PROTECTION AGAINST BACTERIA AND GERMS

INTELLIGENT PROTECTION FOR MAN AND MATERIAL
A MAJOR THREAT TO PATIENTS – MRSA RESISTANT GERMS IN HOSPITALS

Whenever bacteria are not fully killed by antibiotics or disinfectants, they are likely to become resistant. They will only survive in a hostile environment if they learn to adapt to the “weaponry” used by antibiotics and to develop countermeasures. Due to their very short generation cycle and simple construction, bacteria are fast learners and real survival experts.

Most multi-resistant germs originate from hospitals and nursing homes. According to Robert-Koch-Institute, about one third of the staphylococcus aureus bacteria (causing festering wound-based infections) examined in 2010 were resistant against antibiotics. MRSA (methicillin-resistant staphylococcus aureus, often miscalled “multi-resistant”) are the most frequently found type of resistant bacteria in hospitals. Hospitals provide a perfect “survival training” for bacteria: they are exposed to antibiotics and disinfectants on a daily basis so that only the strongest survive – the resistant tribes. In addition, many patients are suffering from a weak immune system so that the bacteria can peacefully grow inside their hosts and then be transferred to other patients.

Staphylococcus aureus means “golden grape cluster”. The persistent pyogenic organism is very self-sufficient and humble, and lives almost anywhere in nature. This type of bacteria will survive up to seven months without food on walls, door handles, textiles, light switches, TV remote controls, on the floor or on hospital beds.

A representative survey by German magazine “Apotheken Umschau” revealed that 56.1% of all interviewed are scared about a possible hospital acquired infection (HAI). Even when only visiting, people are concerned about safety: 82.5% confirmed that you should always use hand-disinfectants when visiting a hospital.

So far, experts were assuming about 500.000 infections with super germs in Germany every year, resulting in approximately 15.000 fatalities. But these numbers are based on the so called NIDEP-study from the 1990’s. Associations like the German Society for Hospital Hygiene (DGHK) believe, that infections of the digestion system have not sufficiently been considered in that study, and that a large number of cases have been left unaccounted for. In a statement, professional associations assume 700.000 cases, of which 30.000 end fatally.
MICROSILVER:

A SUCCESS STORY – FOR THOUSANDS OF YEARS

The medical and antibacterial properties of silver have been known for more than two thousand years and are proven by modern science: silver is protecting against a wide range of germs and bacteria, on a natural basis – completely without harmful chemistry, and long lasting.

Even in Antiquity, silver coins were placed into liquid containers to keep the water germ-free. The Greek history writer Herodotus describes how the Persian king Cyrus is said to have taken water in silver pitchers with him for his wars. In ancient Egypt, wounds were covered with silver film.

During the 1960’s, the use of silver as a medicine reached a preliminary peak with the introduction of the active ingredient silver sulfadiazine. Modern antibiotics replaced this substance, but due to the strong increase of resistant types of bacteria, silver is back on the agenda.

It has now been scientifically proven: sometimes silver is more valuable than gold!
Scattered silver has an antibacterial effect – due to the sufficient release of silver ions from a large reactive silver-surface. The performance depends on the substrate, hence silver is usually used as coating for medical products. Silver ions are efficient disinfectants and can be used as treatment in wound therapy. Different active mechanisms are used for this purpose:

- Blocking of enzymes and disruption of their live-supporting transport function in the cell
- Damaging the structural integrity of the cell
- Damaging the membrane

The described effects can lead to the death of the cell.

**ShieldTec Microsilver**

Our new and innovative microsilver-formulation is based on strongly pure, elemental silver, which is upgraded to its highly performing specific structure by a specially designed, complex physical process. In addition, our developers have managed to integrate this already advanced microsilver into a special matrix with spectacular results: The quantity of silver required to achieve the same antibacterial effect has been reduced to about only one hundredth compared to standard microsilver. This has been tested and certified by independent laboratories (for example the renowned Institute Hohenstein). The main advantage is a significant cost reduction in the ready product – despite all its advantages, standard microsilver was simply too expensive to be used as antibacterial agent in mass products in the past.

The ShieldTec microsilver is an organic, antimicrobial additive that can easily be integrated homogeneously into almost any type of paint or coating due to its advanced matrix. In addition to our own range of antimicrobial paints and varnishes, ShieldTec antimicrobial microsilver can also be used to upgrade existing coatings, either waterborne or solvent based. Standard microsilver often sediments to the bottom. Due to the low concentration and the integration into its specific matrix, ShieldTec microsilver stays evenly distributed and afloat. It is also not having any effect on the colour of the paint. Based on all these advantages ShieldTec can also be used in mass products, and protect against bacteria – not only in the health industry.

