Supplement to
OWM
OSTOMY WOUND MANAGEMENT
March 2009

Balancing a Dynamic Wound Environment:

Multicenter Experience with a Novel Antimicrobial Foam Dressing Containing PHMB

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Moderator's Introduction

Carolyn Cuttino, RN, BS, CWOCN, Medical University of South Carolina, Charleston, SC

Chronic wounds are a financial burden to the healthcare system and impact the quality of life of people who must live with them day after day, month after month, or even year after year. Chronic wounds will continue to drive rising healthcare costs as the population ages and chronic diseases that contribute to wound development increase in prevalence. Chronic wounds are a challenge to all healthcare workers.

Healthcare providers in all sites of service are challenged by today's changing environment. Pay-for-performance is here, and Medicare is taking the lead to ensure quality care for beneficiaries. Medicare no longer will pay for many conditions considered preventable when best practices are followed. In this pay-for-performance environment, clinical and financial success will depend on the ability of the provider to prevent wounds and wound complications, and provide interventions that will facilitate healing. Acute care facilities no longer can bill for services related to the care of patients who develop pressure ulcers after admission or for some surgical wound infections that develop during a hospital stay. This can be an important issue in a hospital's bottom line when possibly 15% of elective surgery cases and 30% of contaminated surgeries lead to healthcare-associated infections that prolong stays and increase treatment costs.[1] Pay-for-performance quality indicators are also being developed in the skilled and home care arenas. Pressure ulcers, wound infections, dehydration, and urinary tract infections are some of the clinical conditions being considered as monitors for quality care in these settings. Adequately managing these conditions hopefully will prevent unnecessary emergency room visits and hospitalizations and help decrease the financial impact of these conditions. All sites of service must focus on proactive, preventive care and evidence-based management. Regardless of setting, clinicians must be able to provide management strategies for the chronic wound that will do more than just treat. Interventions must include strategies that cost-effectively forestall complications and promote healing.

Another major factor affecting chronic wound care is the emergence of infections that are antibiotic-resistant. Healthcare-associated methicillin-resistant *Staphylococcus aureus* (HA-MRSA) and community-acquired methicillin-resistant *S. aureus* (CA-MRSA) are occurring in epidemic proportions, prompting clinicians to look for ways to prevent and manage potential wound infections cost-effectively.

Cost-effective wound management means closing the wound as soon as possible. This can be accomplished by early, accurate diagnoses to determine etiologies and dictate appropriate management modalities; and by prompt, aggressive topical care that can modify the altered chronic wound environment and prevent complications such as infection. For treatment to be effective, the wound bed must be prepared to heal: devitalized tissue removed, wound bioburden controlled, moisture managed, and adjunctive modalities utilized when necessary.

Bioburden Control

Although chronic wounds are frequently contaminated or colonized with bacteria, many go on to heal without complications. However, when a balance cannot be maintained between the host and quantity and virulence of bacteria, healing is delayed. High bacterial counts increase metabolic demands and affect the amount of oxygen available to the wound, which interferes with healing. The clinician must be able to recognize this imbalance and intervene with strategies that will manage the high bioburden present.

Obvious signs of high bacterial counts manifest in the classical clinical symptoms of a local infection: redness, edema, warmth, pain, and purulent drainage. However, some wounds with high bacterial counts do not exhibit the classical symptoms of infection. These wounds may have the following characteristics: friable granulation tissue, increased odor/or drainage, increased pain, wound deterioration, and a plateaued or nonhealing state. Wounds with these characteristics

have been coined "critically colonized" and represent a potentially infected, nonhealing wound. Including these wound characteristics in routine assessment may help in the earlier identification of potential infection. Many recognized wound-treatment guidelines recommend removing nonviable or necrotic tissue that harbors micro-organisms and using a topical antimicrobial dressing to manage bacterial imbalance and return the wound to a healthy, healing environment.

In addition, it's my experience that most chronic wounds are polymicrobial, containing multiple species of micro-organisms. This is a concern because the synergistic relationship among multiple species may determine the virulence of the organisms present in the wound. The number or quantity and the virulence, as well as the host resistance, determine the potential for infection. The most important indicator of a local or systemic or even covert infection as described in "critical colonization" is the host response to the prevalence and virulence of the bacteria present in the wound. Patients with comorbidities and conditions known to negatively affect healing (eg, diabetes, immunosuppression, advanced age, and end-stage diseases) will be at increased risk for wound infections. Patients requiring certain medications or those with poor circulation and perfusion problems also will be at risk. Further, many patients in the aforementioned group may not be able to mount an inflammatory response that would demonstrate possible overt signs of infection. Many patients with wound infections may go undiagnosed if only the usual signs and symptoms of infection are used in the assessment. This underscores the need for the clinician to recognize clues as to why the wound may be slow or nonhealing and to implement appropriate strategies for bioburden control, such as appropriate antimicrobial dressings.

• **Systemic approaches to infection control.** Evidence-based guidelines for bioburden control are lacking, perhaps due to the difficulty in conducting controlled studies in chronic wounds or perhaps inconsistent interpretation of available data. The subject does seem to be mired in controversy, often leaving clinicians at a loss for the correct approach. Literature reviews by O'Meara et al and Hutchison et al suggest that evidence for using systemic antibiotics in chronic wound healing is insufficient and demand that other criteria be used in guiding the use of systemic antibiotics.[2] There are many recommendations based on expert opinion regarding the benefit of early intervention with systemic broad-spectrum antibiotics for suspected infections in diabetic foot ulcer.[3] The CDC warns against indiscriminately using antibiotics, especially those with broad-spectrum activity, because they tend to generate antibiotic resistance. These findings point to the need to consider wound cultures if systemic antibiotics are to be prescribed. A Swedish audit revealed that 60.1% of chronic wound patients had received antibiotic therapy during a 6-month survey period.[2] There is a fragile balance between prescribing antibiotics for chronic wounds and the risks of developing antibiotic resistant organisms. The worldwide outbreak of HA-MRSA and CA-MRSA is extremely concerning and one reason clinicians continuously look for other effective treatments to manage wound bioburden. Adding dressings to control surface bacteria seems like a logical approach in conjunction with systemic therapy and should be considered as part of the management equation. More research on antibiotics and wound bioburden in chronic wounds is needed.

• **Topical strategies.** The clinician managing an individual with a chronic wound must choose the topical therapy that will best meet the needs of the patient and wound. Topical therapy must address removal of necrotic/avascular tissue, bacterial balance and moisture balance. Debridement can be accomplished in many ways and rids the wound of devitalized tissue, senescent cells, and also decreases surface bacteria. Moisture balance is important, as wounds heal faster in a controlled moist environment; this is accomplished by selecting the dressing that addresses the wound's characteristics. Dressings can donate moisture, assist with moisture retention, or absorb excessive exudates. Managing wound bioburden becomes critical when the surface bacteria are out of bacterial balance and the clinical symptoms of critical colonization are present. The widespread problem of antibiotic resistance and the controversy in the healthcare community as to the cause and remedy of the situation dictate that the clinician make decisions based on each patient's needs, risk factors, dressing capabilities, environment, resources, and care goals. In managing wound bioburden, the goal is to prevent critical colonization and/or infection and facilitate a healthy wound environment. Another consideration is the aforementioned increasing problem of

HA-MRSA and CA-MRSA in chronic wounds, which demands rigorous barrier techniques to avoid cross-contamination. Although local wound care for MRSA in an infected or nonhealing wound gets little attention, it would seem logical that controlling the organism in the wound bed or dressing would decrease the bacterial load and diminish cross-contamination potential. Clinicians need to consider this a key strategy in preventing the spread of organisms that contribute to wound infections.

Topical antimicrobials. Using systemic therapy to control bioburden is controversial, and current wound care literature presents conflicting data on use of topical antimicrobial strategies in wound management.

Antibiotics. Landis[4] discusses concerns with topical antibiotics causing antimicrobial resistance, host sensitivities and contact dermatitis. Controlled trials support the use of topical mupirocin for *S. aureus* and Group A beta hemolytic *Streptococcus*. Rodeheaver[5] supports using some topical antibiotics when an antimicrobial agent is deemed necessary to reduce bacterial levels in wounds (mafenide acetate, metronidazole, mupirocin, Polysporin, silver sulfadiazine, and nitrofurazone). Clinicians often use alternative antibacterial strategies due to increasing concerns of resistance and efforts to restrict the prophylactic use of antibiotics.

