suitable for nearly all types of materials.

- textile
- plastic
- wood
- metal
- glass
- concrete
- common construction materials

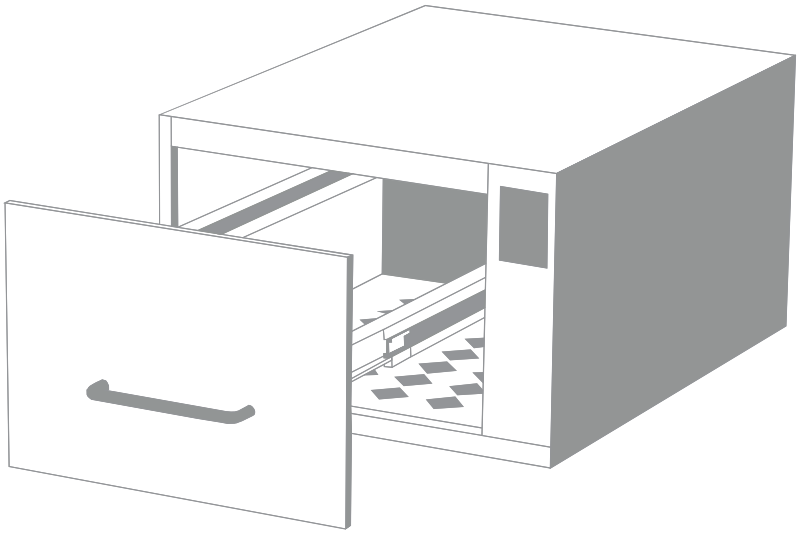
Long-lasting

The catalytic reaction does not diminish the coating in any way. The coating simply provides a substance that acts as a catalyst and triggers the purifying process.

Safe

The active component is titanium dioxide, which is commonly used in foods as a colorant (E171) and in sunscreens.

WiSDOM DS - UVC surface disinfection box



Ultraviolet radiation has been used for disinfection for about half a century. It is most commonly used in water purification, laboratories and industrial processes. UVC light allows disinfection to be performed quickly and efficiently, taking only minutes and, in some cases, seconds.

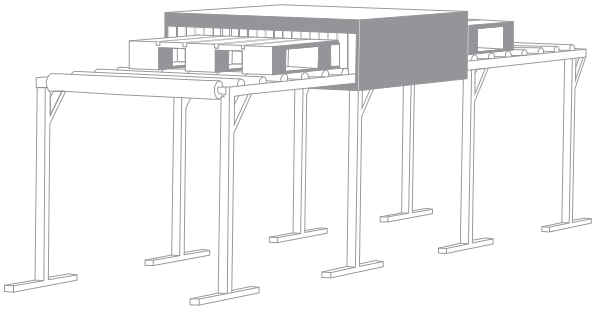
Problems with conventional systems are ozone and ionizing radiation produced by fluorescent UV tubes, which damages the materials to be disinfected. UV light is also harmful to humans.

LED Tailor has launched a series of innovative products based on a new generation of UVC LEDs that allow disinfection to be carried out extremely efficiently and in a completely harmless manner.

WiSDOM DS disinfection unit – ultra-efficient disinfection in just three minutes!

Also suitable for disinfection of sensitive materials, including plastics and electronics.

We also design customized solutions in which photon disinfection can be integrated into an existing production line. The efficiency of the systems is always scaled according to need, and the customer is provided with all necessary calculations.

