

Special Advances in Skin and Wound Care Edition

Update and Report:

from the Offices of **Steven R. Kravitz, DPM, FAPWCA, Executive Director** and **Robert Gunther, DPM, FAPWCA, President**



World renowned faculty who participated in the International Debate on Treatment of Osteomyelitis

It has been a great year and we thank each member for their support and involvement with the many activities in which the APWCA is engaged. The APWCA now represents the largest number of physicians of any wound care organization in the United States. Additionally nurses and other health care professionals are constantly joining. There is greatly increased interest and membership participation in our committees. We recognize each member is an

important contributor to the APWCA and toward that end we share the Association's success with each of you. Our leadership is always open to suggestions members make. We look forward, each year, to seeing and meeting a larger portion of the membership at our annual spring national conference.

The Annual APWCA National Conference continues its growth as a world-class educational event. Total attendance for our April 2006 meeting was estimated at over 650 with a significant increase in corporate support. Nearly 40 faculty members from the United States, Canada, the United Kingdom, India and Ghana participated. Registration reflected a healthy balance of physicians, nurses and other fields representing every discipline involved in wound care. Those attending were from all corners

(continued on page 4)

Feature

Pain Control in Wound Care Practices

Causing less pain when practicing wound care requires innovative and novel new technology

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A brief history of the development and accomplishments to date

The primary challenges in designing advanced wound care therapies require the development of new strengths in product technology. The three priorities appear to be: exudate management to treat heavily draining wounds, reduction and control of pain during dressing changes, and finally, adequate secure placement of product to the wound bed to help control lateral wicking that causes unwanted maceration to the peri-wound tissue and breakdown of viable epidermis.

The availability of advanced medical-grade polymeric materials has led to the development of such greatly needed products such as hydrocolloids, foams, hydro fibers, alginates, and hydrogels. Marked improvements in wound healing outcomes has followed the introduction of these advanced moist wound healing products^{1,2}, leading to a

virtuous cycle of further research into novel material technologies. Some of this recent investigation has also begun to address the problem of pain with dressing removal³.

Wounds have long been associated with pain, and it is well accepted that wound pain is an ongoing challenge for the patient and the clinician⁴. Szor and Bourguignon reported that 87.5% of patients reported pain at dressing change and 84.4% of patients with wounds reported pain at rest. Of those patients complaining of pain during dressing changes, 18% described their pain as "horrible" or "excruciating." Forty-two percent of patients reported their pain as continuous, occurring both with and without dressing changes. Only 6% of the patients had been prescribed analgesics to address their pain⁵, though topical anesthetic therapy has more commonly been used for procedures such as high-pressure pulsed lavage or aggressive wound debridement.

(continued on page 5)

INSIDE THIS ISSUE

Editor in Chief's Report	2
Treatment Options for Biochemical Relief from Pruritus	2
Building Molecular Level Odor Control into a Hydrocolloid Dressing	3
Members in the News	4

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Editor in Chief's Report Newsletters are Pivotal

Larry Schuster, DPM, FAPWCA



Newsletters are pivotal for groups such as the APWCA. They provide a specialized message to a vital, targeted audience. This issue of SYNERGY is condensed as we are incorporating our newsletter into our endorsed journal, *Advances in Skin and Wound Care*. We hope this "taste" encourages you to visit our APWCA website at <http://www.apwca.org>, to review previous issues as well as other useful resources.

SYNERGY delivers information that fosters and facilitates the exchange of information; provides a forum for discussion of issues of importance to the members; disseminates useful and

instructive articles and ideas, advocates for patients and promotes mutual support among practitioners. APWCA membership has grown exponentially and is diverse in both medical specialty and nationality.

SYNERGY calls attention to members who have received special recognition. All members are welcome to submit newsworthy information to our "Members in the News" feature. Dr. Jane Fore, chair of our author's committee, also welcomes submission of articles of interest to the membership. Writings may include interesting case studies, original research or literature reviews. Dr. Fore may direct these articles not only to SYNERGY but also *Advances* and other appropriate publications.

Have a pleasant summer and enjoy our latest issue of SYNERGY! We look forward to hearing from YOU!

Feature

Treatment Options for Biochemical Relief from Pruritus

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Skin health is negatively affected when the itching stimulus leads to uncontrolled scratching. In severe cases, the skin may break completely to form open wounds and potential secondary infection. Preventive measures to address pruritus through the application of well-designed skin care products may be the best way to prevent the progress of an itching stimulus to a full-fledged open wound or skin abnormality. In order to address the issue of pruritus relief, it is worthwhile to examine briefly the leading cellular and biochemical components that are at the root of the problem of uncontrolled pruritus.

