Prepared for the future: Sterillium celebrates its 50th anniversary.
Rediscovering hand disinfection.

50 years ago, Sterillium revolutionised hygiene: hand disinfection had finally become skin friendly. And a recent study demonstrates: Sterillium even increases skin hydration by an average of 30 %, thus ensuring a healthy skin condition.
Editorial

Dear Reader,

Venturing into new territories and leaving known paths behind is often difficult. But experience shows that it is worthwhile.

Also Sterillium owes its invention to the commitment of people who pursued their visions of improved hand hygiene with total determination. And this year’s 50th anniversary of Sterillium – the world’s first marketable alcohol-based hand disinfectant – proves that the team of developers in 1965 just took exactly the right step.

Down to the present day, progress and research have marked the history of the pioneer among hand disinfectants. Just recently, there was a study that investigated Sterillium’s replenishing properties.

With our anniversary campaign we want to thank all those who have helped write the blue classic’s success story and make it come true. A special highlight: the “Nominate Your Modern-Day Hero in Hygiene” initiative to honour particularly committed employees and colleagues and, at the same time, promote compliance with hand hygiene.

Together with the significant birthday, also DISINFECTS strikes a new path: this is the first issue in the new design. The selection of topics and their presentation, however, will remain unchanged.

I wish you an insightful reading,

Dr. Henning Mallwitz
Head of Research & Development
50 years of Sterillium®
Always one step ahead in research

Bright light blue, pleasant scent, gentle on the skin: Sterillium is distinctive – simply an original. For 50 years, the world’s first marketable alcohol-based hand disinfectant has made hygiene history. And the #blue classic’s path has particularly been marked by tireless research for improved infection control.

Wednesday, seven o’clock in the morning, University Medical Center Hamburg-Eppendorf (UKE). The weekly ward round is on the agenda. There is a crowd in and in front of the small patient rooms. Professor Dr. Peter Kalmár, a young physician assistant back in 1965, remembers: “In front of the room, there was this washbowl with diluted disinfection solution that all physicians used to disinfect their hands. This solution appeared suspicious to me.” The cardiologist takes a sample and sends it to the laboratory for examination. His assumption is confirmed: the solution contains many microorganisms. The washing procedure, which shall actually remove bacteria from the hands, has the opposite effect – microorganisms spread even further.

Also surgical hand disinfection was characterised by considerable shortcomings at that time. Before surgeries, physicians scrubbed their hands with soap and a brush under running water. Afterwards, they applied high-proof alcohol to their hands. The problem: this procedure could not achieve an adequate sustained effect and therefore even jeopardised the success of difficult several-hour surgeries.

In addition, this procedure stressed the skin. Surgeons had often to deal with cracked and brittle hands. Many of them suffered from hand eczema and chronic inflammations.

Ad from 1965, Sterillium’s year of birth.
Sterillium, the “researcher product”
with around 60 scientific publications in specialised magazines.

Surgical hand disinfection

Hygienic hand disinfection

Skin tolerability

Other topics

* Number of scientific publications

Committed to enhance infection protection
An insupportable condition for Peter Kalmár, who was appointed senior professor for cardiac surgery at the UKE later on. The cardiologist approaches the specialist for hygiene and disinfection Bacillolfabrik Dr. Bode & Co in Hamburg. Together, they have the aim to develop a hand disinfectant that has a fast and reliable effect and, additionally, is friendly to the skin. A difficult task. The team of researchers conducts an extensive literature search and carries out many studies. It is worth the effort: The experts develop Sterillium – the world’s first marketable alcohol-based hand disinfectant – and its formula has not been changed until today. On 4 June 1965 already, the first bottles of the blue classic leave the production line in Hamburg-Stellingen.

Milestones of hand hygiene
Since then, Sterillium has been firmly linked to research for better hygiene. One of the major milestones was set in 2005: the exposure time for surgical hand disinfection was halved from three to one and a half minutes. This not only saves a significant amount of time in surgical units, but also leads to a much more efficient use of hand disinfectants.