**ShieldTec is NOT** based on nano-technology. Contrary to our big-sized micro-particles (2–3 times larger than human cells), nano particles can transit through the cell membranes and enter into the body cells. The health risks associated with this have not been examined sufficiently yet and are very difficult to assess. Since there is rising concern about the long-term danger of nano-particles (comparable to Asbestos), we are not using this technology at all.

**THE FUNCTION OF MICROSILVER**

As soon as bacteria are settling on a surface protected by ShieldTec, silver ions enter the cells, destroy the genotype and prevent further replication.
All ShieldTec products are tested and certified for their antibacterial performance by independent and renowned institutes, e.g. by Institute Hohenstein in the South of Germany. Tests were carried out according to the Japanese Industrial Standard, JIS Z 2801:2000A “Antimicrobial products; Test for antimicrobial activity and efficacy” and German standard ISO 22196:2011-08 “measuring antibacterial activity on plastic surfaces” with the standardized test strains

- Staphylococcus aureus ATCC 6538
- Escherichia coli ATCC 8739

Despite the very low concentration of microsilver, ShieldTec was classified as "strongly antibacterial" (highest level on the scale).

Sample 13.8.3.0138
Institute Hohenstein certifies that "there is a strong antibacterial activity with the test strains Staphylococcus aureus ATCC 6538 and Escherichia coli ATCC 8739 under given test conditions for the tested samples, calculated with the control material (glass slide)".

Schloss Hohenstein, 15. November 2013
THE USE OF ANTIBACTERIAL PRODUCTS ...

SHIELDTEC APPLICATIONS

1 Walls
2 Light switches
3 Door handles
4 Refrigerator
5 Worktop
6 Remote control
7 Computer (keyboard, mouse)
8 Telephone
9 Toilet seat and accessories

etc.
MRSA as well as other bacteria have become a major problem in hospitals and other hygiene-areas, especially endangering people with weak or subdued immune system. Hence it is important to examine the whole chain of bacteria-transfers and to interrupt wherever possible:

Walls (antibacterial wall paint), door handles (antibacterial metal coating) as well as light switches (antibacterial coating for plastic substrates). Contrary to disinfection with toxic substances, silver is not having an immediate (but short-term) effect. Microsilver is permanently preventing the cell division of bacteria, thereby substantially reducing infection risks. ShieldTec products are designed to stop the growth and expansion of bacteria and to keep the population low at all times, hence giving a permanent and unlimited protection. ShieldTec products are one-time investments, maintenance-free, independent from disinfection routines and possible human errors. They can also protect against bacteria in areas which are difficult to reach (like air conditioning duct systems, hidden corners in ambulances etc.). Recommended areas of application are hospitals, nursing homes, rehabilitation centres, schools, kindergartens, public buildings, toilets in airports, fairs, restaurants and so on.

Bacteria are also causing trouble in other industries: production, transport and packaging of food, pharmaceuticals, medical equipment and many other products.

In order to substantially reduce the risk of MRSA-infections, a wide use of microsilver in various surfaces would be necessary. That was the problem so far: products based on standard microsilver had to be equipped with a high share of silver to achieve the necessary concentration of silver-ions for a strong antibacterial effect.

Hence it was simply too expensive to use microsilver as a standard antibacterial ingredient in wall paints, lacquers and other coatings – although it would be more than necessary to permanently eliminate dangerous bacteria in production units, hospitals, restaurants, aircraft toilets and many other areas. Due to the high efficiency of our innovative microsilver technology, this is now possible, and even private homes can be protected with innovative microsilver paint to prevent the growth of bacteria and benefit from side effects like the inhibition of mould, elimination of smell caused by bacteria and so on.
Corrosion caused by bacteria (MIC) is hardly known to the public, and even experts in many industries are only starting to understand the magnitude of the damages caused by MIC. Microorganisms can corrode and change a number of materials, including polymers, ceramic and glass in addition to metals. About 20% of all corrosion effects are estimated to be caused by MIC, in certain industries the share is much higher. While well-known rust is caused by oxygen (aerobe), bacteria like SRB (sulfate reducing bacteria) are causing microbial corrosion without any oxygen (anaerobic).

The most famous example is the hull of ocean liner Titanic, on which iron-eating bacteria were found.

