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Praxis **aktuell**

- Postoperative Wound Dehiscence -

**Cutisorb[®] Sorbact[®] –
Nonpharmacologic
antibacterial therapy
in traumatology and surgery**

B. v. Hallern, M.-R. Doerk, A. v. d. Weth

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B. v. Hallern

Emergency Outpatient Surgical Department, Elbe Kliniken Stade-Buxtehude gGmbH

Introduction

Traumatic wounds are invariably contaminated with microorganisms, even when they undergo primary healing after extensive disinfection and immediate wound closure. Antibacterial wound dressings – often based on cotton fabric and lanolin and impregnated with antiseptic agents – are used to prevent superficial infection and simultaneously prevent wound exudate adhering to the secondary dressing, which in most cases takes the form of a cotton compress. In practice, however, neither adequate antiseptic efficacy is assured, nor is adhesion to the wound prevented.

This is also the case in „minor surgery“, i.e.

- following incision of axillary abscesses
- carbuncles of the neck
- whitlows
- infected ingrown great toenails and after Emmert's operation
- anal and coccygeal fistulae
- abscesses on the trunk and extremities etc.

in which a gauze pad or tamponade is often used to hold the wound open. Change of dressing, usually performed after 24 hours, reveals especially two noteworthy features: the dressing material is adhering to the wound and it is painful to remove.

It can be concluded from these facts that a dressing material should be selected which eliminates or substantially limits the above factors.

The same findings as in traumatology are also observed in the postoperative phase if disorders of wound healing develop, for example due to the formation of seromas or hematomas. These are opened and debrided and the wound is initially left open and treated with topical antiseptics. For severe infections, systemic antibiotic therapy is required simultaneously. Although modern bandaging materials are now available to treat these critically colonized or infected wounds, the use of tamponades, compresses or swabs impregnated with an antiseptic is still common. If close attention is paid to the „consumption“ period of an antiseptic, which can range from 10 to 30 minutes depending on the nature of the wound, and the dressing is changed at corresponding intervals, the infection is seen to subside rapidly. But: who has time to change a dressing every thirty minutes to an hour?

There is thus a need for dressing materials which can deliver an antiseptic over prolonged periods or can reliably bind bacteria without adhering to the wound and thereby traumatizing the tissue.

„Cutisorb® Sorbact® binds and removes bacteria from exudative colonised and infected wounds.“

During a surveillance study, we therefore used the bacteria adsorbing, nonpharmacologic dressing range Cutisorb® Sorbact® to treat postoperative disorders of wound healing, in topical therapy following abscess incisions, and for infections secondary to traumatic injuries.

Cutisorb® Sorbact® – Properties and mode of action

Cutisorb® Sorbact® rapidly binds and effectively removes bacteria and other microorganisms from exudative colonised or infected wounds. The dressing is made from fabric esterified with the highly hydrophobic substance dialkyl carbamoyl chloride (DACC) and has the ability to bind microorganisms.

Table 1: Factors that induce wound infection

The mere presence of microorganisms does not automatically mean that a wound infection will develop but in many cases has a negative impact on the healing process. Several additional factors are involved, the most important being:

- the amount of microorganisms and
- what types of organisms
- the degree of toxicity (virulence) of the microorganisms
- the type of wound, e.g. lacerated or smooth, necrotic or fresh
- potential presence of foreign bodies in the wound
- the injured person's immune status.

The Sorbact® method is based on the purely physical effect of hydrophobic (water-repellent) interaction, i.e. the fact that hydrophobic substances accumulate in an aqueous environment. Since pathogenic microorganisms which impair wound healing – e.g. bacteria such as *Staphylococcus aureus*, Streptococci, *E. coli* and *Pseudomonas* as well as fungi like *Candida albicans* – express cell surface hydrophobicity, they bind to Cutisorb® Sorbact®.