Shortly thereafter, a study conducted with Sterillium also revolutionised hygienic hand disinfection. The 2008 study demonstrated that hands are best covered when the user uses her/his own method to apply the hand disinfectant. Also the German “AKTION Saubere Hände” (Clean Hands Campaign) recommends this responsible rub-in method, which simplifies hand disinfection and thus increases the chance to achieve higher compliance rates.

The world’s most frequently examined hand disinfectant
Also today, the research activities with and on Sterillium are continued. With around 60 scientific publications in specialised magazines, Sterillium is the most frequently tested hand disinfectant in the world. Just recently, there was a study that took a close look at the preparation’s skin-nurturing properties (see page 7). Looking at Sterillium’s development and the research over the past decades until today makes it very clear: the slogan “Sterillium, a hand disinfectant ahead of its time” which was developed in the 1970s is still valid today – even though the classic just turned 50.

Download the study supplement containing the most important studies on Sterillium under SCIENCE at www.bode-science-center.com for free.
Heroes wanted: Good hygiene requires role models.

Trust is the key to Sterillium’s 50 years of success. To thank all users for their trust, in May 2015 HARTMANN will start an international campaign comprising many activities. One of the highlights: the “Nominate Your Modern-Day Hero in Hygiene” initiative to honour particularly committed employees and colleagues and promote compliance.

Hygiene can only reliably protect against infection, if it is performed consistently. Right from the outset, the developers of Sterillium were aware of this fact and stepped up to the challenge. The result: the first marketable alcohol-based hand disinfectant that not only has a fast and reliable effect, but also is friendly to the skin and popular among users.

Role models for more compliance
To celebrate the success story, thank the users for their trust and promote compliance, HARTMANN will start an anniversary campaign in May 2015. A special highlight: the “Nominate Your Modern-Day Hero in Hygiene” initiative, which shall recognise and support the role of employees with an exceptional level of commitment to hand hygiene in hospitals, care facilities, etc. Studies have repeatedly shown how important role models are to motivate physicians and nursing staff to disinfect their hands [1].

Hygiene from A to Z
Also the visuals focus on hands: a fancy finger alphabet is the eye-catcher of the campaign. The most important tool healthcare professionals work with – their hands – protects patients and residents. And these hands are protected by Sterillium. Hence, PROTECT, CARE and TRUST are the key messages depicted by the finger alphabet.

The new www.sterillium.com website offers users helpful background knowledge and informative studies on Sterillium as well as reports of Sterillium users.

Nominate Your Modern-Day Hero in Hygiene
at www.sterillium.com

Join in and support your role model!

Sources:
Powerful formulation that nurtures the skin

A healthy skin is the basis for effective hand hygiene. A new clinical study by HARTMANN examined Sterillium classic pure’s moisturising properties. The result: the repeated daily use of Sterillium classic pure increases skin hydration by an average of 30%.

In many respects, alcohol-based hand disinfection is superior to handwashing: it eliminates pathogens more efficiently and can be carried out fast and directly at the patient bed, independently of washbasins. However, often there are concerns, as users wonder whether alcohol-based products damage the skin.

To get to the bottom of this concern, a new study by HARTMANN and the BODE SCIENCE CENTER analysed the skin-nurturing properties of Sterillium classic pure: under practical conditions, over a period of ten days, 30 times per day. Along the lines of hygienic hand disinfection, one hand of all 29 test subjects was disinfected with 3 ml of Sterillium classic pure for 30 seconds. The second, untreated hand served as control. The skin hydration was measured with the Corneometer, the skin’s pH value recorded and the condition of the skin barrier determined by measuring the transepidermal water loss (TEWL).

Intact skin barrier – healthy pH

The result? The Corneometer values showed that, at every measuring time, the skin hydration of the treated hand was significantly higher than the baseline value and the skin hydration of the untreated hand: at the end of the first week, it was increased by 30.4 %, and by as much as 39.3 % on the eighth day. With values between 4.4 and 5.4 the pH was within the healthy range, just as the TEWL was. Also the test persons’ subjective perception reflected this result: the hand disinfectant was tolerated very well. Conclusion: Sterillium classic pure not only retains the skin’s condition, but maintains the skin and thus ensures a healthy skin.