Antiseptics. Antiseptics are much less likely to generate resistance because they target multiple sites. However, cell toxicity and efficacy are major concerns, and literature reviews often present differing interpretations. Some traditional antiseptics (hydrogen peroxide, acetic acid, iodine, and Dakins) have conflicting data and should be used with caution. Considerations such as dosing, concentration, and exposure time must be balanced against potential harmful effects when seeking to control bacteria in wounds. In a wound that does not have the ability to heal, antimicrobial control becomes more important than how many cells may be killed, and these agents may be used to dry out the wound surface. Antimicrobial agents combined with modern dressings provide a safe, effective option for managing wound bioburden in healable wounds. Literature supports using sustained-released antimicrobial dressings in wound care and demonstrates that modern antimicrobial dressings do not impede healing. Studies supporting topical antimicrobials in chronic wounds have postulated that the benefits may come from their ability to deliver high local concentrations of antimicrobial properties irrespective of vascular supply, avoidance of systemic effects, and a low incidence of resistance.[2]

Topical antiseptics. Some widely used topical antiseptics are silver-sustained release dressings and cadexomer iodine. These antibacterials have been used for several years and have been proven to provide safe, nontoxic, broad-spectrum activity against Gram-positive and Gram-negative organisms, MRSA, vancomycin-resistant Enterococci (VRE) bacteria, fungi, and yeast. Both silver and cadexomer iodine are biocides whose mode of action is different from antibiotics, which act specifically and effectively against narrow ranges of bacteria, contributing to resistance problems. Broad-sprectrum antimicrobial agents act across three target areas: the cell membrane, cytoplasmic organelles and the bacteria's nucleic acid.[6]

Antimicrobial Wound Dressings

Another available antimicrobial is the Kendall™ AMD antimicrobial foam dressing (Covidien, Mansfield, MA). These dressings are impregnated with polyhexamethylene biguanide (PHMB), a biocide that has been used for many years without any known resistance.[4] PHMB is a synthetic compound similar in structure to naturally occurring antimicrobial peptides (AMPs), molecules produced at the wound site by inflammatory neutrophils and keratinocytes that help protect against infection. PHMB attaches itself to the bacterial cell membrane, causing a structural change that kills the bacteria. In common resistance, bacteria protect themselves by pumping some antibiotics out of the cell using efflux pumps. The structural change to the cell walls caused by the PHMB is an advantage because the bacteria cannot use their efflux pumps to pump out the PHMB.[1]

PHMB has been incorporated into a variety of common wound dressings: Kerlix™ AMD gauze dressings, Excilon™ drain sponges, Curity™ AMD gauze dressings and packing strips, and Telfa™ AMD nonadherent dressings impregnated with 0.2% PHMB have been proven to effectively kill many clinically relevant bacteria within the dressing. *In vitro* studies demonstrated broad-spectrum activity against Gram positive and Gram negative organisms and fungi.[1] One significant study showed that Kerlix AMD gauze decreased growth of MRSA and VRE at 24 and 48 hours and exhibited a 3 to 6 log reduction of MRSA and a 4 to 5 log reduction of VRE at 30 minutes and 2 hours post-inoculation of the

dressing.[7] In human studies, the Excilon AMD drain sponge demonstrated a marked decrease in MRSA and *P. aeruginosa* around tracheostomy sites.[8] The results of another study of 24 delayed surgical closures, pressure ulcers, and diabetic foot wounds packed with Kerlix AMD gauze showed a decrease in total number of bacteria and number of species present compared to the control dressing with no antimicrobial agent. The bacterial decrease was accompanied by improved healing in the wounds covered with the PHMB dressing.[9] Many case studies for surgical incisions and pressure ulcers reported similar results, as well as decreases in wound size and reduced cost of care. One significant study reported a decrease in vascular site infections from 4.6% before the PHMB dressings to 0.4% after 5 years of routine use. The estimated savings was $817,176 and was reported to have been associated with dressing substitution and no other apparent changes in practice or patient population.[1]

While managing bacteria on the wound surface is important for healing, it is also important to prevent cross-contamination and prevent bacteria from entering the environment from the dressing or from entering the wound from the environment. Studies of PHMB dressings have proven them effective in preventing bacteria from entering the wound through the dressing and in killing the bacteria in the dressing.[1]

The following series of case studies will look at a new PHMB-impregnated foam dressing. The Kendall AMD foam dressing has 0.5% PHMB impregnated in absorbent foam. Antimicrobial efficacy of the foam is reflected in an *in vitro* study that showed an ~8.87 log reduction in MRSA growth at 24 hours. The log reduction at 3 days and 7 days was ~9.36 and ~8.88, respectively.[10] Another *in vitro* study compared the antimicrobial efficacy of the PHMB dressing with that of several silver technologies and one nonsilver antimicrobial dressing. Kendall AMD antimicrobial foam dressings demonstrated a >3 log reduction for 7 days for MRSA, VRE, and *P. aeruginosa*. The silver technologies tested did not show consistent efficacy against all three organisms for 7 days. The only tested antimicrobials that showed 7-day efficacy against all three organisms were the nonsilver biguanide antiseptics, Kendall AMD antimicrobial foam dressings (PHMB), and Johnson & Johnson Biopatch™ (CHG), both of which showed >3 log reduction for 7 days against all three organisms.[11] The Kendall foam dressing is highly absorbent, which is needed for wounds with high bioburden because of the excessive drainage usually present. Chronic wound fluid not only contains high levels of bacteria, but also high levels of proteases, which can create an unhealthy environment for healing. Foam dressings that provide antimicrobial control and moisture balance by absorbing excessive drainage are ideal choices for many chronic wounds.

All chronic wounds will eventually become colonized with bacteria, putting them at risk for critical colonization, infection, and delayed healing. Traditional wound dressings are not able to manage the bioburden of the wound, and bacteria will grow unchallenged. If we can manage bacteria in the dressing and prevent cross-contamination; if we can maintain a healing colonized wound by managing bacteria on the wound surface; if we can prevent the progression and proliferation of bacteria across the bioburden spectrum; and if we can use products that can be incorporated easily into routine protocols and inventories, our goal of quality, cost-effective care can be accomplished. This goal can be achieved when clinicians make informed decisions about management of wound bioburden. The following case studies demonstrate some of the decisions and rationale for selecting the Kendall AMD foam dressing.

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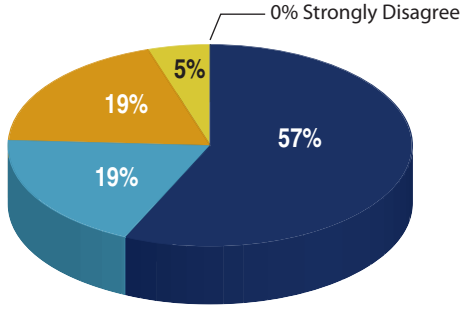
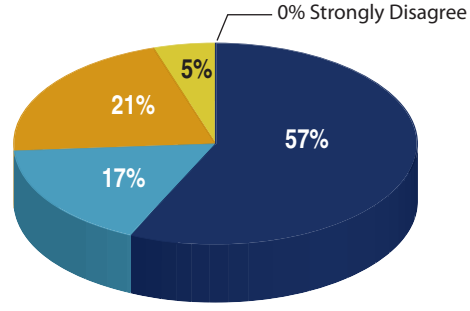
Survey Summary: Open-Label Customer Acceptance and Preference Evaluation of Kendall™ AMD Antimicrobial Foam Dressings

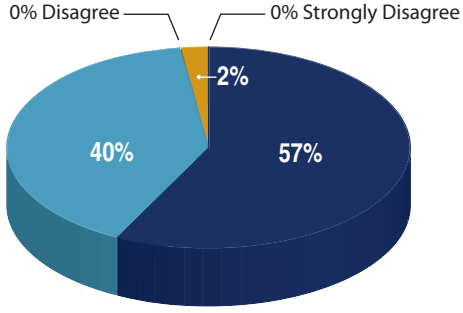
Dressing appeared to be effective in preventing bacterial proliferation



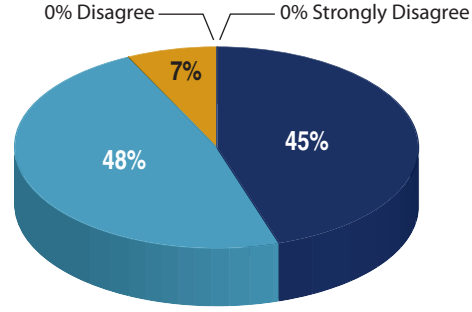
Dressing helped manage bacterial growth



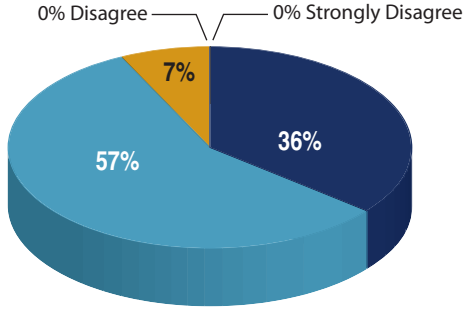
Is soft

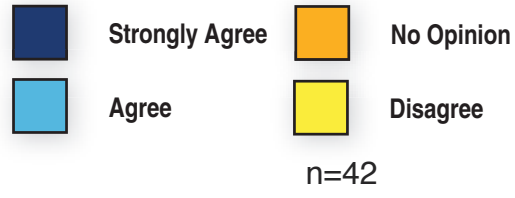


Dressing retains fluid during dressing changes



Helped improve overall quality of care



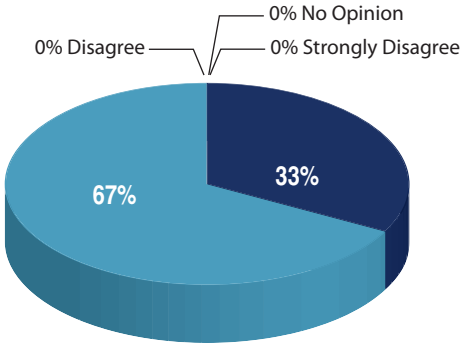


This study was an open-label customer acceptance and preference evaluation of Kendall AMD antimicrobial foam dressings. Four clinical sites participated in the evaluation: two acute care facilities, one long-term care facility and one home healthcare agency. The evaluation was designed to follow the use of the dressings for four weeks at each site.