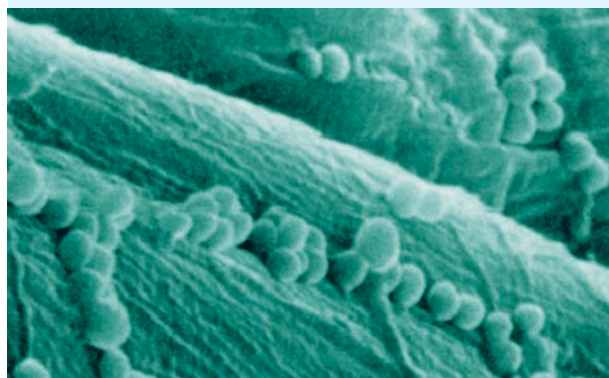
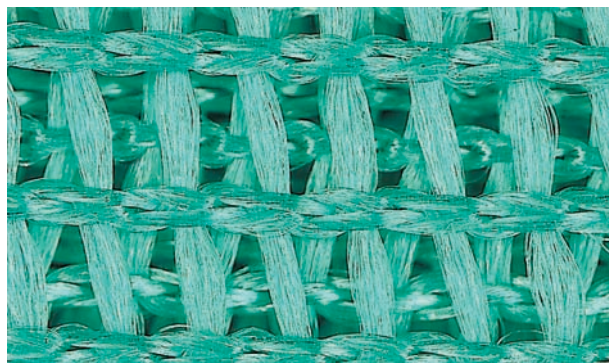
„Since the action is based on a physical principle, there is no risk of inducing or increasing bacterial resistance.“

There are no known side effects or risks of cytotoxic, allergic or other intolerance reactions. Since the action is based on a physical principle, there is no risk of inducing or increasing bacterial resistance.

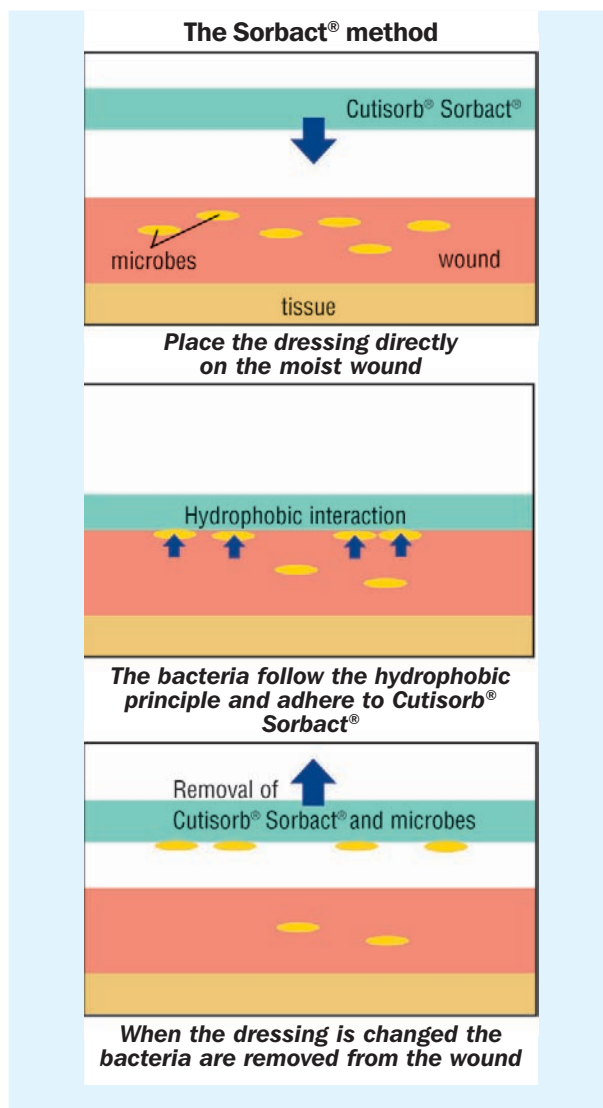
While the Cutisorb® Sorbact® swabs are made from impregnated acetate fabric, the absorbent pads additionally have an absorbent core of cellulose. The tamponades are made from impregnated cotton gauze.

Some guidance for the effective use of Cutisorb® Sorbact®:

It is essential to ensure that no fatty substances (creams, ointments or oils) are applied simultaneously. The bacteria binding properties of the material is immediately



The coating with dialkyl carbamoyl chloride (DACC) gives Cutisorb® Sorbact® its hydrophobic properties: *Staphylococcus aureus* bound to the dressing surface



exhausted since these substances impair the mechanism underlying the hydrophobic interaction.

Because of its hydrophobic properties, it is somewhat difficult to moisten Cutisorb® Sorbact® with Ringer's or saline solution for special applications.

The hydrophobic dressing material can also be used without problems for bacterial reduction under hydro-active dressings.

As soon as the infection has subsided, treatment is continued with the usual moist wound management technique.

Summary

Rapid remission of the infection accompanied by a marked improvement in wound status was observed in 51 patients over a period of 9 months.

Other noteworthy findings were painless, atraumatic dressing change and the nonpharmacologic approach of anti-infectious therapy. All currently available substances, such as polyhexanide, octenidine, PVP-iodine and silver-containing products are effective antimicrobial agents but are not completely free from side effects.