Data applicable to Sterillium

The study results can be completely applied to Sterillium as both hand disinfectants contain the same skin-hydrating skincare substances. The only difference is that Sterillium also contains fragrances and colourants.

This recent study once again confirms the good skin tolerability of the Sterillium products. This fact is important, as a good tolerability motivates users to disinfect their hands and thus contributes to improved compliance.

RCTS’ Study No. 3295. Evaluating the effect of a hand sanitizer using an exaggerated handwash method
Promoting compliance. But how?
Suggestions from clinical routine for clinical routine

Hand disinfection is considered the most successful and most cost-effective measure to prevent nosocomial infection. However, in spite of many interventions, compliance is not adequate. To find the reasons, McInnes et al. followed a new approach. They for the first time interviewed members of the hospital management on current strategies to increase compliance.

Which ideas seem most promising to have a sustainable positive effect on compliance in hand hygiene? And how can existing measures such as campaigns or training be changed to have a higher and lasting impact? Thirteen executive employees of an Australian hospital answered to these questions in a thirty-minute interview.

The study opens up new perspectives with regard to previous compliance-enhancing strategies. The greater part of the participants had a medical background and worked in the administrative area – and is therefore the interface between clinical and non-clinical departments.

Setting a good example
The majority of respondents particularly agreed on one thing: non-compliance must not be accepted, hand hygiene is a must. For everybody. Hence, also the senior management should actively advocate hygiene. As a sign that everybody takes part. Additionally, role models have an infectious effect. They influence the behaviour of others and thus indirectly convey how to perform hygiene. Combined with best-practice examples, employees can be motivated to comply with hand hygiene protocols – and become role models themselves.

For those responsible to know, for example, in which wards it is particularly reasonable to use role models they need up-to-date data from compliance audits or surveys. These data, however, are only helpful when they are shared promptly and broken down into wards, disciplines and occupational groups.

This is the only way to take on concrete compliance challenges in a targeted manner, geared to specific situations. Some of the respondents, however, were critical about treating non-compliance as malpractice and apply disciplinary sanctions. Their explanation: inadequate hand hygiene was no conscious decision against hand disinfection, but rather an indication of too high time and work pressure.

Five tailored moments
The five indications for hand disinfection cannot be applied to all fields and situations in hospitals as they stand.

For example, the hand disinfection before aseptic tasks is not relevant to cleaning or

The respondents’ answers in 7 subject areas:

• Compliance is a task that begins at management level
• Prompt publication of detailed audit results
• Redefinition of non-compliance as malpractice
• Disciplinary sanctions for non-compliance
• Adaptation of the 5 Moments for Hand Disinfection to different occupational groups
• Update of work materials that are based on the 5 indications for hand disinfection
• Patient empowerment
canteen staff. These employees, however, work in patient surroundings. For this reason, measures to improve compliance should be adapted to the different occupational groups and reflect the kind of patient contact.

This was the unanimous opinion of the respondents. Training materials or posters, for example, can be tailored to individual fields of activity. Because there is not one single solution for all.

In addition, the interviewees emphasised that existing work materials such as posters with the 5 Moments for Hand Disinfection urgently need an update. Similar to advertisement, which attracts less interest after a while, also posters lose their effect. For posters, stickers and Co. to have a stronger impact, they need to be varied by, for example, changing their design or adapting them to different fields of work.

**Actively involve patients**

Why not also involve patients? This is what some of the interviewees thought about. And this is exactly what patient empowerment is: the patients approach the medical staff about hand disinfection, turning themselves into actors rather than being mere silent observers. However, in many cases, patients fear a negative impact on the treatment and prefer not to ask. Also nursing staff and physicians are afraid that the relationship to the patients may get tense. To create a climate that welcomes the involvement of patients, some of the respondents suggested to conduct personnel training.

Another part of such a patient-centred approach could be to use real case studies for training purposes, for example, during ward rounds. Thus, the consequences of inadequate hand hygiene obtain a real, human face – and leave an impression that lasts.