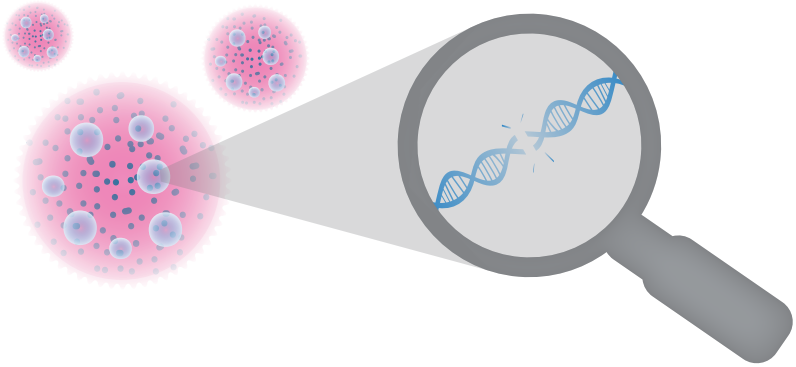


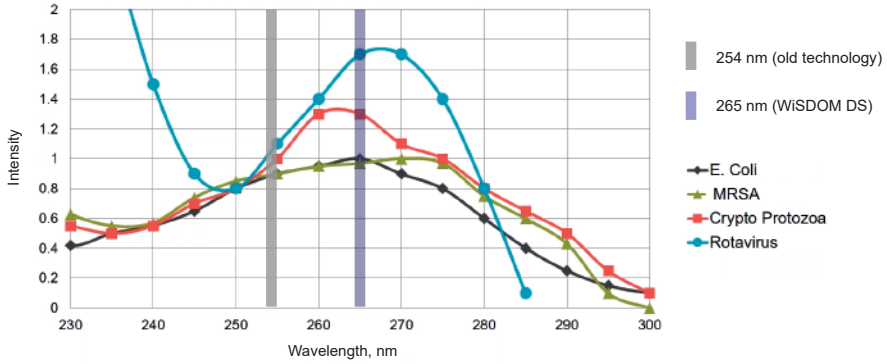
LED Tailor products utilize UVC radiation only within a closed space, ensuring absolute safety to the user.

STUK

The Finnish Radiation and Nuclear Safety Authority (STUK) tested our UVC LEDs in its laboratory on 15 August 2017. The test report shows that the radiation is non-ionizing.

UVC radiation is absorbed into the DNA and RNA of microbes, where it efficiently destroys the genetic material. The microbes are then unable to reproduce and simply die off.



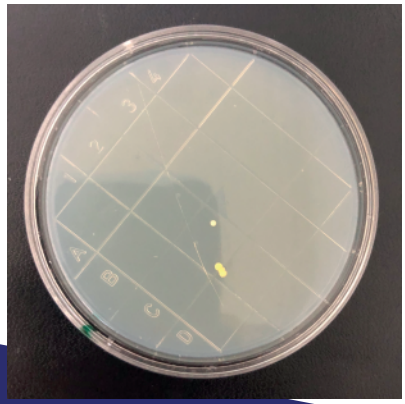


This graph shows the reaction of four different types of microbes to UV light of various wavelengths. The wavelength of UVC LEDs used in the WiSDOM DS disinfection unit is significantly more antimicrobial than traditional UVC tubes. The high precision of the wavelength of UVC LEDs allows disinfection to be performed efficiently and safely.

	WiSDOM DS operating time	reduction log	reduction %	dose	reference
Clostridium difficile	3 min	4.04 log_{10}	>99.99%	36 mJ/cm²	Rutala W et al. 2010. Room decontamination with UV radiation. Infect Control Hosp Epidemiol 2010;31:1025-9. Published online: 01 January 2015
MRSA *(Methicillin-resistant Staphylococcus aureus)*	1 min	4.71 log_{10}	>99.99%	12 mJ/cm²	Rutala W et al. 2013.Rapid hospital room decontamination using ultraviolet (UV) light with a nanostructured UV-reflective wall coating. Infect Control Hosp Epidemiol 2013;34:527-9.
VRE *(Vancomycin-resistant enterococci)*	1 min	3.90 log_{10}	>99.9%	12 mJ/cm²	Rutala W et al. 2010. Room decontamination with UV radiation. Infect Control Hosp Epidemiol 2010;31:1025-9. Published online: 01 January 2015

The amount of microbes on a computer keyboard before and after being treated in the WiSDOM DS for 3 minutes.

BEFORE



AFTER

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