



## LAMILUX ANTIBAC

MAXIMUM HYGIENE THANKS TO STERILE SURFACES



# LAMILUX COMPOSITES

## HIGH-TECH MATERIALS FOR THE MARKETS OF THE FUTURE

Carbon- and fibreglass-reinforced composites are state-of-the-art construction materials with the highest degree of innovation potential at a global level. LAMILUX Composites are true innovators when it comes to pioneering product solutions in several dynamically growing markets.

UNPARALLELED BENEFITS FOR VERSATILE USE IN THE REFRIGERATION AND FOOD INDUSTRIES, AND IN THE MEDICAL FIELD

- Good thermal insulation values and low heating expansion – particularly important in the refrigeration sector
- Sealed, pore-free and easy-to-clean surfaces – for the highest degree of hygiene
- Food safe – substantiated by test certificates
- Extremely lightweight, yet highly stable – an important factor in the area of transport



### The LAMILUX CI Philosophy

Customer value is the reason for our existence and is the focus of our activities. This requires harmony, identity and a balance between customer value and company strategy.

These guiding ideas for our company's actions and our day-to-day relationship with our customers are described in LAMILUX's company philosophy:

**Customized intelligence – serving the customer is our priority.**

This requires outstanding performance and leadership in all areas relevant to customers, particularly in the role of:

- A leader in quality - optimum benefit for customers
- A leader in innovation - at the cutting edge of technology
- A leader in service - fast, uncomplicated, reliable and friendly
- A leader in expertise - optimum sales and technical advisory services
- A leader in solving problems - individual, tailored solutions



» LAMILUX is the world's first manufacturer of fibre-reinforced composites to have voluntarily submitted a major portion of its laboratory and testing facilities to testing by TÜV Süd Deutschland and to have successfully obtained certification. With this, LAMILUX has submitted itself to the very highest quality requirements. «

Dr. Heinrich Strunz,  
third-generation managing director of  
LAMILUX Heinrich Strunz GmbH

#### LAMILUX – EUROPE'S LEADING PRODUCER OF FIBRE-REINFORCED COMPOSITES

LAMILUX produces fibre-reinforced composites on four production lines using an industrial flat sheet process. The high degree of quality which has been certified on numerous occasions and the material properties that ideally cater to the respective applications have aided in maintaining the company's leading position in the international market for fibre-reinforced composites.

The high-tech materials are employed around the world as highly stable and ultra-light construction materials: Lightweight construction in the automotive and transport sector, food industry, portable room systems, façade design and temporary buildings.