To better reach the employees, Sigrid Thieme-Ruffing offers flexibly scheduled local training sessions. “When a surgical unit, for example, favours a training at seven o’clock in the morning, we will be there. And when the students prefer an appointment at eight o’clock in the evening, we will conduct the session at eight o’clock in the evening. We see ourselves as service provider,” explains Sigrid Thieme-Ruffing.

The speciality at the Saarland University Medical Center: hand hygiene knows not hierarchies. From chief physicians to student nurses – all of them receive the same training, because patient safety is top priority. “Our message is: hand hygiene is a key topic that applies to everybody,” says Sigrid Thieme-Ruffing.

To their experience, the biggest challenge in implementing the recommendations of AKTION Saubere Hände is to recognise the moments for hand disinfection before touching the patient and before aseptic tasks. To enhance the employees’ awareness of these measures during work and incorporate them in work routines, regular training is imperative.

Activities, stands and information material
In addition, the hygiene team employs events as platform for the campaign. Particularly the stands and activities on the occasion of the World Hand Hygiene Day on 05 May and a Health Day initiated by the in-house medical service were very well received. At such
events, the promotional items such as stickers, buttons and sweets carrying the campaign’s key visual are very popular and contribute to further spreading the hand disinfection messages.

The campaign is rounded off by varied information materials such as flyers and posters in different formats, which are displayed in entrance zones, outpatient departments, waiting areas and wards.

**Committed entrants and improved compliance**
The campaign meets with extremely positive response of employees, patients and visitors. Particularly the trainees of the nursing school show above-average commitment and carry the campaign’s contents into their departments. Additionally, the image with the blue tachometer achieves a high recognition in the wards. And besides an increasing awareness, the consumption of hand disinfectants also increased. So, the objective to dynamically promote hand hygiene at the Saarland University Medical Center and further improve compliance is well on track.

In spite of the success, Sigrid Thieme-Ruffing foresees further major challenges related to hygiene. For her it is important to not only motivate employees for a short time, but sustainably strengthen the awareness of hand disinfection. Her wish for the future: hand disinfection should be carried out as intuitively and naturally as putting on the seatbelt when driving.
The combination is key:
Area output of single-use wipes.

Fast and easy – that are the pre-conditions for good compliance with surface hygiene. Hence, pre-soaked disposable wipes to disinfect near-patient surfaces grow in popularity. The new study by Schweins et al. demonstrates which properties of alcohol-based single-use wipes determine their area output: Active ingredients, wipe material and saturation volume. The wipe size alone, however, is not as decisive.

The expectations are clear: pre-soaked disposable surface disinfection wipes should have a reliable antimicrobial effect, be gentle on materials and user friendly. In addition, they should have a wide reach, which is an important selection criterion when looking at economic efficiency.

But which product properties ensure alcohol-based disposable wipes to have a good area output? Schweins et al. now have the answer. And, contrary to the assumption, it is not the wipes’ size alone that determines the reach of single-use wipes. It is rather the material, the formulation of active ingredients and the saturation volume that decide on the area output.

**Single-use wipes put to test**
The study analysed, among others, six commercially available alcohol-based wipes from various manufacturers. Each type of wipe was used by two persons on three consecutive days – i.e. a total of six times. As usual in practice, the wipes were folded in half. To determine the area output, the study participants wiped a centre row on the test area and then the remaining surface in circling movements. Against the light, it was checked if the entire surface was covered completely or if the liquid film had gaps. The length of the covered surface was measured and the area output calculated.

In addition, the wipe material or fibre mixture was determined, the wipe surface of the folded wipe measured and the saturation volume calculated. Also the wipes’ grammage – i.e. the weight in g/m² – was calculated in accordance with DIN 12127.
Wipe material, active ingredients and saturation volume are the decisive factors.