With Cutisorb® Sorbact®, a product is now available which can replace other dressings or tamponades in traumatic and postoperative wound management, and especially following abscess incisions, coccygeal and anal fistula excisions, burst abdomen and other fistula revisions.

Case report: Achilles tendon

Diagnoses:

- minor injury over the right Achilles tendon 7 months previously with superficial skin injury
- right-sided Fontaine stage III arterial occlusive disease
- diabetes mellitus Type II
- late complications of cerebral stroke
- post-stroke residual left leg paralysis
- status post percutaneous transluminal vascular intervention: right leg angioplasty

History:

The 65-year-old patient injured himself above the right Achilles tendon while closing a garage door when the door struck his leg. The superficial skin injury was initially ignored. Since the skin abrasion did not improve and the skin became reddened with black skin necrosis, the patient consulted his general practitioner. The wound was cleansed and the patient was then given a tetanus vaccination and a wound dressing with PVP-iodine ointment and ointment gauze. When no improvement was observed on this therapy after four weeks, and the necrotic process had even spread to involve parts of the Achilles tendon, treatment was initially switched to an antibiotic ointment, then to a cortisone ointment and subsequently to topical enzyme therapy. After four months of treatment a Doppler examination of the leg vessels and shortly afterwards a vascular imaging procedure was performed, revealing Fontaine stage III arterial occlusive disease. After a waiting period of three months the patient received an appointment with a vascular surgeon.

Figure 1 shows the local wound conditions 7 months after the injury. The Achilles tendon is exposed over a length of 4 cm, and small necrotic skin lesions are seen at the wound margin. The defect wound was extremely painful. Surgical debridement with partial removal of the Achilles tendon was therefore performed under general anesthesia. Further vascular surgical examinations were performed to establish the type of vascular revision required. The infection in the defect wound was to be treated first. Immediately after the operation, a moistened Cutisorb® Sorbact® compress was applied to the wound and the dressing was completed with an absorbent compress. The dressing was changed daily and a hydrogel was applied over the antibacterial compress to maintain a moist wound environment. After four days of treatment, the infection

was seen to be subsiding and the skin redness at the wound margin decreased. A hydroactive dressing (Allevyn® thin) could then be fixed over the Cutisorb® Sorbact® compress. The leg was immobilized up to the third week, after which partial and then full loading were re-instituted.

After 5 weeks of treatment the wound was free from infection and slight incipient granulation was observed. Hyaluronic acid was then applied under a moist hydroactive wound dressing to promote the granulation process.

In the 7th week of treatment the local situation of the right leg deteriorated. Angiographic revealed extensive occlusion of the superficial femoral artery and popliteal artery. Satisfactory recanalization was achieved by intraarterial lysis and the wound conditions improved.

After 9 weeks, a good layer of granulation tissue was observed which continued to be provided with hyaluronic acid products and hydroactive dressings. Although wound healing progressed only slowly, after 13 weeks the Achilles tendon was overgranulated and the granulation tissue was conditioned with a synthetic skin substitute and prepared for skin grafting. 14 weeks after intensified wound treatment and vascular revision, skin grafting was performed.



Figure 1:
Status on admission. Defect measuring about 6 x 3 cm with exposed Achilles tendon.



Figure 2:
Necrotic tissue and part of the Achilles tendon have been surgically removed.

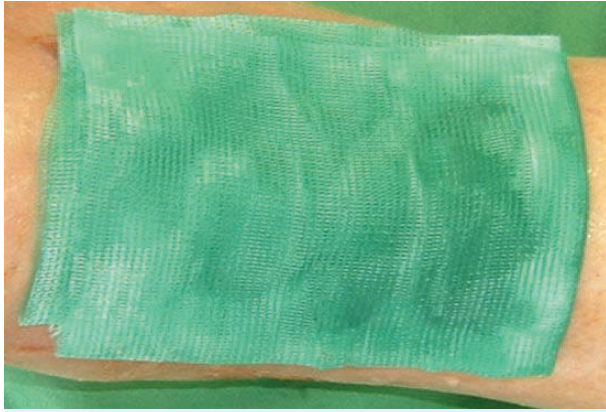


Figure 3:
 Start of antibacterial therapy with Cutsorb® Sorbact® compress and daily dressing change. Some hydrogel is applied onto the dressing to keep the wound environment moist, and for the first four days an absorbent pad is used as secondary dressing.