#### TÜV CERTIFIED QUALITY

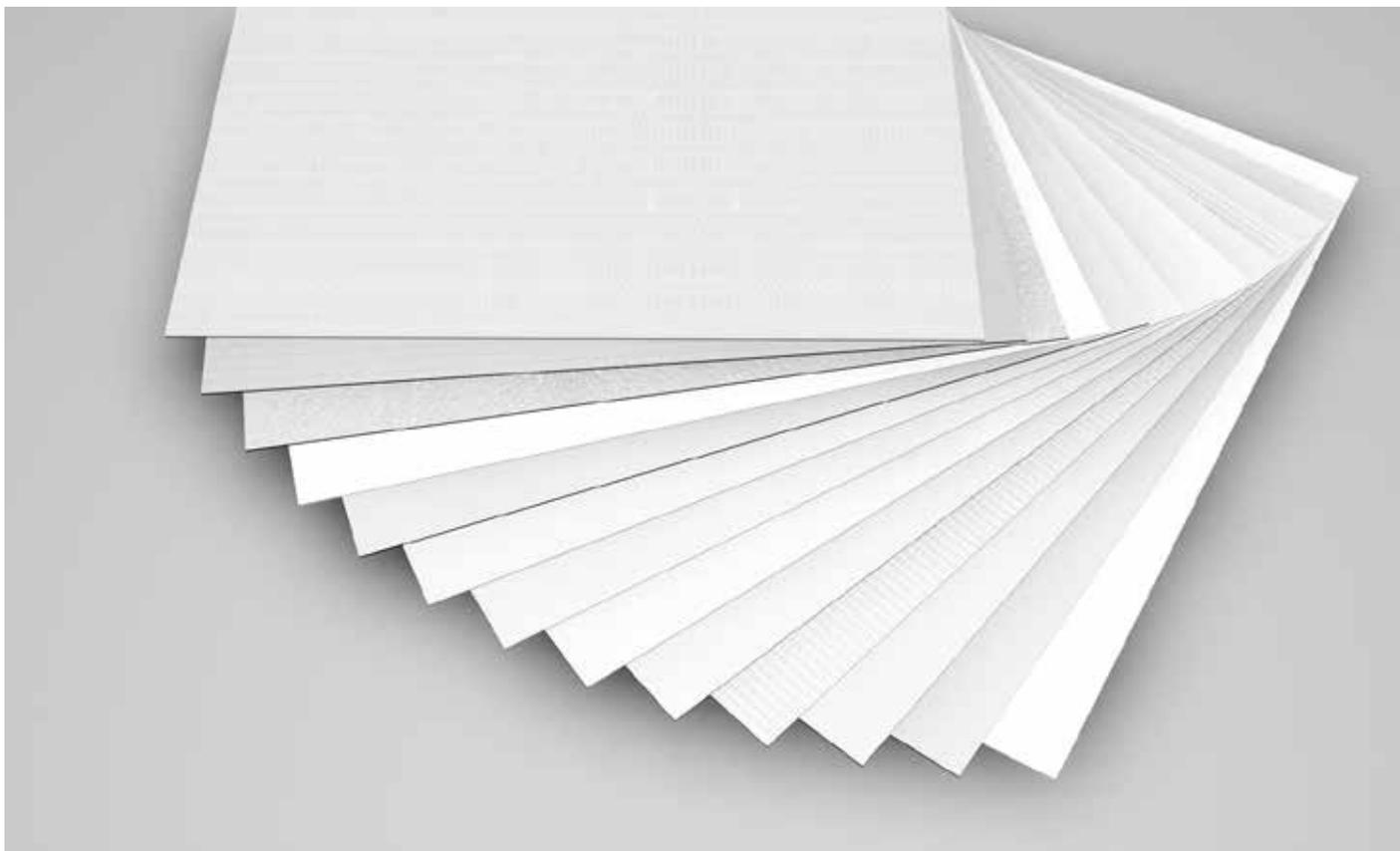
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TÜV SÜD certified quality



**LAMILUX ANTIBAC  
FOR MORE SAFETY AND HYGIENE**



## INNOVATIVE NANO SILVER TECHNOLOGY

**LAMILUX has developed an innovative composite material for the medical field: this fibre-reinforced plastic has a special nano silver surface which has an antibacterial effect. The effect: Germs die off within a few hours. The innovative material is thus an excellent choice, e.g., for wall coatings in operating theatres and other medical institutions.**

The development partner here was the research company "Rent-a-Scientist" from Regensburg, Germany. The company is regarded as a world leader in nano silver research.

The new, antibacterial material can be used to cover both walls and ceilings. In a research project funded by the ITZB (Innovations- und Technologiezentrum Bayern), a nano silver technology has been developed in collaboration with "Rent-a-Scientist" on which - as scientific experiments clearly prove - dangerous germs die within a few hours.

### WHY LAMILUX ANTIBAC?

Multi-resistant bacteria pose an increasingly serious threat in hospitals, and can become a deadly risk for patients. Hospitals are therefore facing the permanent challenge of mitigating or even preventing the occurrence of hazardous hospital germs through targeted preventive and acute measures.

For example, the dreaded MRSA (methicillin-resistant staphylococcus aureus) has repeatedly occurred in OP in areas. It can cause wound infection and inflammation of the respiratory tract, in humans in particular, and is resistant to certain antibiotics. Medical experts estimate that in Germany alone 15,000 patients are killed by hospital germs each year.

### MORE APPLICATIONS IN THE FOOD SECTOR

In addition to use in hospitals, there are numerous fields of application for the antibacterial high-tech material in the food industry. More specifically where high standards of hygiene must be complied with, and sterility is of the utmost importance; for example, in cold stores, refrigerated cells and transports, as well as in processing rooms and abattoirs.