The result: two HARTMANN products were among the best in test. One single Bacillol 30 wipe safely disinfects an area of 0.61 m\(^2\) – one Bacillol AF Tissue even 0.83 m\(^2\). The area output of all alcohol-based wipes was between 0.16 m\(^2\) and 0.83 m\(^2\). The reason for these differences in area output is not the size of the wipes: also the reach of wipes of the same size varied greatly. It was rather the interaction of the different product and material properties that was crucial for the area output. The data revealed that the area output increases with increased saturation volume.

And when the wipe is made of polyester fibre (PET fleece) instead of cellulose, the area output can be increased further. The reason: PET fibres release more liquid to the wiped surface area.

Conclusion: Surface disinfection with a high-quality single-use wipe – which is made of polyester fibre, is saturated generously with an effective disinfectant with a low alcohol content – also promotes compliance in surface hygiene.

With passion and heart

Care of immunosuppressed patients

The haematological oncology unit at the Clinical Centre Passau covers an extremely wide range of tasks. Day by day, the team responsible for hygiene actively and committedly takes on the associated challenges. At the heart of their successful collaboration: good communication.

In an experienced manner, the grey-haired man uses his elbow to push down the lever of the hand disinfectant dispenser and thoroughly rubs his hands with the colourless liquid pouring out, while having a chat with a woman, who uses the second floor-standing dispenser. Behind them, there are two young girls waiting as they want to disinfect their hands as well. The two floor-standing dispensers placed in the entrance hall of the Clinical Centre Passau clearly demonstrate: hygiene is a top priority here.

This also applies to the haematology, oncology and palliative care units of the clinic which is operated by the City of Passau. The committed team consisting of infection control nurse Bettina Gayk, infection control specialist Dr. Madeleine Kuhn and head nurse Elke Brandtner ensure that hygiene is carried out safely and smoothly in these wards. All team members have a long experience in the field of haematological oncology. When the three talk about their work they often use the words “passion”, “challenge” and “varied”.

Sophisticated hygienic tasks

With nearly 70 beds for haematological oncology and 6 beds for palliative care, the ward has an above-average size. “Except for transplantations, we cover the entire spectrum of haematological oncology treatments,” explains senior physician Dr. Madeleine Kuhn. With this wide spectrum it is clear that the team responsible for hygiene has to deal with demanding tasks. Especially when considering that infections in immunosuppressed patients often involve severe or even life-threatening complications. But the severity of immune deficiency not only depends on the underlying disease, but also on the treatment’s intensity.

The use of certain invasive medical devices, for example vascular catheters, additionally increases the risk of infection. Around 60 % of the leukaemia patients in the haematological oncology unit at the clinic in Passau have an implanted port. Further risks of infection emanate from defective mucosal barriers – a frequent result of cancer treatment – that allow pathogens to enter the body.

Around 60 % of the leukaemia patients in the haematological oncology unit at the clinic in Passau have an implanted port.
“In case of questions or problems we can suggest training courses specifically adapted to the needs of our haematological oncology unit.”

Tailored training
To ensure best possible infection control for the immunocompromised patients, the clinic opts for consistent hygiene management. This also comprises a special hygiene plan for the haematological oncology unit, extensive screening for multidrug-resistant pathogens on patient admission, the participation in MRSA-KISS (German Hospital Infection Surveillance System) and an intensive exchange of information at all levels of communication. The most important part is regular employee training.

In addition to the four obligatory training sessions that are conducted for all employees, the hygienists also offer specialised courses. "Just recently, we conducted training sessions on reverse isolation* measures and how to use personal protective equipment, specifically prepared upon request of the haematological oncology staff," reports infection control nurse Bettina Gayk. Elke Brandtner, head nurse, confirms: "In case of questions or problems we can suggest training courses specifically adapted to the needs of the haematological oncology unit."

Listening and informing
Another important aspect is the dialogue with patients and their relatives or visitors. Example: after a successful test run, approximately nine months ago the unit officially introduced professional consultation for patients arriving at the oncological emergency department or being called in for oncological therapy. Here, an oncological nurse gives advice on all kinds of questions – also on hygiene.