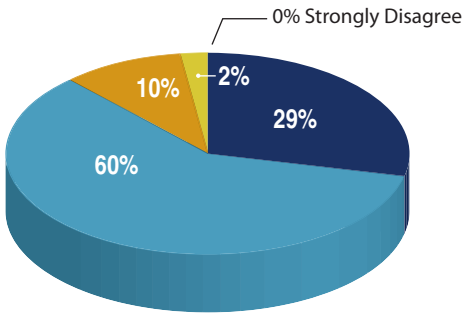
Forty-two (42) clinicians completed the questionnaires in each of the settings under the direction of a study coordinator. The nursing staff was instructed to utilize Kendall AMD antimicrobial foam dressings on wounds they deemed clinically appropriate. The questionnaires evaluated the newly designed dressing for the following physical and clinical properties:

- improvement on wound outcome,
- effectiveness in preventing bacterial proliferation,

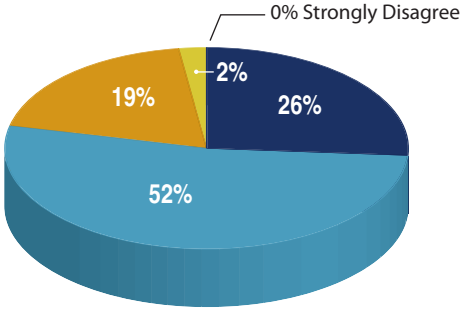
Does not cause pain during removal



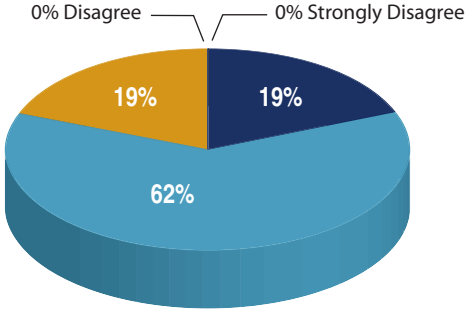
Is highly absorbent



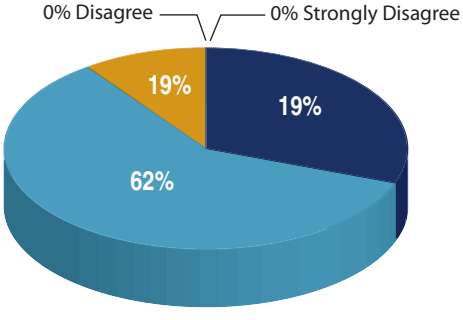
Helped to improve wound outcome

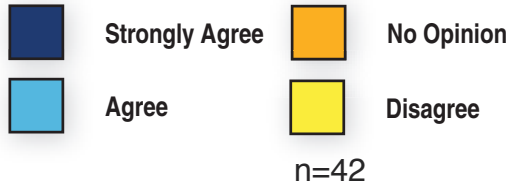


Dressing helped manage odor



Does not cause pain during use





Kendall AMD Antimicrobial Foam Dressing Overall Assessment

	Worst 1	2	Neutral 3	4	Best 5	No Response
How would you rate the overall clinical performance of the product?	0%	0%	7%	26%	31%	36%

- effectiveness in managing bacterial growth,
- apparent management of odor,
- overall quality of care,
- control of skin maceration,
- comfort during application and use,
- the shape of the wound,
- absorbency,
- softness,
- wear time,
- cutting ease, and
- dressing adhesion to the wound bed.

In addition, clinicians were asked to provide an overall clinical performance rating of the dressing on a scale of 1 to 5. The questionnaire further asked the clinicians who were using foam products to compare Kendall AMD antimicrobial foam dressings to the foam dressing they were currently using. The product sizes used in the evaluation were 4 inches x 4 inches (10 cm x 10 cm). Product and detailed instructions on conducting the evaluations were provided to each participating site by the manufacturer. Subjects included in the study were adults with wounds clinically indicated for antimicrobial foam dressings. The only criteria excluding subjects were wounds that were contraindicated for foam dressings (dry wounds and full-thickness burns) and an age younger than 18 years.

Antimicrobial Foam Dressings on Moderately to Heavily Draining Wounds Treated in Home Health Care

Bridget Mejza, RN, BSN, CWOCN, VNA of Southeast Connecticut, Waterford, CT

Wounds often are complex and difficult to heal. They may persist for months or years due to underlying disease processes or complications within the healing process. Nonhealing or slow-healing wounds represent a major health burden and drain resources and contribute substantially to disability, morbidity, and cost. The treatment of chronic wounds has a profound effect on the participant's quality of life.[1]

Efficient strategies for wound healing have become crucial for the survival of home health agencies (HHAs). Treating wounds in home health settings can be expensive and time-consuming. Comorbidities and variable home environments can lead to challenges associated with wound healing and infection prevention.[2]

Treating Bioburden

Treating wounds requires a comprehensive approach that includes addressing the underlying etiology of the wound, removing causative factors, and attending to systemic needs of the patient.[3] According to Bryant and Nix,[4] an important step in woundbed preparation is removing bacterial burden. Bacteria in wounds compete for the limited supply of oxygen and nutrients available in the wound. All wounds contain some level of bacteria — the challenge is to achieve a level of bacterial burden or bioburden the host can manage.

Wound bioburden has four recognized stages: contamination, colonization, critical colonization, and infection. Contamination is the presence of nonreplicating micro-organisms on the wound surface arising from normal flora that normally do not elicit a response from the body. Colonization refers to the presence of replicating bacteria, without a response from the body. Bacteria levels in these phases are not pathogenic and do not necessitate treatment with systemic or local antibiotics.[4]

When a wound progresses to the critical colonization phase, healing is arrested as a result of bacteria competition for nutrients and oxygen. Wounds in this phase are progressing toward the final infection stage even while bacteria have not penetrated the tissues or evoked the classic clinical presentation of infection (eg, redness, warmth, fever, pain, edema). Because bacteria have not penetrated the tissues, systemic antibiotics are not indicated. However, appropriate use of topical antimicrobials can prevent progression to infection and assist wounds in their progression toward healing.[4]

According to Tomaselli,[5] the most popular antimicrobial products used by home care agencies contain silver. Silver products are available in a variety of dressings. They provide antimicrobial protection that may reduce wound bioburden. This is also important for home care agencies financially, because efficient wound healing can decrease expensive nurse visits and improve patient outcomes. A drawback of silver products is that they are very costly.

Financial Challenges of Home Health Agencies

HHAs are currently reimbursed by Medicare using a Prospective Payment System, or PPS. Under PPS, Medicare pays HHAs a predetermined base payment, adjusted for the health condition and care needs of the beneficiary.[6] HHAs have a set amount of money to use for all services and supplies used by the patient at home during a 60-day episode; thus, HHAs need to prudently use supplies and distribute home care visits to fit the predetermined base payment. HHAs are anticipating the Centers for Medicare and Medicaid Services changing to a pay-for-performance model (currently in the demonstration phase), where agencies are rewarded for improvements based on measurements of quality, efficiency and outcomes.[6] Upcoming changes are encouraging agencies to become even more conscious of their use of staffing and supplies.

Polyhexamethylene Biguanide

The antiseptic polyhexamethylene biguanide (PHMB) has been added to wound dressings. It has been found to be effective against a broad spectrum of micro-organisms, fungi, and yeast.

PHMB's structure and mode of action are similar to antibacterial peptides that function by disrupting microbial membranes. No known resistance has been reported.[3] Motta et al[7] also report that PHMB has minimal to no odor; is nonfoaming, chemically stable, and nonvolatile; and has low mammalian toxicity. A variety of wound care products contain PHMB.[8]

Mulder et al[8] evaluated the cellulose wound dressing antimicrobial on 12 patients with 26 wounds of various etiologies. PHMB dressing use resulted in elimination of *Pseudomonas aeruginosa*, diptheroid Gram-positive rods, beta-hemolytic *Streptococcus*, and *Enterobacter aerogenes* in some patients and decreased levels of *Staphylococcus aureus*, *P. aeruginosa*, and *Proteus mirabilis* in others.