Mast cells and the harmful chemical they contain, histamine

Mast cells (see Figure 1) are resident in connective tissue and skin¹. These cells are part of a normal mature immunity system and have the potential to release granules, a process accurately called degranulation. The granules present in the mast cells contain a potent amine named histamines² (see Figure 2). Through a biochemical process, histamine ultimately causes nerve end stimulation, creating the sensation of itchiness near the skin surface, at the dermal-epidermal junction³. The release of mast cell granules happens when there is an insult to skin,

Figure 1. Mast cells

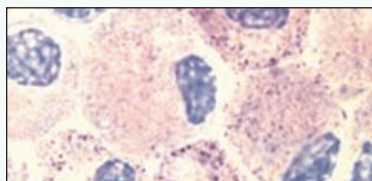
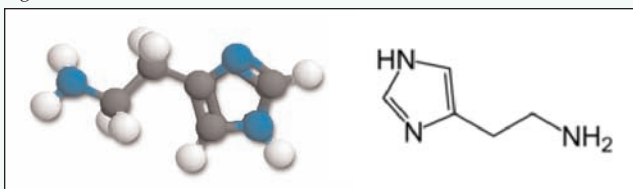


Figure 2. Histamine molecules



e.g., through infection, xerosis, dermatitis, inflammation, insect bites, or sunburn. A therapeutic product that is designed to address itchiness should aim to generally reduce the level of histamine. This may be achieved by preventing degranulation directly through the use of beneficial chemicals, or indirectly by reducing the activity of the other chemical entities that encourage degranulation⁴.

The following biochemical entities also have roles to play in pruritus:

1. The occasionally problematic chemical class of prostaglandins:

Infected and inflamed skin possesses excessive levels of a sometimes useful chemical called prostaglandin E-2 that reduces the stimulatory barrier for mast cells to release their granules (and thus the enclosed histamine)⁵. Therefore, infected or inflamed skin tends to itch more easily with very little external stimulus.

2. The generally challenging chemical class of leucotrienes:

Infected and inflamed skin also has excessive levels of chemicals called leucotrienes, which promote three effects, all harmful, which are: further inflammation, degranulation of mast cells, and increasing the sensitivity of the nerve cells responsible for the feeling of itchiness⁶.

In short, the "bad" chemicals encourage the mast cells to degranulate, which triggers the "itching" cascade, leading to further inflammation, and even greater level of degranulation, in short, creating a vicious cycle that ultimately results in destruction of skin and tissue loss, if the pruritus or itching is left uncontrolled.

(continued on page 7)

Building Molecular-Level Odor Control into a Hydrocolloid Dressing

Thomas A. Serena, MD, FACS, FAPWCA, Medical Director; Penn North Centers for Advanced Wound Care, Warren, PA

The issue of odor that develops under a wound dressing, specifically hydrocolloid dressings, has long been one that affects the quality of life of the patient as well as the clinicians who care for them.

Attempts made to remove odor have involved the use of simple solutions such as room deodorizers, ventilation, deodorizers and drugs such as metronidazole, or materials such as charcoal¹.

Molecules such as cyclodextrins have been used in consumer products such as Febreze® (Proctor and Gamble, Cincinnati, OH) to remove odor. These molecules work through the concept of host-guest chemistry, where the active ingredient in the product, through its rather unique shape, irreversibly captures molecules of odor in the environment.

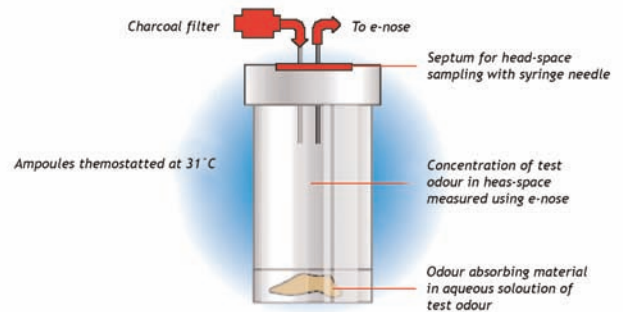
In attempts to develop an efficient dressing that may use such well-proven host-guest chemistry, researchers have developed an odor measurement device that reproducibly mimics the human nose (see Figure 1). Sensitive analytical methods have been used to yield conclusions that seemed to translate well in real clinical practice. Essentially, the air around a wound dressing, exposed to an odoriferous liquid in an enclosed space, would be analyzed for molecules that are associated with odor. It is, of course, well known that the sense of odor is a chemical process wherein odoriferous molecules directly interact with nasal receptors.