In case the patients have questions on hygiene during their stay, Bettina Gayk is the right address to turn to. She provides patients and relatives with information and advice on everything to do with hygiene. Particularly the question of how to deal with multidrug-resistant pathogens make many people feel uncertain. But Bettina Gayk can in most cases take away the fears in detailed, personal discussions.

The hygiene team supports their personalised advice with extensive information material. This includes self-designed posters on hand hygiene and on how to correctly put on face masks as well as a flyer with in-depth information on hygiene for immunocompromised patients on how to behave at home. Altogether, the hygiene team of the clinic in Passau is a perfect example of how good communication and good hygiene can interact successfully.

*Reverse isolation: immunocompromised patients are isolated from the normal environment to protect them against infection.

An experienced team: Bettina Gayk, Elke Brandtner, Dr. Madeleine Kuhn.

Clinical Centre Passau.
**Achromobacter outbreak in a haematological oncology unit:**

**Filtered tap water identified as source**

Gram-negative *Achromobacter* bacteria have increasingly to be dealt with as a cause of nosocomial infection in immunosuppressed patients. The study by Hugon et al. [1] for the first time examined an *Achromobacter*-associated outbreak in a paediatric haematology/oncology unit.

Infections in high-risk patients, for example haematology/oncology patients, may involve severe, sometimes even life-threatening complications. These cases therefore require particular attention to be paid to possible transmission paths and pathogen reservoirs.

In addition to *Pseudomonas aeruginosa*, also other Gram-negative nonfermenters such as *Achromobacter* spp. come into focus as elicitor of nosocomial infections in immunosuppressed patients. Mostly multidrug-resistant, *Achromobacter* are responsible for significant morbidity and mortality in these patients. Epidemiological data prove that *Achromobacter* spp. are found in the environment, particularly in water. In recent time, the opportunistic pathogen – particularly *Achromobacter xylosoxidans* – has been increasingly identified as cause of different infections, especially bacteraemia.

However, most of the studies deal with infections in adults. Those on children are rare and are limited to case reports and outbreaks in neonatology wards.

**Sixteen bacteraemia in seven patients**

The current study by Hugon et al. closes this gap. The study for the first time examined an *Achromobacter*-associated outbreak in a paediatric haematology/oncology unit. It was conducted in a teaching hospital in French Nice and focused on determining the source of the outbreak. Between January 2007 and January 2008, seven children were affected by a total of sixteen *Achromobacter*-associated bacteraemia. All patients were immunocompromised, had fever and a central venous catheter (CVC). During periods of feverish neutropenia – a life-threatening complication of chemotherapy characterised by a decrease in immune cells – patients underwent strict isolation measures in the normal ward or were treated in the isolation ward.

**Analytical methods**

Different analytical methods were used to detect the origin of pathogens. To this purpose, environmental samples were taken, for example, from furniture, floors and washbasins in patient rooms. In addition, samples were taken from the rooms where drugs are prepared. Special focus was on the filtered tap water and the disinfection solution. The latter, a French preparation based on quaternary ammonium compounds, was used in an atomiser to routinely disinfect all surfaces in the patient rooms and the room where medications are prepared. The search for the source of pathogens was completed by blood samples from the patients’ CVCs.
After sampling, different testing methods were used. The disinfectant’s bactericidal activity was tested with two representative Achromobacter spp. strains and a reference strain of Pseudomonas aeruginosa, both in biofilm and in planktonic cultures. After 5, 10 and 30 minutes as well as after 4 hours of contact with the disinfectant, the number of surviving bacteria was determined (see table).

In addition, the 41 strains detected in the samples were subjected to molecular biological analysis methods for bacterial identification. At the same time, the clinical isolates’ susceptibility to antibiotics was examined and molecular typing was carried out.

**Paths of the pathogen**

The results of the study are clear: bacteria were found in the samples taken from the filtered tap water, surfaces, furniture and disinfectant solution. All of the strains isolated from environmental samples and blood cultures had identical profiles. The data collected during the two-year study period even allowed to chronologise the spread of the pathogen. According to this chronology, Achromobacter was first detected in filtered tap water. That is the reason why it is considered the source of the outbreak.