In an animal study by Cazzaniga et al,[9] three pigs received 18 wounds — nine were treated with PHMB gauze dressings and nine with plain gauze, followed by a polyurethane film dressing to maintain a moist environment. The dressings were challenged on the surface with a suspension of *P. aeruginosa* and cultured at 24, 48 and 72 hours. The results showed that fewer organisms invaded the wounds with the PHMB dressing.

Motta et al[7] compared bacterial counts using gauze containing PHMB and gauze with no antimicrobial in wounds that required packing. Using PHMB-treated gauze resulted in a larger reduction of the total number of microbial isolates, the number of polymicrobial counts, and the log colony counts as compared to the regular gauze dressing. In addition, chronic, nonhealing wounds in case studies of PHMB-treated dressing use showed improvement and progression toward healing. Although PHMB antimicrobial products cost slightly more than their non-antimicrobial equivalents, they cost less than other antimicrobial dressings on the market, especially silver.

Because of their absorbancy, foam dressings are used for moderately to heavily draining wounds. The foam provides a desirable moist wound environment while drawing excess moisture away from the skin. Foam dressings are a popular choice in home care patients — they decrease nursing-visit frequency because they can handle drainage so well that patients require less-frequent skilled-nurse visits for dressing changes.

A study was conducted through the VNA of Southeast Connecticut to test a foam dressing on a variety of moderately to heavily draining wounds. The study purpose was to find a cost-effective way to help keep microbial counts down and efficiently manage wound drainage in order to help heal patients' wounds and increase their quality of life.

Case Report

Mr. R is a 72-year-old man who had been treated with negative pressure wound therapy (NPWT) for a surgical wound of his right calf since July 14, 2008. His measurements on September 24 were 11.5 cm x 2 cm x .02 cm (see Figure 1). At that

Addressing Redness, Soreness, and Increased Drainage from Tube Sites Using an Antimicrobial Foam Dressing

Susan Krause, RN, MSN, CWOCN, Senior Specialist, Wound Healing Department, Sharp Metro Campus, Sharp Memorial Hospital, San Diego, CA

Patients with tubes and drains are at risk for skin infection and skin irritation around the tubes. Treating these conditions can be painful, costly, and time-consuming when frequent dressing changes are required.

Case Report

Ms. D is 53 years old with gastrointestinal dysmotility. She has a J-tube through which she receives some of her medications. (Patient was discharged before medications could be ascertained). She also has a biliary drainage tube. She receives chronic total parenteral nutrition (TPN) through a port-a-cath T-tube.

Ms. D was admitted to hospital with a high fever (>102 F); line sepsis was suspected. She had previously been instructed to clean her tube sites with alcohol wipes and to cover them with Tegaderm dressings (3M, St. Paul, MN) because of a reported history of methicillin-resistant *Staphylococcus aureus* (MRSA) infection. She reported having followed these instructions for just 1 day before admission.

A site culture uncovered light *Pseudomonas aeruginosa*, *Escherichia coli*, a small amount of vancomycin-resistant *Enterococcus faecium* and *Candida albicans* (not usually seen in a J-tube site, in this author's experience) in the J-tube. The T-tube culture yielded a small amount of MRSA and rare colonies of E. coli.

The amount of exudate had required Ms. D to change the dressings around the tube sites several times a day. Her clinician wanted to provide a dressing with antimicrobial coverage as well as some degree of absorbency, so the patient would not have to change the dressings as often. The clinical profile of the Kendall™ AMD antimicrobial foam dressing seemed well-suited to the situation, and the new dressing was applied.

Ms. D was an inpatient for 2 days. On day 2, she reported that she liked the dressing because she only needed to change it once a day and it was handling all the drainage. She also reported that is was comfortable and did not irritate her already compromised skin.

Moderator's Commentary

This study points out another type of patient that may benefit from an absorptive, antimicrobial dressing: those with tubes and drains. The author further highlights the challenges of dealing with these patients. A dressing that addresses bioburden and exudate management that is comfortable, easily changed, and requires only daily (or fewer) changes can be very helpful to both patient and caregiver. It appears that at the time of discharge, the patient was very satisfied with this dressing regimen.

Figure 1

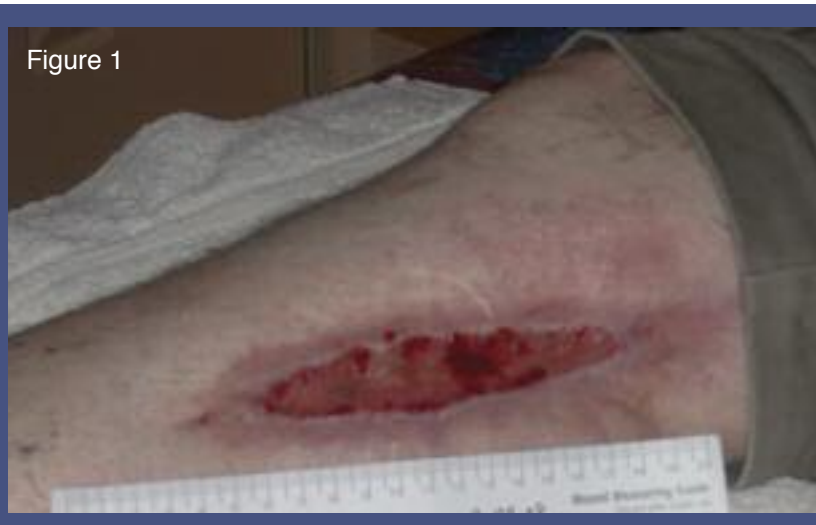
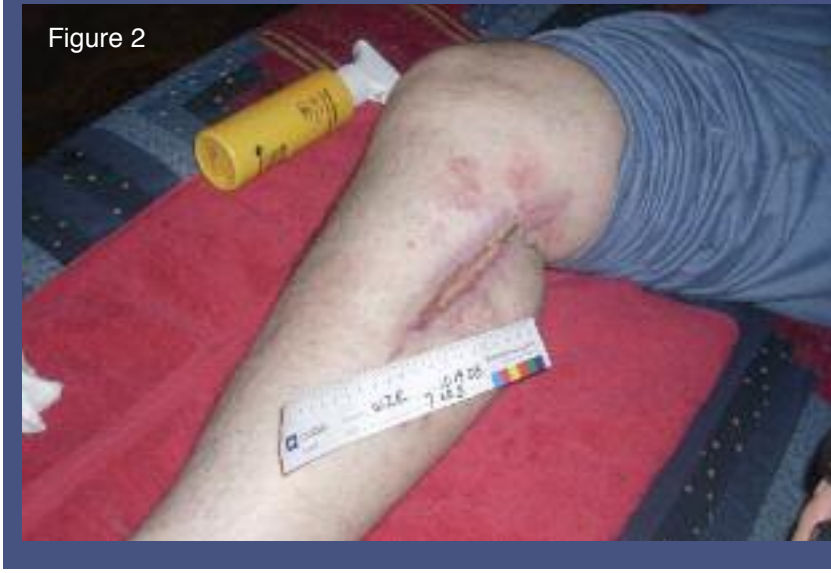


Figure 2



time, Mr. R had increased yellow drainage and a wound culture was positive for *Staphylococcus*. NPWT was discontinued that day and he was started on Kendall™ AMD antimicrobial foam dressing. Mr. R and his spouse were very happy to stop NPWT; it was cumbersome to carry and he found it difficult to have his leg attached to the unit, especially as his mobility increased.

Mr. R's spouse changed the foam dressing every other day after he showered. She was able to apply dressing, did not complain of difficulties with use, and secured it with transparent dressing or paper tape.

On October 14, a WOCN visited Mr. R. His wound dimensions had decreased to 7 cm x 0.5 cm x 0 cm, with a small amount of serous drainage on the dressing and some scabbing around the periphery (see Figure 2). The wound bed was dry, so a small amount of wound gel was applied to the wound bed for added moisture. The patient was instructed to continue every other day with the dressing change, until healing was complete.

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Moderator's Commentary

The author provides insight into chronic wound management in today's home care arena. She discusses the importance of managing wound bioburden and why home care agencies must look for ways to manage wounds, supplies, and frequency of visits in cost-effective ways. Ms. Mejza also very succinctly outlines some of the evidence behind these PHMB dressings by summarizing some of the clinical studies.

In this case study, the key to success was an effective (specific for Staphylococcus and able to absorb drainage) dressing that could be changed easily every other day by a family member. This is a very manageable treatment plan for home care and lets the nurse visit periodically to assess wound progress, monitor for infection, and re-enforce family education. These dressings will be especially important in the home care nurse's arsenal of topical therapies.

Changing Healing Trajectory of a Postsurgical Wound Using Topical Polyhexamethylene Biguanide-Impregnated Antimicrobial Foam Dressing: A Case Study

Marek K. Dobke, MD, Division of Plastic Surgery, Department of Surgery, University of California San Diego

A young woman's surgically open post-panniculectomy methicillin-resistant *Staphylococcus aureus* (MRSA) infected, unstable, refractory wound was not healing successfully using Dakin's solution and silver products to address infection. After topical application of an antimicrobial foam dressing, signs of infection resolved and the wound healed.