Figure 1. E-nose schematic

Using this odor detection device, it has been found that dressings that contain charcoal are indeed able to remove odor. This function, however, seems to be rapidly lost in the presence of serum proteins, because it appears that serum proteins are preferentially and irreversibly adsorbed on the active surfaces of charcoal, thus blocking the odor elimination capacity of the charcoal. This has negative implications for charcoal-containing wound dressings, as wound exudate invariably contains a large proportion of proteins.

A new generation of hydrocolloid dressings (Exuderm® OdorShield™, Medline Industries, Mundelein, IL) contains cyclodextrin, whose odor removal capacity is actually

Figure 1. E-nose schematic



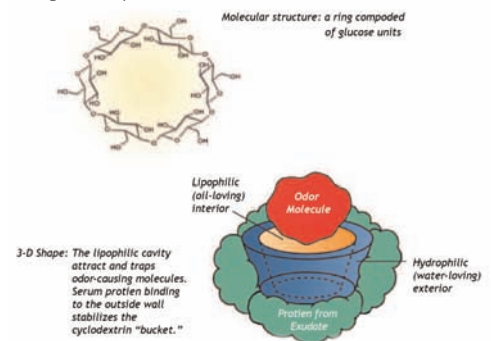
enhanced by serum proteins, as the tests performed with the specially developed analytical methods, described above, have shown.

At a molecular level, the cyclodextrin molecule present in these dressings assumes a “bucket” shape when hydrated in the presence of liquid water² (see Figure 2). The “bucket,” as the name implies, provides a depression into which odor molecules tend to fit quite effectively. Odor in a wound is of various origins; for example, catabolic amines such as putrescine and cadaverine, both of which possess extremely unpleasant odor, are present in many wounds.

Figure 2. Molecular structure and bucket-shaped conformation of the cyclodextrin (starch) molecule that captures lipophilic odor molecules, neutralizing odor.

More importantly, serum proteins in wound exudate are too voluminous in size to fit into the depression in the bucket shape of the hydrated cyclodextrin molecule. The size of cavity of naturally occurring cyclodextrins is between 4.7 and 8.3 Angstrom. It is known that serum albumin is the smallest of the four main classes of plasma proteins, namely serum albumin, serum globulin, fibrinogen and prothrombin. The smallest protein among these, serum albumin

Figure 2 cyclodextrin (starch) molecule



(continued on page 6)

APWCA is to terminate Open Enrollment for membership as voted at the recent Board of Directors meeting. The various alternative pathways that will be available to attain Fellow, Diplomate or Associate are being developed. Look for updated information as it becomes available. Those considering joining or members who have colleagues that plan to join while open enrollment is available should keep this information in mind.

Update and Report from the Offices of:

(continued from page 1)



of the United States, Canada, and England. Mark your calendar for April 19-22, 2007 and plan now to attend our next APWCA National Conference in Philadelphia, PA.

During the National Seminar this past April, we convened our first APWCA House of Delegates Meeting. A healthy, interactive discussion was held. The four regional districts will be modified to coordinate with the states that make up the four regions for CMS (Medicare). This will allow our four regional districts to better coordinate insurance-related issues.

We will continue grass roots contact with membership through multiple regional seminars and local dinner meetings, with plans to start these overseas as well. Upcoming APWCA conferences include a regional meeting in Seattle for late fall 2006 and a meeting in Anchorage during summer 2007. A schedule of conferences that will offer CME/CE for different fields is available on our website (<http://www.apwca.org>). The APWCA seminars are intended to be multidisciplinary and anticipated to provide CME/CE approval for Medicine, Podiatry and Nursing. Additionally the approved credit hours of the CME/CE will be applied toward that required by the Association to maintain credentialed status as Fellow, Diplomate or Associate.

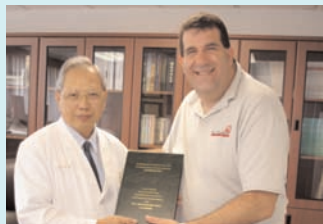
We have made the commitment! APWCA will be an American Host Society for the 2008 World Union of Wound Healing Societies (WUWHS). This third congress will take place June 4-8, 2008 in Toronto, Ontario, Canada and is anticipated to draw 5000 to 8000 attendees. More information will be forthcoming as this presents an excellent opportunity for APWCA and our membership.