# MAXIMUM HYGIENE THANKS TO STERILE SURFACES

Besides the benign and useful bacteria that inhabit our bodies in their billions, there are also many unwanted germs that we encounter in nearly all walks of life. Whether in the food industry or in medicine – contact with these pathogens typically has unpleasant and sometimes even fatal consequences. Above all, multi-resistant germs, against which antibiotics are powerless, cause major health and financial damage around the world every day.

In a three-year research project, LAMILUX has collaborated with scientists and health professionals to develop a highly effective and durable material that can improve global hygiene standards in many walks of life. Whether as a wall and ceiling coating in hospitals and operating theatres, a lightweight material in food transportation, or for hygienic wall panels in food processing, LAMILUX AntiBac sustainably and efficiently neutralises more than 99.9% of all bacteria on its surface.

## MEDICAL

In Germany alone, some 15,000 people die each year from "healthcare-associated infections" – despite high hygienic standards. The threat here stems from multidrug-resistant pathogens which have developed resilience to most antibiotics.



## FOOD STORAGE

Refrigerated food storage, of fish, meat and dairy products, for example, necessitates the highest requirements in terms of hygienic conditions of all storage locations in the food chain – from the abattoir to the warehouse to the refrigerated counter.



#### NANO SILVER ENCAPSULATED IN AN INNOVATIVE PROTECTIVE COVER

- Maximum effectiveness against all bacteria
- Maximum durability even under the toughest conditions
- Health safety and environmental compatibility guaranteed