Case Report

Ms. O is a 25-year-old obese American Indian woman with a history of alcohol abuse and insulin-dependent diabetes mellitus (IDDM). She underwent a panniculectomy in order to control recurrent intertrigo of the lower abdominal wall skin and to improve ambulation. Postoperatively, she developed a wound hematoma.

The suprapubic wound was opened 7 days after Ms. O's surgery: The hematoma was drained and the wound was irrigated and re-closed. Subsequently, Ms. O developed cellulitis; a swab-culture from the small draining wound disruptions revealed methicillin-resistant *S. aureus* (MRSA) (see Figure 1). The wound was opened, re-debrided, and treated with 0.025% Dakin's solution soaks and subsequently with Elta Silver Gel (Swiss-American, Carrollton, TX), once the presence of the MRSA was confirmed. For 3 weeks, the wound remained unstable and odorous, exhibited a significant amount of exudate and progressive build-up of necrotic subcutaneous fat layers, and showed no inclination to contract (see Figure 2). Topical treatment was changed to Kendall™ AMD antimicrobial foam dressings applied once daily. The wound stabilized, odor and exudate production ceased, and the wound wall became vascular and granulating. After 1 week, wound size was reduced by more than 50% and cultured negative (see Figure 3). Within 2 weeks after initiating use of the antimicrobial foam dressing, Ms. O's wound contracted and closed spontaneously. Perioperatively and during the wound complication treatment, Ms. O remained in stable and in good overall condition, without any signs suggestive of systemic infection. Ms. O was not receiving systemic antibiotics with the exception of the routine perioperative prophylaxis (Ancef, GlaxoSmithKline, Philadelphia, PA).

Discussion

Initially, before the result of swab culture was known, this odorous, exudative wound was treated with modified Dakin's solution at a concentration 0.025%. Dressings with Dakin's cotton soaks were changed twice daily. It was expected that modified Dakin's solution would be therapeutically efficacious because it preserves general bactericidal properties and has relatively few detrimental effects.[1] Because Ms. O did not show any signs of systemic infection and in light of the poor penetration in devitalized tissue of systemic antibiotics, wound management continued to utilize topical agents. Silver-releasing dressing was considered: Elta SilverGel™ (Swiss-American Products, Carrollton, TX), designed to provide a moist healing environment and known to provide sustained and effective silver-ion release to the wound to inhibit the growth of *S. aureus* and MRSA, appeared to be a logical alternative.[1] Data indicating that silver ions do not inhibit angiogenesis and microvascularization reaffirmed the notion that a silver-based, moisture-retaining wound dressing would be an appropriate, evidence-based treatment choice decision for this IDDM patient.[1,4] However, the silver-releasing topical did not seem to speed granulation or contracture or reduce exudate (a sign of bioburden), so the wound management regimen was changed again.

The antimicrobial foam dressing that was introduced — Kendall AMD antimicrobial foam dressings — is, like silver, known to exert a bactericidal effect on MRSA. Topical 0.5% polyhexamethylene

biguanide (PHMB)-impregnated material was associated with a changed course of healing of an unstable, refractory wound to a nonodorous, exudate-free (which corresponded with the negative swab culture), contracting wound with developing granulation[2,3] (see Figures 3, 4). This change in the trajectory of the healing process, not even necessarily the fact that the wound closed, can be considered a positive outcome of wound healing.[5] This result reaffirms that PHMB dressings can be used as an effective topical treatment for problem wounds.[5-7]

Interestingly, some reports suggest that silver might be superior to PHMB dressings; however, this case illustrates that results of studies *in vitro* are not necessarily predictors of outcomes *in vivo* in the management of complex wounds with ever-changing milieu. Also, it probably illustrates that a variable response to topicals relates not only to the antimicrobial agent, but also to physical and chemical dressing characteristics.[3,6,7] Experience with the synergistic effect of negative pressure and silver on reduction of bacterial bioburden of infected wounds exemplifies that physical characteristics of the dressing material and elimination of areas of noncontact with wound walls matter.[8] The antimicrobial foam has the good conformability needed for contact with wound cavity walls. In Ms. O's case, this feature in conjunction with sustained bactericidal agent activity could have been the decisive factor leading to a sufficient antimicrobial stimulus for the turnaround in the wound's healing.

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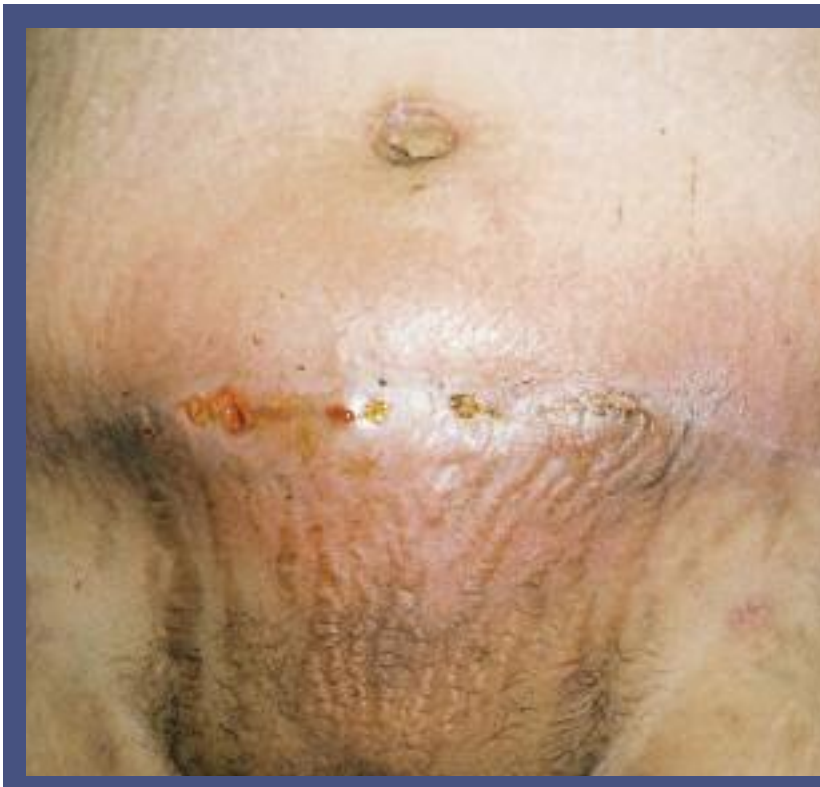

Figure 1. Day 10 after surgery (before second debridement): cellulitis of wound edges, drainage droplets through spontaneous, multiple areas of pending wound disruption.

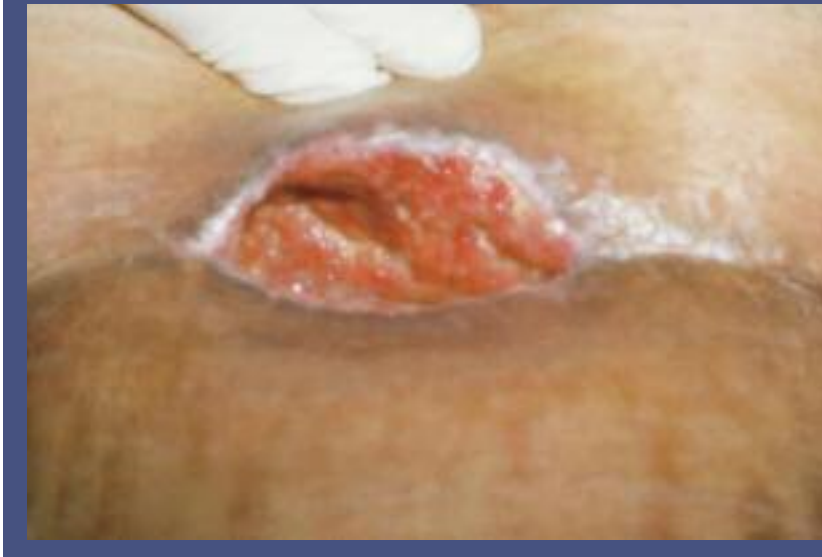

Figure 2. More than 4 weeks after the original surgery: poor response to Dakin's solution (twice-daily) and Silvergel (once-daily) treatments. The wound remained odorous, producing exudate and developing devitalized fat tissue layers. Measurements (9 cm x 4 cm x 3 cm to 4 cm in depth) remained practically unchanged.