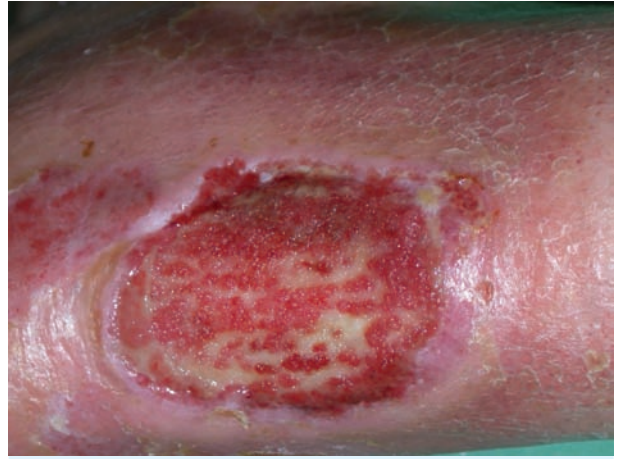


Figure 7:
 After 13 weeks, the Achilles tendon is completely overgranulated. Preparation for epidermal graft.



Figure 4:
 Wound status after 3 weeks: Infection-free wound conditions. Switch to moist, hydroactive wound treatment with Allevyn® thin and Hyalofill®.



Figures 5, 6:
 Moderate healing progress after 5 and good granulation after 9 weeks.



Figures 8, 9:
 Wound status of conditioned granulation tissue and the fitting of epidermal graft.

Case report: Gluteal abscess

Diagnoses:

- deep rectal cancer
- gross obesity

History:

The 64-year-old female patient underwent abdominoperineal rectum amputation. An abscess formed in the right gluteal region during the postoperative course. The deep gluteal abscess was incised and large amounts of necrotic fatty tissue were removed. The wound was intraoperatively irrigated with antiseptic and a vacuum seal was fitted for 4 days.

After removal of the VAC, necrotic areas were observed at the wound margin and individual areas of necrotic muscle tissue deep inside the wound. The infected wound measuring 10 x 7 cm with a depth of 7 to 8 cm underwent further surgical debridement under local anesthetic cream (Emla®). Two Cutisorb® Sorbact® ribbon gauzes were inserted in the wound cavity and the wound was covered with a Cutisorb® Sorbact® absorbent pad. This was followed by daily wound treatments and dressing changes. After four days only slight marginal skin and fatty tissue necroses were observed and debrided. The infection was clearly subsiding, and the wound was closed with a highly absorbent hydroactive dressing (Allevyn® Plus Adhesive) while continuing the antibacterial therapy with Cutisorb® Sorbact®. Depending on the amount of exudate, the dressings were changed every 36 to 48 hours.

Sixteen days after intensive antibacterial therapy the infection had subsided completely and treatment was switched to exclusively moist wound management with alginates and hydroactive dressings. The dressings were now changed at 2-day intervals.

Twenty-nine days after the start of treatment, well-granulating wound conditions were observed and the wound depth had decreased to only 3 to 4 cm. Treatment was continued and after 35 days the wound margin was epithelialized. The wound depth was now only 2 cm.

On day 45 of treatment, epithelial tissue growing into the wound cavity was removed with a ring curette and the wound was closed with tissue adhesive.

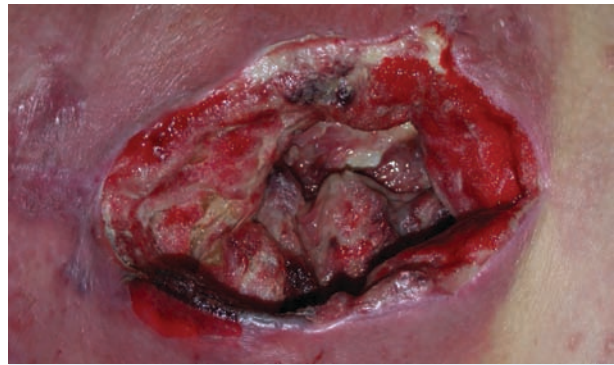


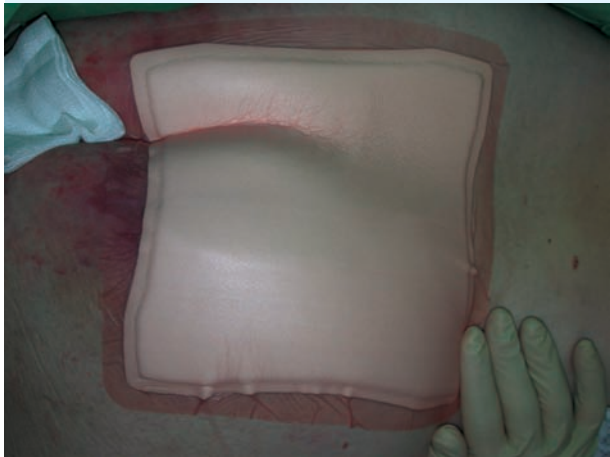
Figure 1: Wound status after removal of the VAC on day 4 of treatment. Skin necroses at the wound margins, muscle and fatty tissue necroses deep inside the wound. The wound environment is swollen and markedly reddened. Draining wound exudate of putrid odour.