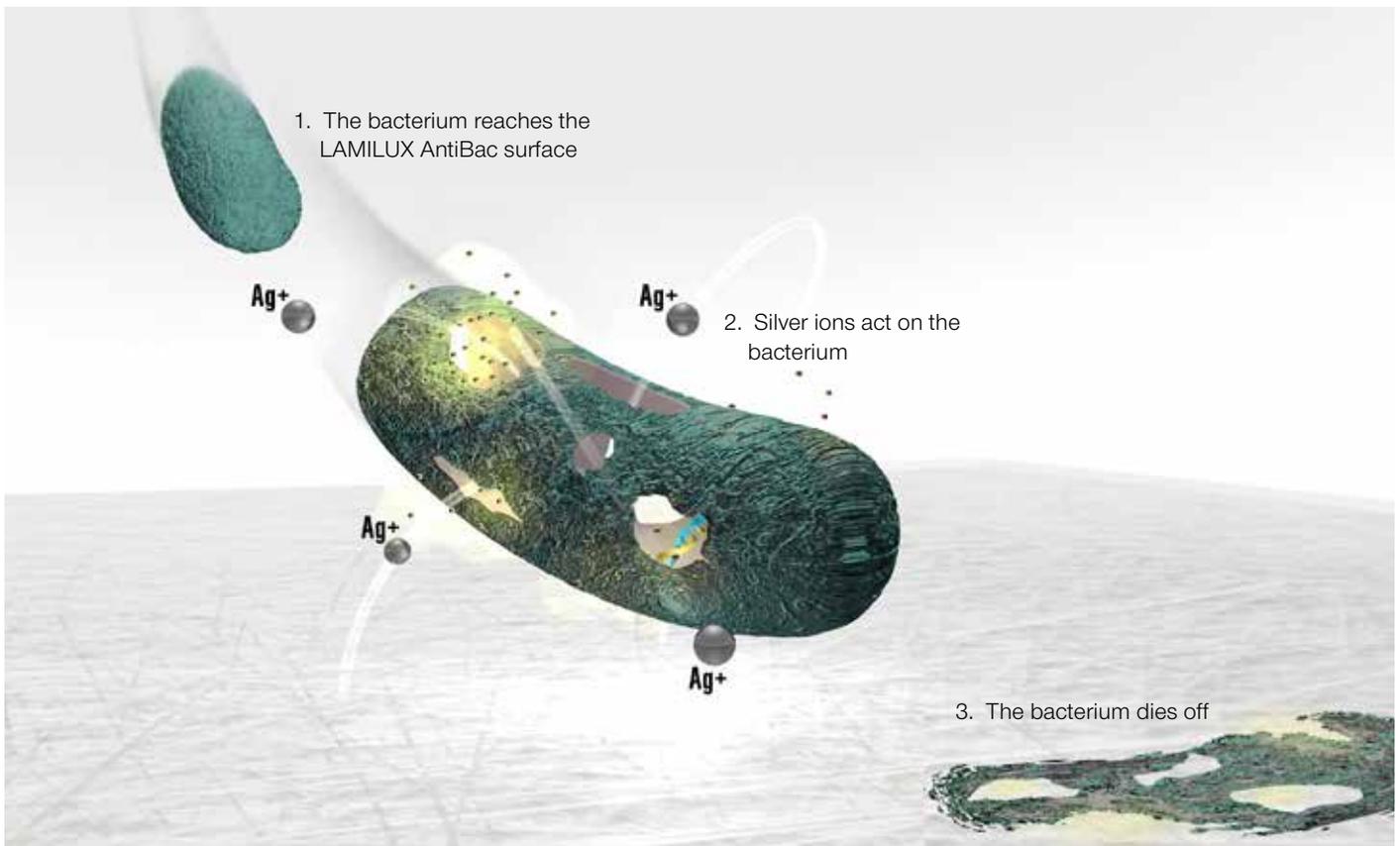
## FOOD PROCESSING

Many of the resistant pathogens come from industrial intensive livestock farming. Large amounts of broad-spectrum antibiotics are used to protect animals against diseases. However, in the long term, pathogens can become resistant and eventually be transferred to humans. Sterility is therefore paramount, especially in food processing.



## FOOD TRANSPORT

Living without mass transportation of refrigerated and sensitive foods is unthinkable in our globalised world – a demanding task for cleaning and hygiene logistics, especially if you consider the permanent loading and unloading processes and the contamination they involve.



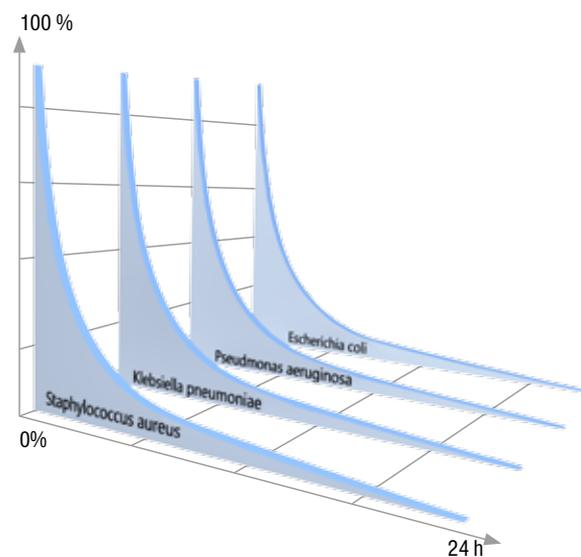
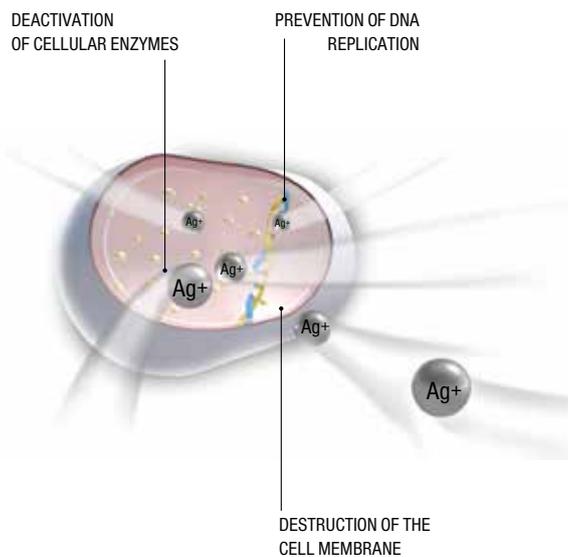
## TRIPLE EFFECT AGAINST PATHOGENS