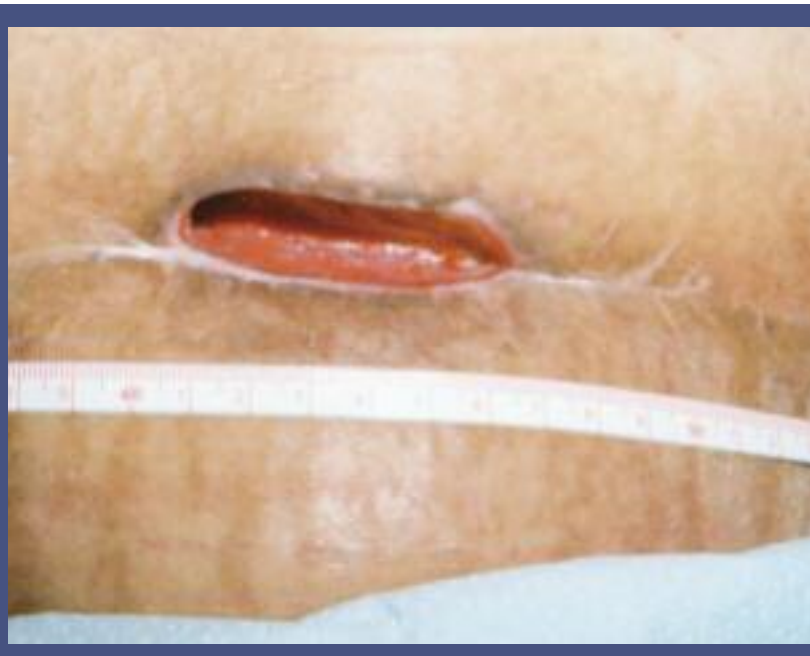

Figure 3. After 1 week of treatment with daily applied Kendall AMD Antimicrobial Foam Dressing, the wound decreased in size to 5 cm x 1.5 cm x 0.8 cm to 1.5 cm in depth and exhibited no devitalized and desiccating wound walls tissue, odor, or exudate. One week later, the wound was healed.

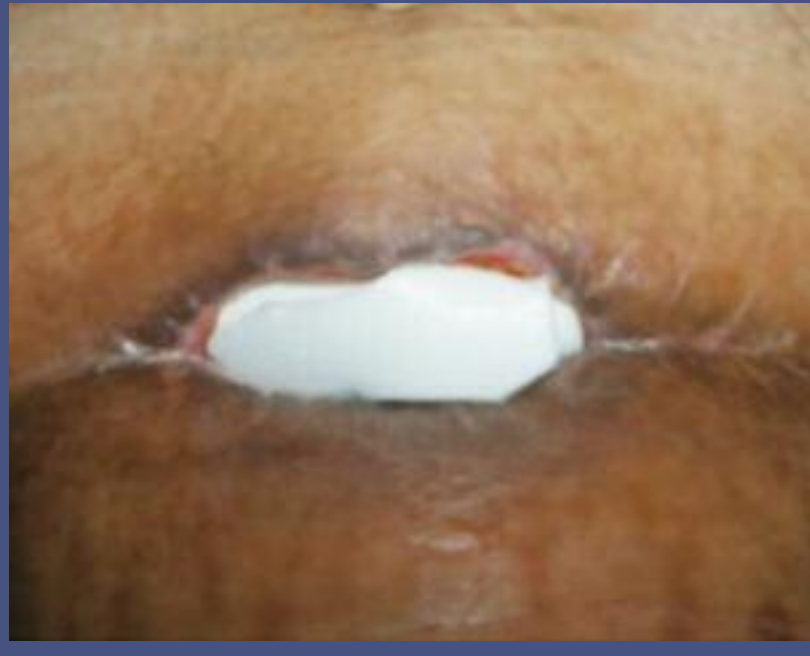

Figure 4. Cavity of the wound filled with Kendall AMD Antimicrobial Foam Dressing before placement of the extra layer to overlie wound margins. Dressing changes were pain-free and sponges were nonadherent and easy for the caregiver to remove.

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Moderator's Commentary

This case study highlights some common problems that healthcare providers face. A high-risk patient (eg, obese, diabetic) undergoes elective surgery and subsequently develops a wound infection. The wound was opened and debrided and treated with some topical antimicrobial dressings. Dakins was initially used because of odor and drainage. Because of the poor response to this therapy, a culture was done revealing MRSA. Another topical antimicrobial known to be effective against MRSA was initiated (silver hydrogel). When signs of healing were not observed, the Kendall AMD foam was started because of its bactericidal effect on MRSA. The wound responded positively and closed, indicating that the Kendall AMD antimicrobial foam dressing was an effective solution for this wound. Dr. Dobke also makes another important point: The physical characteristics of a dressing can be an important aspect in the selection process. Wound fluid has been shown to have high levels of proteases and excessive bacteria and needs to be managed effectively. These types of wounds may benefit from a dressing that can manage exudate and bacterial bioburden. A foam dressing is an excellent option to meet these objectives. One other aspect of this case needs to be pointed out: Although many topical antimicrobials have reported to be effective against various organisms, in the ever-changing milieu of the chronic wound environment, the critical question is, "Is it working?" If not, do something different.

Antimicrobial Foam Dressing Used in the Treatment of a Diabetic Foot Ulcer

Robert Feldman, DPM, Medical Director, Bedford Memorial Hospital Wound Care Clinic, Bedford, VA

Diabetic foot wounds require offloading, good control of blood glucose, good vasculature, infection control, and nutritional status, all of which are more problematic in patients with diabetes. Topical products that address any of the issues relevant to treatment provide opportunities to improve care and patient acceptance of protocols.

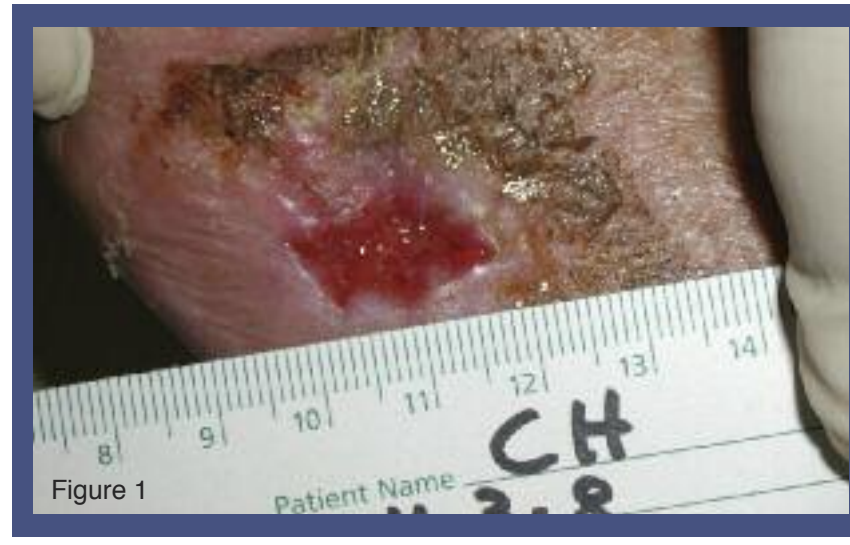


Figure 1

Case Report

Mr. H is an 81-year-old Caucasian with a 7-month history of a diabetic foot wound over the dorsolateral left foot just proximal to the fifth metatarsophalangeal joint. His relevant medications include insulin, coumadin, Fosamax (Merck and Co., Whitehouse Station, NJ), metolazone, magnesium, aspirin, furosemide, allopurinol, metoprolol, isosorbide, simvastatin, losartan, and pantoprazole. Mr. H's A1C levels have ranged from 7.1 to 7.4 during wound treatment and his physician believes this is as well as he can be controlled. Additional complications include pedal edema, which is mostly controlled by Unna boots used for the past 2 months. He also had adverse reactions to Apligraf (Organogenesis, Canton, MA).

Mr. H's wound occurred 18 months ago and was healed at that time using weekly debridment, Prisma, and Dermagraft (Smith and Nephew, Hull, UK). When his wound recurred, Prisma and Dermagraft were used again without success. More recently, the wound was managed using weekly debridment, Acticoat-7, Aqacel Ag, Prisma, Apligraf, Dermagraft, Unna boots and Ziox (Stratus Pharmaceuticals, Miami, FL). CT scan and X-rays were negative for osteomyelitis, bone pathology, or abscess and biopsy cultures were eventually negative. Clinicians diagnosed a diabetic foot wound of the left foot (see Figure 1).

It was not determined why the wound returned. Mr. H is not very aware of the stresses or pressure on his foot or attentive to his blood glucose control. He had a good bit of post-debridment bleeding and occasional serous drainage. Mr. H's clinicians believed the new product had qualities that would make it more comfortable on his sensitive skin.