We encourage all members to join us in Toronto. Dr. R. Gary Sibbald, General Chairman of the 2008 World Union of Wound Healing Societies, is an active member of our Medical Advisory Board. Serving on the core planning committee of the world congress is APWCA Board of Directors member Elizabeth Ayello, PhD, RN, FAPWCA. Dr. Sibbald had a planning committee meeting during the 2006 APWCA National pre-conference activities and has announced that he again will have a United States planning session during the 2007 APWCA pre-conference meeting sessions as well.



Planning Committee Meeting for the 2008 World Union of Wound Healing Societies (WUWHS)

Members in the News



Dr. Wang and Dr. Tutnauer

This past February, Dr. Philip Tutnauer traveled to the Far East where he lectured to groups in Taiwan and the Philippines. At Cebu Doctor's University in Cebu City, Philippines, he presented a talk on "Foot Ulcers and other Dermatological Conditions" to nurses, physical therapists, occupational therapists and physicians. He also met with Dr. C. Wang of Taiwan, originally an Orthopedic Surgeon with the Mercer-Bucks Orthopedic group of NJ and Pennsylvania. Dr. C. Wang would like to communicate with U.S. APWCA members performing extracorporeal ultrasound to accelerate wound resolution; he is conducting an extensive study in Taiwan on this subject.

In lecturing, Dr. Tutnauer found the New APWCA Power Point CD "Fundamentals of Wound Care" to be an important resource for his lectures as well as his almost daily emails to Dr. Gunther and Dr. Kravitz. In his interview with SYNERGY, he stated, "the American Professional Wound Care Association is a valuable resource whether you are in NJ, Pennsylvania or even the Far East."



Elizabeth Ayello

APWCA legislative committee members, Board Member Elizabeth Ayello, PhD, RN, FAPWCA and Laura Stasik, MSN, RN, DAPWCA, recently attended and responded to the Wound Healing Society summit for their Ulcer Practice Guidelines. The association will continue legislative and insurance initiatives. In that regard we will also continue to work with Marcia Nusgart, R.Ph., AAPWCA, of the Alliance of Wound Care Stakeholders and other organizations that have collaborative interest in related issues. Look for updated legislative news in upcoming E-Mail News Updates, future editions of Synergy and the APWCA web site.

Pain Control in Wound Care Practices (continued from page 1)

The foremost and largely common component of pain in wound healing, in the opinion of most clinicians, continues to be the act of dressing changes⁶, and this issue is tightly woven into a lack of patient adherence to frequent and appropriate dressing changes. Wounds that arise from commonly painful etiologies (such as lymphedema, trauma, arterial/venous insufficiencies, vasculitis and pressure) are often exquisitely sensitive to the removal of any adhesive product from the wound site.

While a great deal of education and priority has been placed on managing pain during wound healing, we in no way have a standardized evidence-based model that consistently and adequately helps to control pain.

In addition, dressing design and wound pain management have not, however, always gone hand-in-hand⁷. For example, dressings that handle exudates efficiently and still can remain secure around the wound site have generally utilized acrylic adhesives (which are polymers of acrylic acid esters) for securement. Such adhesives are common in the adhesive varieties of film dressings, foam dressings and non-woven or gauze dressings. Another class of adhesive dressings, the hydrocolloids, typically utilizes an adhesive polymer such as polyisobutylene, or mineral oil plasticized synthetic block copolymers (styrene-butadiene-styrene or styrene-isoprene-styrene copolymers being the more common polymers in this category). Synthetic or natural tackifier resins are often used to enhance the adhesive ability of hydrocolloid-based adhesives. Both hydrocolloid and acrylic adhesives are inherently "aggressive" by nature, and for hydrocolloid adhesives in particular, the degree of adhesion to peri-wound skin increases with residence time of the dressing in situ. Both acrylic adhesive as well as hydrocolloid dressings tend to strip the top layer of stratum corneum when the dressings are removed. In addition to the associated pain, this skin stripping and the subsequent attachment of the skin cells to the adhesive makes the product unsuitable for repositioning onto the underlying skin. This repositionability is important if the intent of the dressing removal (e.g., from an edge or corner) was only to examine the wound bed, something that a clinician is frequently tempted to do⁸.