### TRIPLE EFFECT ON BACTERIA:

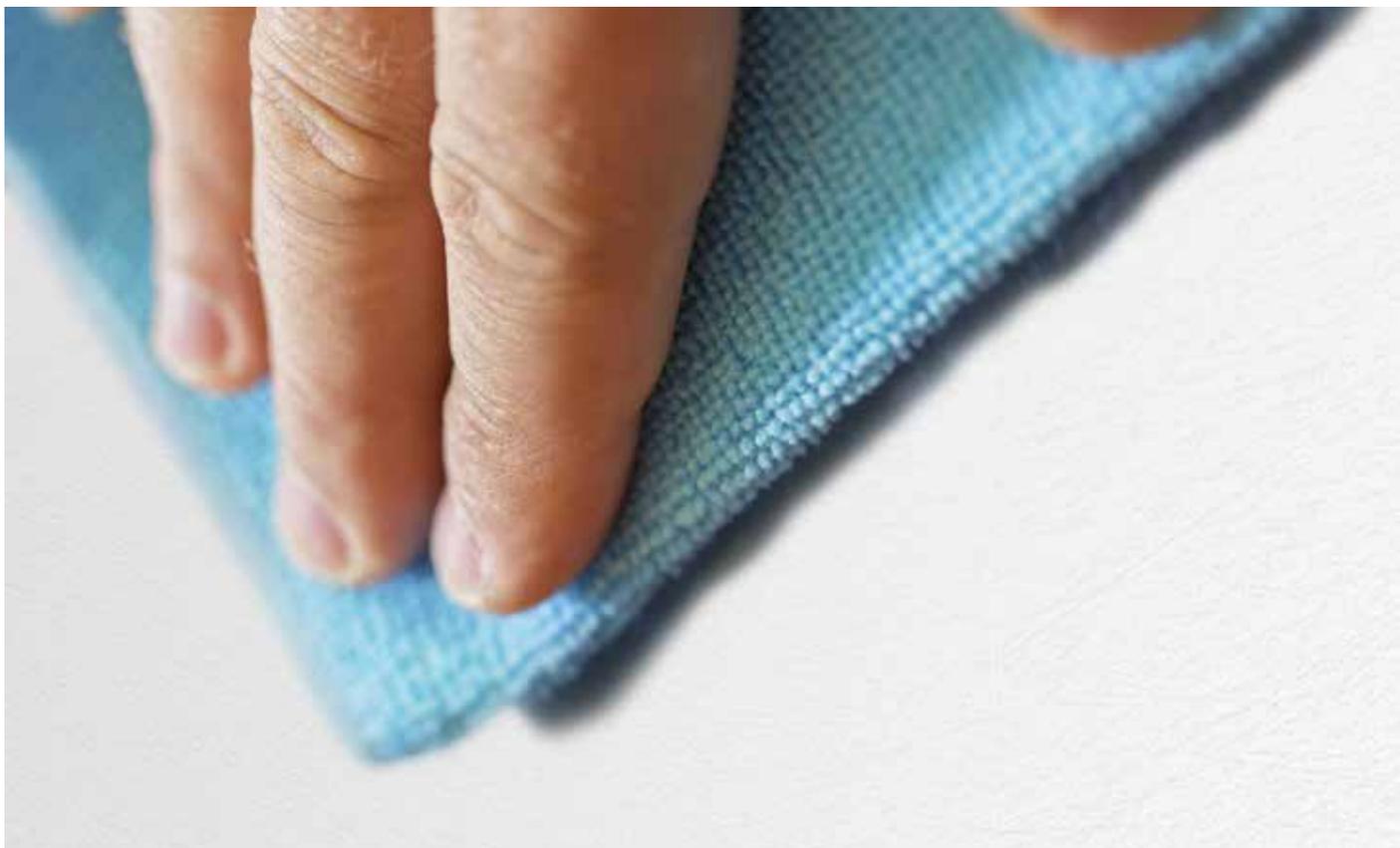
- Destruction of metabolism due to deactivation of cellular enzymes
- Destruction of the cell membrane
- Prevention of DNA replication

### EFFECTIVENESS AS PER DIN EN ISO 22196 BASED ON FOUR REPRESENTATIVE BACTERIA

More than 99.9% of all bacteria are killed within 24 hours.