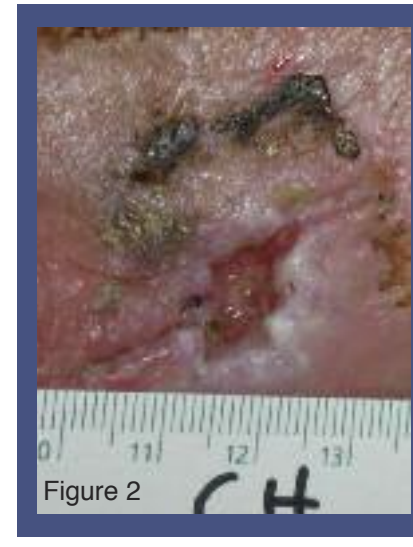


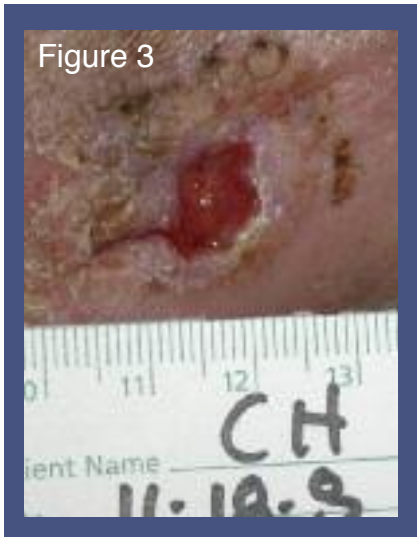
Figure 2

Use of Kendall™ AMD antimicrobial foam dressings was initiated to provide antibacterial coverage different than the traditional silver (see Figure 2). Although resistance to silver exists only in the lab and

Table 1. Wound progression using antimicrobial foam dressing

Date	Product	Wound size
November 3, 2008	Acticoat-7*	0.7 x 1.2 x .2 cm
November 11, 2008	Kendall AMD	0.8 x 1.4 x .2 cm
November 18, 2008	Kendall AMD	0.7 x 1.2 x .2 cm
November 25, 2008	Doctor out of town; patient did not show for his appointment	
December 2, 2008	Kendall AMD	0 .7 x 1.2 x .2 cm

**Smith & Nephew*



is not seen in wound care, it was determined that the wound was not progressing and a different type of antimicrobial might be more useful. Silver had reduced the bioburden (biopsy cultures were negative), but the foam dressing provided broad-spectrum antimicrobial coverage in addition to a more favorable (ie, moist) wound environment.

Although wound size does not reflect much progression (see Table 1), this problem wound improved and deteriorated periodically over the course of treatment. Although this is not typical for diabetic foot ulcers, problem wounds follow this pattern, particularly as blood glucose varies and as swelling and pressure slow healing. With foam dressing use, the wound appeared much healthier and appeared to be healing (see Figure 3). The wound edges and wound base appeared healthier: The edges began to show epithelial tissue growth and the base had less hypergranulation tissue and improved color, becoming less pink and more red (see Figure 4).

Conclusion

For this particular diabetic foot ulcer, which had previously showed little improvement and actually enlarged over a period of months, the foam antimicrobial dressing created a healthier wound environment and a wound bed that would now facilitate several measures for wound closure including use of skin grafts, Dermagraft (Advanced BioHealing, Westport, CT) and Dermaclose RC (Wound Care Technologies, Chanhassen, MN).

Moderator's Commentary

This case study discusses the use of the Kendall AMD antimicrobial foam dressing on a diabetic foot ulcer. The history given describes a wound of long duration; a patient with issues in glucose control; and additional management complications like edema. Dr. Feldman notes that this wound "improved and deteriorated periodically during the course of many months." This is not uncommon with many diabetic ulcers and other chronic wounds. The diabetic ulcer is a hard wound to heal and requires vigilance and persistence from the clinician and patient. A diabetic ulcer and other chronic wounds of long duration usually present with high bioburden, elevated proteases, and low levels of growth factors, and are subject to continuous trauma. High wound bioburden can increase wound proteases that break down growth factors, creating an unhealthy, nonhealing environment is created. Adequate off-loading, wound debridement, optimum blood flow, and appropriate systemic antibiotics are the standard care for infected diabetic foot ulcers or one that has a heavy bacterial burden, no matter what the organism. Advanced dressings, biologics, frequent debridement, medications, biopsies, and various radiological diagnostics mentioned in this case study are examples of why these chronic wounds are creating such a financial burden on the healthcare industry. However, many times these adjunctive therapies are needed for these difficult to heal wounds and prove to be cost-effective when closure occurs. In this reported case, a culture was not reported, but statistics lean toward a high probability that this non-healing diabetic ulcer could have been colonized with MRSA or other clinically relevant bacteria. It was reported that the wound dimensions of the ulcer did not change during the test period. However, the study describes the wound as "appearing much healthier ... wound edges and wound base appeared healthier"... after the foam dressing was used. A "healthier" wound bed is many times the first clue that the wound is progressing and bacterial are coming under control. Bioburden control may be demonstrated by healthier, more robust granulation tissue in the wound bed and wound edges that begin to flatten with epidermal resurfacing. Achieving a healthier wound bed and edges is an important step in facilitating closure of a diabetic ulcer.

Inhibiting Bacterial Growth in Venous Ulcers Using an Antimicrobial Foam Dressing

Mary Foote, RN, MSN, CANP, CWCN, ED.Dc, CEO, Wound Consultant, Woundcare On Wheels, Inc., Nerville, IL

It is not unusual for a Class 3 venous stasis patient to experience increased susceptibility to infection associated with exudate production and compression therapy. (A Class 1 patient presents with changes to the skin surface — ie, swelling and scaling of the skin. Class 2 refers to changes in coloration of the skin as fibrin leaks from the blood vessel into the interstitial region of the leg causing hemosiderin staining. Scaling increases and taut, shiny skin called lipodermatosclerosis appears. Class 3 venous disease is indicated by broken skin, and ulcers with active weeping, jagged edges, irregular shape, and partial thickness with variant degrees of pain. Most Class 3 cases experience weeping of serous exudates to a moderate or copious degree.) This is particularly common due to the prevalence of *Pseudomonas* and fungal infections within this population. When products that do not address bacterial bioburden in exudate are left in place for several days, the moist, dark environment allows bacteria to thrive and grow. Changing compression therapy more frequently than two to three times a week may defeat the purpose of using products meant for less-frequent dressing changes and decrease management efficacy of the venous stasis patient.

A patient was selected to try a new dressing based on the presence of bioburden that was not responding to a silver-impregnated alginate used in conjunction with compression therapy. The biofilm was inhibiting his wounds from contracting in dimension and decreasing in exudate production.

Case Report

Mr. E is a 77-year-old man with a history (at least 5 years) of venous disease that includes intermittent ulcerations. The hemosiderin staining present in both legs is more advanced in the left gaiter which shows lipodermatosclerosis. Mr. E's history also includes degenerative joint disease, osteoarthritis, coronary artery disease, hypercholesterolemia, and peripheral vascular disease (PVD). The clinic he had previously attended had been applying topical clotrimazole with betamethasone cream to the leg around the wounds and a silver alginate to the wounds, using an Unna boot and light weight tubular elastic stocking as a covering. Mr. E's systemic medications included an antihypertensive, a diuretic, potassium replacement, a vasodilator, and an anti-cholesterol drug.

Mr. E presented with Class 3 venous disease to the left gaiter that was slow to respond to conservative treatment rendered by a wound clinic. He had been attending a wound center twice weekly for 14 weeks for application of a silver dressing to two wound sites, followed by Unna boot application. In addition, Mr. E applied pneumatic compression for 30 minutes daily to his left leg.

Given his prolonged course of treatment and presentation of the wounds to the medial leg and lateral malleoli, clinicians believed Mr. E was resistant to the efficacy of the current dressing. He was amenable to trying an alternative course of treatment that may enhance healing. In his initial presentation, the wounds looked clean but had not contracted in size even with management of edema; his wound dimensions had not contracted in the 5 weeks before current intervention and the tissue was now friable, indicative of his inability to combat the bioburden.

The decision was made to change the dressing every three to four days and initiate a protocol of cleansing with an isotonic wound cleanser, application of the antibacterial foam, and covering with two-layer compression wrap system and Tubigrip (ConvaTec, Skillman, NJ). The Kendall™ AMD antimicrobial foam dressing was believed to be a better alternative to combating the biofilm than the silver dressing.

Within 1 week of product use, evidence of wound contraction was noted in both wounds. Compression therapy was consistent. In association with the type of antibacterial dressing, the biofilm growth was inhibited, allowing for healing to progress quickly (see Table 1). Healing was complete within 3 weeks.

Table 1. Healing progression in venous wounds

Initial/week 1 measurements (Nov. 18, 2008)	
Left lateral leg	5 cm long x 2.4 cm wide x surface
Left medial malleoli	1.2 cm long x 1.0 cm wide x surface
Week 2 measurements (Nov. 25, 2008)	
Left lateral leg	4.6 cm long x 1.2 cm wide x surface
Left medial malleoli	pinpoint
Week 3 measurements (Dec. 4, 2008)	
Left lateral leg	healed
Left medial malleoli	healed

Discussion

Biofilms represent on-going bacterial growth that continues to inhibit healing and can become resistant to antibacterial agents. Although biofilms may not culture as a true infection, in this case the presence of biofilm growth was determined based on empirical presentation of the wound and response to past management strategies incorporating silver. A review of literature reveals that few topical alternatives other than silver can be used in the home to decrease bioburden; these include gentamycin cream, triple antibiotic cream, antibiotic spray, methylline blue and gentian violet, and iodine derivative products. Gentamycin cream is an aminoglycoside to which *Pseudomonas* and *Staphylococcus* bacteria are highly responsive; however, side effects include skin irritation and increased discomfort and pruritus. Thus, this medication is only meant for short-term use due to toxicity. Iodine also can be toxic and drying to a wound bed that should remain moist to facilitate healing. The delivery mode for the methylline blue and gentian violet increases the frequency of dressing changes (the product is indicated for dressing changes every 2 days), which is not cost effective or efficient for a Class 3 venous wound and may increase periwound tissue maceration because of the necessary moistening. Many Class 3 venous wounds already have moderate to copious exudate production.