In addition, water pipes, storage tanks, gas tanks, oil pipelines and other parts of production installations can be affected by microbial corrosion. Better knowledge about the background and the effects of bio-corrosion could prevent or reduce a major part of the damage: e.g. a more effective choice of suitable materials, their correct combination and the consideration of general framework conditions.
The triggers for MIC are the metabolic products of microorganisms, for example acid sulfur, hydrogen sulfide and nitric acid. Sulfate-reducing and acid-forming bacteria cause a big part of the problem. They cause very high local acid concentrations, which can also degrade high-alloyed substrates.

MIC affects almost any material: bacteria can inhibit all metals (except titanium, molybdenum and nickel cadmium), plastics, glass, ceramics and any organic material. And they do not need much: Moisture, nutrients, microorganisms and any type of surface are sufficient.

The main issue: bio corrosion caused by SRB (sulfate-reducing bacteria) can destroy structures up to 10 times faster than “usual” corrosion caused by oxygen and water. Usually the parts in question are difficult or impossible to clean or repair, so that the perfect solution is a protective coating with highly efficient microsilver right from production.

Another important area of application is the protection of all sorts of water installation (tanks, cooling equipment, and water treatment). ShieldTec engineers have managed not only to protect the inside surfaces of tanks etc., but also to keep the water free from bacteria. Beyond the obvious hygienic advantage this is very important from a technical point of view: a high number of bacteria in any system is leading to bio mucus, which will block filters, valves, confuse sensors and so on, and can cause massive damages or high cost for cleaning and maintenance. MIC is causing billions worth of damages every year in repair costs, interruption of production and loss of value.

ShieldTec protective coatings based on microsilver are offering effective and permanent protection against all types of bacteria, also including sulfate-reducing bacteria – free from chemical and poisonous ingredients.
**SHIELD TEC – PRODUCT OVERVIEW**

The bacterial load of surfaces and objects is increasing continuously. To protect people and values, SISTEC Coatings is offering a wide choice of different antibacterial coatings under its brand **ShieldTec** for a variety of applications, surfaces or substrates. Whether you want to protect walls, metal or plastic surfaces against bacteria: we are confident to have the right coating in our portfolio. If not, we will be happy to develop a customized solution together with you. Some examples from our list of products:

**SHIELD TEC ST011**
A high quality, matt acrylic waterborne paint for interior usage. ST011 removes germs and stops the growth of bacteria, i.e. on walls and ceilings in hygienically sensitive areas such as hospitals, retirement homes, kindergartens, schools, private homes, kitchen, public buildings, toilets in restaurants, swimming pools, food and pharmaceutical production and many more. Institute Hohenstein has certified ST011 as “strongly antibacterial”. Due to the unlimited antibacterial effect of our special microsilver, ST011 will perform throughout the lifetime of the paint.

ST011 is offering high value for money due to its excellent opacity (Class I) and high abrasion resistance (Class II).

**SHIELD TEC ST021**
This transparent, strongly antibacterial waterborne clear coat is designed for plastic substrates like ABS, polycarbonate, polyamide. It is suitable for permanent antibacterial protection of worktops, light switches, plastic door and window handles, toilet separation walls and other plastic surfaces with high bacterial exposure. ST021 features excellent curing properties, high mechanical resistance, easy application and economic spreading rates.

**SHIELD TEC ST041**
ST041 is our antibacterial solution for most metallic and mineral substrates. Any type of metallic handles (doors, windows, furniture), metal work surfaces (e.g. in kitchens, sinks) or heavily stressed surfaces, ST041 ensures a germ-free surface for the lifetime of the coating.

In our **ShieldTec** range, we offer additional antibacterial solutions such as extremely thin and flexible coatings for rubber, coatings for general industrial use, inside-coatings for tanks, floor coatings and many more. Please contact us for more details.
SHIELDTEC – PRODUCT BENEFITS AT A GLANCE

Strong anti-bacterial effect with a very low concentration of high-efficiency microsilver concentration

- Effective against bacteria such as MRSA, E-Coli, and EHEC etc.
- Also removes odours caused by bacteria
- Long-term effect: The antibacterial effect remains for the lifetime of the coating due to the deposit effect of the silver
- No use of nano-silver (deemed hazardous to the health)
- No interference with visual properties of the coating (e.g. no grey haze)
- Due to the very minimal microsilver concentration, more affordable than all comparable products
- Flexible use for various applications and substrates