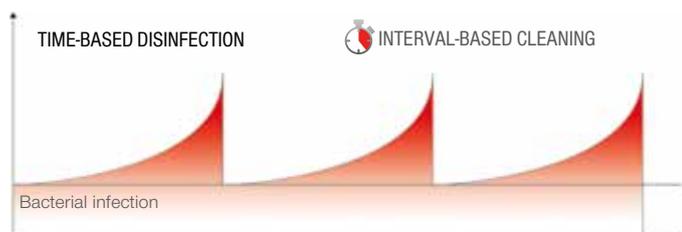


Demonstrable efficiency against various pathogens as per standards JIS Z 2801/DIN EN ISO 22196, ASTM 2180, ASTM 2149 can be found on the last page.



## ADDED SAFETY

With its permanent effect, LAMILUX AntiBac helps to compensate for natural fluctuations in cleaning and disinfection at every point of the wall and ceiling surfaces. This creates a redundant system of maximum hygienic safety.

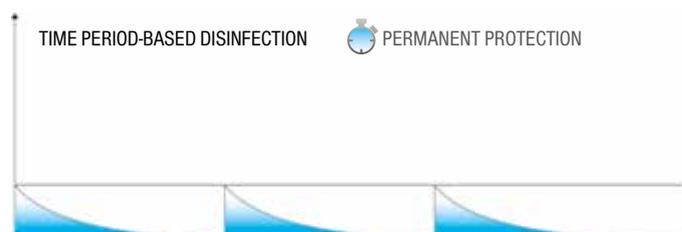


Starting from the time of disinfection, bacteria reproduction again increases exponentially. Often, a critical level is already reached here, before the population growth is stopped by the next cleaning action.



Cleaning and disinfection are not always equally effective at all locations.

What disinfection means here is reducing germs by a factor of at least  $10^5$ ; in other words, thanks to LAMILUX AntiBac fewer than 10 of 1,000,000 replicable germs survive.



However, time period-based disinfection through LAMILUX AntiBac immediately suppresses the propagation of bacteria. Uninterrupted disinfection of the surface occurs 24 hours a day, 7 days a week, 365 days a year.



LAMILUX AntiBac offers continuous disinfection at any point of the surface, even in hard to reach areas.

A healthcare professional, likely a nurse or doctor, is shown in profile, wearing a light blue surgical cap and a matching face mask. They are wearing teal scrubs and are focused on washing their hands under a stream of water from a chrome faucet. The background is a clean, white clinical setting. The overall tone is professional and hygienic.

**LAMILUX ANTIBAC  
IN MEDICINE**



## AVOIDING INFECTIONS SAVES LIVES

**Multidrug-resistant bacteria and nosocomial infections account for 400,000 to 600,000 infections and 15,000 deaths per year in Germany alone: a hazard in healthcare that means additional treatment costs amounting to an average of 20,000 euros per patient.**

Innovative LAMILUX AntiBac surfaces help to prevent this and save lives. In addition to many useful germs, like those on our skin or in our intestinal flora, there are a number of germs that cause illness and can have devastating consequences for a patient if they infect

the wrong place, for example, a wound. Among other things, antibiotics are used to eliminate these germs, but the limits are being reached because of resistant pathogens.

Hospitals are therefore facing the permanent challenge of mitigating or even preventing the occurrence of hazardous hospital germs through targeted preventive and acute measures. Especially on the largest surfaces of a hospital complex, the walls and ceilings, LAMILUX AntiBac can ensure more effective and permanent protection against pathogens and interrupt the propagation chain.



### STAPHYLOCOCCUS AUREUS

An inflammatory pathogen that can trigger abscesses and wound infections, among other problems, and which can additionally aggravate the symptoms in the case of hybrid infections with other pathogens. Anti-biotic-resistant strains (MRSA) are well known.



### KLEBSIELLA PNEUMONIAE

Ubiquitous occurrence, also in the human intestinal flora. 10% of nosocomial infections are attributed to this germ. Natural resistance to benzyl penicillin and aminopenicillin.