In addition to addressing a wide range of micro-organisms, the Kendall AMD antimicrobial foam dressing is nonadherent, would absorb exudate, and would not damage healthy developing skin cells.

Conclusion

The Kendall AMD antimicrobial foam dressing was an excellent option in the management of Class 3 venous disease, particularly in a recalcitrant wound that failed to respond to conservative wound management and was unyielding to alternative antibacterial agents. The dressing showed extended wear-time ability under compression therapy (a minimum of 3 days to a maximum of 7) compared to other dressings tried. The wound responded favorably within the first week of use and continued to progress.

Moderator's Commentary

This is another case utilizing the Kendall AMD dressings for a patient with a lower extremity venous ulcer. It must be noted that the PVD mentioned in the patient's history was obviously not significant enough to prevent the use of compression needed to manage the edema and venous insufficiency, as evidenced by a positive outcome for this patient. This study also demonstrates the importance of knowing what the viable options are for wounds that are not responding to current treatment modalities. Ms. Foote chose the foam dressing because of its antimicrobial properties, non-adherence to the wound, and absorbency capabilities needed on a dressing used under compression wraps. A positive healing trajectory was noted after only 1 week, and complete healing observed within 3 weeks. This dressing appeared to make a difference.

Antimicrobial Foam Dressing Used in the Treatment of Wounds in Patients With Compromised Vascular and Arterial Sufficiency

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Caring for patients with compromised vascular and arterial sufficiency presents numerous challenges. Patients providing their own care may find it difficult to place the dressings and/or apply overlying compression. Wound drainage puts patients at risk for periulcer maceration. Desloughing or maintenance debridement decisions are limited by patient pain and the market withdrawal of certain enzymatics. Although many of these patients receive systemic antibiotics, clinicians are open to trying products that address other wound issues, underscoring the desire to trial the new foam dressing.

Case Report 1

Ms. A is a 73-year-old woman with a history of diabetes mellitus, obesity, venous insufficiency and lipodermatosclerosis. Her arterial flow was intact (toe pressure adequate). She had multiple recurrent infections, predominantly strep, methicillin-sensitive *Staphylococcus aureus* and *Pseudomonas*.

Ms. A had multiple bilateral lower extremity ulcers >1 year. The three ulcers on her left leg were the largest, one measuring 6 cm (irregular shape), with a fibrinous base and significant periulcer maceration and stasis dermatitis. She had one ulcer on her right leg that measured 2 cm; this ulcer healed during treatment before initiation of the study dressing. We chose to try the Kendall™ AMD antimicrobial foam dressing relevant to her significant wound drainage, as we believed it would better manage her secretions and periculcer maceration. The dressing was applied directly over the wound and affixed with conform gauze and an overlying ACE wrap.

Ms. A found the study dressing to be comfortable and she exhibited no skin reaction, unlike her previous use of three different silver dressings and one plain alginate dressing with which she reported discomfort. Her treating clinicians found the absorptive capacity of the antimicrobial foam dressing better than any other dressing tried previously. Because Ms. A was receiving systemic antibiotics at time of dressing trial, clinicians were unable to determine the effectiveness of the dressing's antimicrobial properties.

Case Report 2

Eighty-two year old Mr. B had chronic ulcerations on his left ankle with multiple previous hospitalizations for recurrent infection. His medical history includes aortic valve replacement, congestive heart failure (CHF), anemia (multifactorial), and monoclonal gammopathy (suspected multiple myeloma). Arterial inflow is intact.

Mr. B's ankle wounds included Stage II lymphedema with a chronic left lateral ulcer that had healed previously but frequently recurs, typical in a setting of noncompliance with leg elevation and Pseudomonal infection. Venous insufficiency was mild but edema was evident and related to the CHF. Mr. B's wounds were positive for methicillin-resistant *S. aureus* (MRSA), pansensitive *Pseudomonas* and occasional other Gram negative organisms (*Morganella*, *Citrobacter*).

We chose to use Kendall AMD antimicrobial foam dressing to address heavy drainage from the wound and multiple pathogenic organisms recently cultured, hoping to provide some form of antimicrobial control to enhance his oral antibiotics.

Mr. B found the dressing extremely comfortable under two-layer compression wrap, and the dressing's absorptive capacity was excellent. Mr. B did not have any obvious skin intolerance. Because Mr. B was receiving oral antibiotics (minocycline) at the time of the trial, the dressing's antimicrobial properties could not be assessed.

Case Report 3

Ms. C is 64 years old and morbidly obese (body mass index >40). Her medical history includes insulin-dependent diabetes mellitus (IDDM) and peripheral vascular disease (PVD) with suspicion of arterial insufficiency (she was

undergoing vascular evaluation during the 2-week product trial).

Ms. C had a right lower-leg lateral aspect ulcer measuring 8 cm x approximately 5 cm with occasional fibronecrotic coating. The ulcer is usually painful and difficult for Ms. C to access due to body habitus so she has difficulty applying most dressings and is often forgetful/semi-noncompliant. She had been using compression stockings in conjunction with various foam dressings. Ms. C also has experienced multiple recurrent infections caused by MRSA, *Pseudomonas*, *Klebseilla*, and *Enterobacter* species.

The antimicrobial foam dressing was applied to address copious drainage. Ms. C found the dressing uncomfortable because it deformed surrounding skin under compression. However, drainage was controlled adequately and Ms. C showed no signs of skin sensitivity. Dressing use was discontinued due to difficulty of application and discomfort.

Conclusion

The Kendall AMD antimicrobial foam dressing appeared to work for highly exuding wounds. Antimicrobial activity could not be assessed in this three-patient trial — all of the patients with recurrent cellulitis were receiving antibiotics at the time of the study. The dressings showed yellowing around the edges; this probably did not affect their efficacy but was noted by the patients. The dressing color easily displayed the colors of the wound discharge.

Moderator's Commentary

These cases demonstrate that exudate management is excellent with these dressings. Two patients reported that the dressings were comfortable with no skin sensitivities. Patients with venous insufficiency and lower leg ulcers usually have large amounts of drainage and dressings that can manage the exudate in conjunction with compression are necessary. Many of these patients also present with skin problems like stasis dermatitis that may be secondary to some type of sensitivity to products used. The fact that no sensitivities developed is important. It is also interesting that in the first two cases, the patients had ulcers of long duration with histories of multiple recurrent infections. MSSA, MRSA and Pseudomonas were among the organisms reported. This supports the data that many venous ulcers are non-healing because of high bacterial counts. Although the patients were on systemic antibiotics, and any positive outcomes could not be contributed directly to the antimicrobial topical dressing, local wound bioburden control and prevention of cross contamination always have positive outcomes when managed effectively.

Moderator's Final Commentary

Carolyn Cuttino, RN, BS, CWOCN, Medical University of South Carolina, Charleston, SC

Discussion throughout this paper has focused on topical management of wound bioburden. It has been demonstrated through laboratory studies, clinical studies, and these case presentations that the Kendall™ AMD antimicrobial foam dressings and other AMD dressings can be effective choices for management of MRSA, VRE, *Pseudomonas aeruginosa* and other clinically relavent bacteria in the chronic wound. The utilization of antimicrobial dressings for the wound with clinical symptoms of critical colonization and even in conjunction with systemic antibiotics also has been discussed. But what about the colonized wound with no signs and symptoms of a potential problem or infection? Is there a place for a "prophylactic" or "proactive" dressing that will prevent critical colonization and potential wound infections from occurring, and, at the same time, manage excessive, unhealthy chronic wound fluid? With the increasing problem of wound infections and non-payment for wound complications, with the increasing problem of HA-MRSA and CA-MRSA and other antibiotic resistant organisms, and with the increasing financial burden chronic wounds and their complications are placing on the healthcare system, using a cost-effective, proactive antimicrobial dressing that can effectively manage wound bioburden and drainage and also provide an effective barrier to prevent cross-contamination seems like a reasonable and viable strategy. Healthcare providers must be proactive in decisions about their management of bioburden in chronic wounds.

Ms. Cuttino is a board-certified enterostomal therapy nurse at the Medical University of South Carolina. She has served as a consultant in wound care for acute-care facilities, long-term-care facilities, and industry. Ms. Cuttino has chaired regional wound care meetings for the past 10 years and has educated thousands of clinicians while receiving consistently excellent evaluations.

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