Preparing the use-solution with the filtered water presumably contaminated the disinfection solution. It was assumed that the pathogen was thus transmitted to the surfaces through the atomisers and, from there, to the patients’ CVCs.

Of particular interest: the strain isolated from the disinfectant atomiser was found to be highly resistant in biofilm and remained intact even after short contact with the disinfection solution used (see table).

Different measures were then introduced to check the outbreak. One of the measures was to do without the disinfectant atomisers. Additionally, the isolation ward only used sterile water to prepare disinfection solutions; in the normal ward, the filtered water was checked weekly. The consistent implementation of these measures promptly and sustainably eliminated Achromobacter from the hospital environment and stopped the outbreak.

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New e-learning module on hand hygiene for emergency medical services

The right hand hygiene measure at the right moment – the e-learning tool for emergency medical services (EMS) entered the second round. Its new module on hand hygiene with practical tasks and challenges started just recently.

Employees in hospitals, nursing homes or medical practices work under a high pressure of time. This also and particularly applies to emergency medical services – in emergencies there is no time to think. Hand disinfection needs to be carried out automatically and exactly in the right moment. To identify the right moment, however, often is not easy. The animated training programme “Hygiene in emergency medical services” by HARTMANN can be of assistance: the new hand hygiene module simulates concrete situations to gain more routine and confidence for the practice.

Practical lesson contents
For a short while now, the new “Hand hygiene” lesson has complemented the surface hygiene module. Available at www.rettungsdienst.bode-science-center.de, the module offers much information on hand disinfection and cleansing, the preconditions for hand disinfection and the use of protective gloves. All contents are based on latest findings and are accompanied by helpful practical tips. Participants can either have a look at the contents first or get started with the hygienic risks right away and solve the tasks.

Situation foreseen – danger averted
EMS staff need their specialised knowledge for the “Hand hygiene quiz”: when do hands have to be disinfected? Before touching a patient, after having gloves removed or before taking the emergency backpack out of the ambulance during a mission? The training tool has the right answers.

The animated “Pit stop” mission confronts the participants with different common situations. Here, the player can score points when she/he selects the right hygiene measures.

Virtual missions test the lessons learned. Thus, the training programme helps recognise the situations requiring hand hygiene and practice the right sequences.
Major benefit: the new “Hand hygiene” module is supported by the German “Registration of professional nurses” with two continuing education credits and 90 minutes, respectively.

As soon as the tasks are solved, the printed certificate can be submitted to the responsible authority. In addition, all participants have the chance to win €500 for a good cause. Thus, the players do not only deepen their knowledge on hygiene, but also support social projects. A true win-win situation.
The right order counts: Hand hygiene in case of Clostridium difficile

Throughout the world, the Clostridium difficile bacterium is known as most common cause of nosocomial diarrhoeal diseases often linked to antibiotic therapy. To reliably prevent the spread of the highly contagious and environmentally resistant pathogen, correctly performed hand hygiene is crucial.

Clostridium difficile bacteria are spore formers and therefore occur in a vegetative form and as highly resistant spores. The pathogen and its spores are transmitted directly or indirectly via the hands of infected people or by contact with contaminated surfaces.

In case of contamination with Clostridium difficile, hand hygiene plays a major role.

However, since alcohol-based hand disinfectants are only active against vegetative cell forms, the following hand hygiene procedure has proven its worth:

1) Hygienic hand disinfection
Alcohol-based hand disinfectants reduce vegetative cells by more than 99.999 % ($5 \log_{10}$) within 30 seconds.

2) Thorough handwashing
The spores that remain on the hands can be mechanically removed by up to 99 % ($2 \log_{10}$) within 10 seconds. Neither prolonged washing nor the use of antimicrobial soap can improve the reduction rate. If these steps are carried out in reverse order, there is the risk that the vegetative cells of the pathogen are transmitted to other surfaces, e.g. taps [1]. In addition, when used after handwashing, hand disinfectants are not as effective.

Also the Robert Koch-Institute (RKI) recommends the described, combined procedure when the hands are contaminated with Clostridium difficile [2].