Figure 2: On day 7 of treatment hardly any necroses are visible. The swelling and redness at the wound margin are subsiding.



Figures 3, 4: Insertion of Cutisorb® Sorbact® ribbon gauze and completion of dressing with a Cutisorb® Sorbact® absorbent pad. From day 10 onwards, a hydroactive wound dressing (Allevyn® Plus Adhesive) is fixed over the antibacterial tamponade.



Figures 5, 6:
Wound status on day 14 of treatment: Granulating wound conditions, now only very slight redness directly at the wound margin. Odourless wound. Last antibacterial treatment plus hydroactive dressing.



Figure 7:
Bulge-like granulation on day 16 of treatment.



Figure 8:
Rapid healing progress on day 22.



Figure 9:
By day 30 of treatment, the size of the wound has greatly decreased.

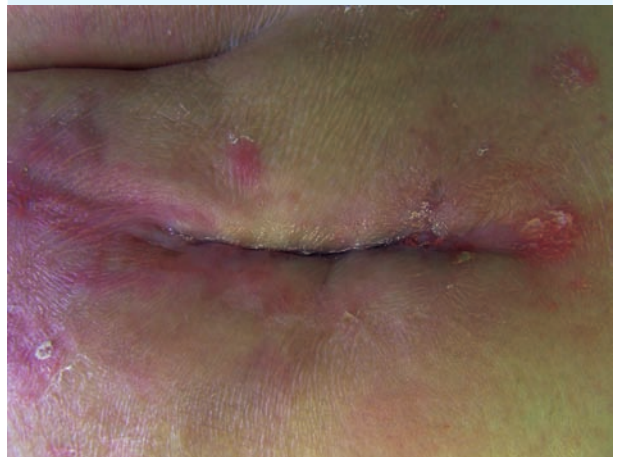


Figure 10, 11:
Wound status on day 45 of treatment. Epithelial tissue is physically removed and the wound is closed with skin adhesive.

References:

1. Cell Surface Hydrophobicity of Staphylococcus aureus measured by the Salt Aggregation Test (SAT) Per Jonsson, Torkel Wadström; Current Microbiology, Vol. 10 (1984), pp. 203-210
2. Growth Conditions influence Expression of Cell Surface Hydrophobicity of Staphylococci and other Wound Infection Pathogens; Asa Ljungh, Torkel Wadström. Microbiological Immunology, 39(10), 753-757, 1995
3. Bacterial colonisation and healing of venous leg ulcers; Soren Munk Madsen et al.; APMIS 104, 895-899, 1996
4. Hydrophobized wound dressing in the treatment of experimental staphylococcus aureus infection in the young pig. Torkel Wadström et al.; Acta path. Microbiol. Immunol. Scand. Sect. B, 93: 359-363, 1985
5. High Surface Hydrophobicity of Autoaggregating Staphylococcus aureus Strains Isolated from Human Infections Studied with the Salt Aggregation Test; Asa Ljungh et al.; Infection and Immunity, Feb. 1985, p. 522-526
6. A new hydrophobized wound dressing (Sorbact® 10⁵) in the treatment of infected wounds. Göran Friman; Current Therapeutic Research, Vol. 42, No. 1, July 1987
7. Pathogenesis of Wound Infections; T. Wadström, A. Ljungh; Wound Healing and Skin Physiology, 1995
8. Participation of Yeast Cell Surface Hydrophobicity in Adherence of Candida albicans to Human Epithelial Cells; Kevin C. Hazen; Infection and Immunity, July 1989, p. 1894-1900
9. Prophylaxe und Therapie postoperativer Infektionen aus mikrobiologischer Sicht. K. Schröppel Presentation at Seminar: *Sepsis und Postoperative Infektionen*, 02.04.2003, Friedrich-Alexander-Universität Erlangen-Nürnberg,
10. Removal of wound bacteria from infected and colonized wounds with Cutisorb® Sorbact®, Bernd v. Hallern, M.-R. Doerk, A. v.d. Weth, MEDIZIN & PRAXIS Spezial Disturbance of wound healing, 3. Auflage 2004, Verlag für MEDIZINISCHE PUBLIKATIONEN

Address for correspondence:

Bernd v. Hallern
Elbe Kliniken Stade-Buxtehude gGmbH
Bremervörder Str. 111

D-21682 Stade
Germany