### PSEUDOMONAS AERUGINOSA

Widespread soil and water germ characterised by pronounced frugality in terms of its habitat. Pronounced resistance to antibiotics, particularly to most penicillins and cephalosporins.



### ESCHERICHIA COLI

Normally helps to ensure healthy intestinal flora. However, it may lead to infectious diseases outside the intestinal tract. The dangerous EHEC bacterium belongs to this group.

**LAMILUX ANTIBAC  
IN THE FOOD SECTOR**





## FOOD PROCESSING AND STORAGE

**In livestock farming, and especially in meat processing downstream, it is important to comply with what are often strict national or international standards. In many cases, these strict hygienic requirements also need to be ensured under tough conditions.**

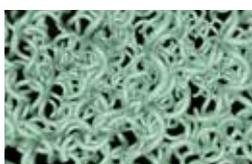
Here too, LAMILUX AntiBac continuously contributes towards eliminating all germs that come into contact with the surface – 24 hours a day, and 365 days a year.

Assured food safety and non-toxicity of the materials used, is also essential for storage rooms, refrigerated shelves and deep-freeze

counters.

Many LAMILUX material qualities are thus tested for indirect contact with food, and the newly developed nano silver is considered absolutely safe for humans and the environment.

In livestock farming, too, cleanliness and freedom from germs are ensured by periodic cleaning as the most important means in the fight against bacteria. LAMILUX AntiBac impresses here with easy and residue-free cleaning thanks to the pore-free surface, which does not lose its antibacterial properties even under the toughest conditions.



### CAMPYLOBACTER JEJUNI

One of the most common causes of diarrhoea in humans besides salmonella. They are transmitted through unpasteurised milk, raw poultry meat and drinking water. Symptoms include severe abdominal pain, diarrhoea, fever and, in rare cases, neurological damage such as the Guillain-Barré syndrome with paralysis.



### ESCHERICHIA COLI (SPECIAL FORM OF EHEC)

EHECs are disease-causing strains of E. coli that produce certain toxins and destroy the cells of the intestinal wall and blood vessels. EHEC can be transmitted through raw meat. The disease can lead to serious consequences, such as the development of the life-threatening HUS (haemolytic uremic syndrome).



### PSEUDOMONAS AERUGINOSA

Anaerobic, gram positive bacteria, which can often be found in vacuum-packed, raw meat and lead to the food spoiling. The metabolism of the bacteria causes various foul-smelling gases and acids, which become visible as bloating of the packaging ("blown pack spoilage").



LAMILUX ANTIBAC  
IN THE TRANSPORT INDUSTRY



## FOOD TRANSPORT

**In addition to its low thermal conductivity, and high strength despite a light weight, LAMILUX AntiBac above all impresses with the constant disinfectant effect of its surface in temperature-controlled transportation of foods that require refrigeration throughout the delivery chain**

Refrigerated containers and semitrailers are exposed to severe mechanical stress, temperature changes and harsh cleaning cycles – often with aggressive media – during loading and along the transport route. LAMILUX AntiBac is demonstrably resilient to these stresses and reliably disinfects for at least 55 years – even under the toughest conditions.



### SALMONELLAE

Salmonellae are common in raw eggs, poultry meat, unpasteurised milk and chocolate and can infect both humans and animals. Infections with salmonellae can trigger illnesses such as diarrhoea or typhoid fever. Depending on the course of the sickness and the treatment, these diseases can be fatal.



### YERSINIA ENTEROCOLITICA

Yersinia enterocolitica is a widespread bacterium that mainly occurs in pigs. Due to its optimum temperature of 4 °C, the bacterium can even survive in the refrigerator. Infections are manifested in diarrhoea, swollen joints and inflammation of the abdominal fat.



### LISTERIA MONOCYTOGENES

Listeriosis pathogens can cause meningitis and are very dangerous for pregnant women, new-born children and persons with immune deficiencies. The pathogens are transmitted through contaminated food, such as fruit and vegetables. Because the bacterium is psychrophilic, it can also propagate well in refrigerated conditions.

**LAMILUX ANTIBAC**  
**MORE APPLICATIONS**





USE IN STORAGE ROOMS

## EMERGENCY SHELTERS IN CRISIS AREAS

The versatile LAMILUX AntiBac is available with variety of fibre reinforcements and surfaces and thus lends itself to flexible use. Among other things the material contributes towards improving basic hygiene and containing epidemics in crisis areas or slums.

Germs and pathogens can, in particular, colonise the large wall and ceiling surfaces of emergency shelters and thus generate unnecessary disease potential in schools, kindergartens, medical facilities or in private accommodation.

Known germs in areas with a lack of hygiene infrastructure include: *Vibrio cholerae* (cholera), *Mycobacterium tuberculosis* (tuberculosis), *Neisseria meningitidis* (meningitis), Enterohaemorrhagic *Escherichia coli* (EHEC).



USE IN ANIMAL BREEDING AND AGRICULTURAL BUILDINGS



USE IN MOBILE ROOMS AND CONTAINERISED SHELTERS



## LONG-TERM EFFECT & DURABILITY



- Silver ion release (worst case conditions) under substance-specific limit for food contact as per EU regulations on biocidal products (50 ng/g)



- Theoretical durability: 55 years (= max. duration of silver ion release and consequent anti-microbial effect when cleaned twice a day) with maximum aggressive cleaning method with nitric acid (HNO<sub>3</sub> at 40°C )



- Laboratory weathering as per DIN ISO 4892-A-2 1,000 h
- Condensation test 40 °C 100% R.H. (no change in the material and surface properties)



- Temperature cycle test 8 h 80 °C/16 h 25 °C 6 weeks (no change in material and surface properties)
- Temperature aging at 80 °C for 6 weeks (no change in material and surface properties)

### EFFICACY AGAINST FOLLOWING PATHOGENS AS PER STANDARDS JIS Z 2801 / DIN EN ISO 22196, ASTM 2180, ASTM 2149

Bacillus subtilis, Burkholderia cepacia, Clavibacter michiganensis, Enterococcus faecium, Erwinia amylovora, Escherichia coli, Klebsiella pneumoniae, methicillin-resistant Staphylococcus aureus (MRSA), Pseudomonas aeruginosa, Pseudomonas fluorescens, Pseudomonas syringae, Rhizobium radiobacter (Agrobacterium tumefaciens), Staphylococcus aureus, Staphylococcus epidermidis, Streptococcus mutans, Aspergillus niger, Aureobasidium pullulans, Aureobasidium pullulans, Candida albicans, Fusarium solani, Microdochium nivale, Penicillium funiculosum, Scopulariopsis Brevicaulis, Streptomyces abikoensis, Trichophyton mentagrophytes, Virus bacteriophage MS2 and others



## SAFETY & NON-TOXICITY

### BIOCOMPATIBILITY

In-vitro cytotoxicity:

Mutagenicity:

Allergy test:

Skin tolerance:

Eye inflammation:

Inhalation studies:

Oral toxicity:

Development toxicology & teratogenicity:

ISO 10993-5

OECD TG 471

Local lymph node assay (LLNA)

OECD TG 402

OECD TG 404

OECD TG 406

HET-CAM test

OECD TG 406

OECD TG 413

OECD TG 408

OECD TG 413

OECD TG 422

### ECOTOXICOLOGY

Water organisms:

Micro-organisms:

Soil organisms:

Activated sludge:

Waste water treatment plant:

OECD TG 201, 202, 203, 210, 211, 221

OECD TG 217, 201, ISO 15685, DIN 38412 L 48, DIN

ISO 17155

OECD TG 232, 226, 222, 219, 207, ISO/DIS 17512-1

OECD TG 303, 209

Nitrification is not affected; also, efficient and high removal rate of nano silver (worst case scenario: 1 ppm nano silver)



Bus industry



Commercial vehicle industry



Construction industry



Recreational vehicle industry

The information in this brochure is based on our current knowledge and experience. It does not constitute a guarantee of technical characteristic features in the scope of a specification. Due to the wide range of usage parameters, users themselves are responsible for testing the suitability of the product for their required application. Subject to changes and errors.



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