By far the adhesive/dressing combination that is known to cause the least pain upon dressing removal is based on silicone adhesive technology. The origin of such products lies in the decades-old development of anti-scar products. Adhesive silicone products have been used regularly on scars, as there is a great deal of clinical evidence that the long-term use of such products over time reduces the dimension and severity of scar tissue.

The removal of the silicone-based anti-scar dressings (these dressings are meant to be repositioned and reapplied) tends to be a pain-free procedure. Their intrinsically gentle

adhesive nature makes it possible for them to be reusable, as skin stripping, and subsequent destruction of the adhesive properties, does not occur during removal⁹ even with sensitive and fragile skin.

Wound dressings that use silicone technology thus already arrive at the clinic with certain historically proven advantages as far as absence of pain during removal is concerned. Most painful wounds with sensitive peri-wound areas also tend to produce large amounts of exudates. It is thus ideal for the atraumatic (in this context, silicone) dressing of choice to also have a significant fluid handling capability. In a simplistic scenario, a foam island surrounded by an atraumatic silicone adhesive could afford such dual functionalities of pain-free dressing removal and high absorbency. Such simple constructs are, however, most likely to let the exudates be squeezed out under the pressure of compression bandages that would also normally be used around these wounds. It is important then that the exudates absorbed in the ideal dressing be resistant to being squeezed under the pressure of compression bandages.

New Developments in the Field

Atraumatic dressings that have been available to the clinician in recent years do not have a material mechanism built into the foam component to prevent the release of wound exudate under pressure. Based on our clinical experience to date, a newly launched atraumatic dressing* has assisted in the resolution of exudates being squeezed out by bandage pressure with the incorporation of super-absorbent components placed into the product. Polyacrylate-based super-absorbent technology is effective in irreversibly (to pressure) absorbing physiological fluid; however, the exposure of such particles directly into the wound bed would be of questionable clinical merit because these particles are not truly biodegradable.

The new atraumatic super-absorbent dressing avoids this problem of directly introducing super-absorbent particles into the wound bed by placing these particles behind the foam center of the dressing. The foam component of this new dressing, in essence, possesses an absorbency gradient, with the higher absorbency section (containing the super-absorbent particles) designed into the distal surface of the foam. This feature, of course, allows the wound fluid to move away from the wound contact layer of the foam, reducing the chances of periwound maceration.

It is hoped that further research will continue in the field of multifunctional atraumatic dressings that allow the clinician to approach the painful wound with confidence and the patient not to fear the event of a dressing change.

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Building Molecular-Level Odor Control into a Hydrocolloid Dressing (continued from page 3)

has an approximate size of 30 x 30 x 80 Angstrom³; thus, proteins are much too big in size to fit into the “bucket” of the cyclodextrins, though it is not unreasonable to expect that they may have non-covalent interactions with the “outside” of the cyclodextrin molecule.

At a molecular level, in contrast to charcoal products, the proteins in the wound exudate are therefore unable to negatively affect the odor-removing function of the cyclodextrin active ingredient. In fact, theoretical research has shown that the binding (covalent or otherwise) of polar molecules such as proteins to the “outside” of the cyclodextrin “bucket” may have positive effects on the stability of the odor-absorbing “bucket” conformation⁴.

Clinical practice using these dressings seems to indicate that the dressing indeed removes odor effectively, and the amount of wound exudate present in the tested wounds does not seem to overwhelm the odor-removing capacity of the special hydrocolloid dressing containing cyclodextrin⁵.

It is also crucially important that this introduction of a novel component in the hydrocolloid (cyclodextrin) does not affect the primary function of the hydrocolloid, which is its absorptive capacity. Tests have shown that the new cyclodextrin ingredient has not affected the absorptive capacity of the novel hydrocolloid dressing (See Table 1).

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Table 1. Absorption capacity comparisons

Property:	Thickness	Static absorption
Test Method:	ATM - T07/020	ATM - T06/021
Unit:	mm	g/m ² /24h
Exuderm OdorShield™	0.6	2550
3M Tegaserb® Thin	0.5	2202
ConvaTec Duoderm® Extra Thin	0.6	1667
ConvaTec Combiderm® ACD	1.6	2500
Coloplast Comfeel Ulcus®	1.1	3099

* thickness of hydrocolloid only

Clinical studies are underway to obtain more data on the effect these new dressings have on a wide variety of odoriferous wounds. It is expected that this data will conclusively prove the efficacy of these novel dressings in addressing the important quality of life issue of odor removal.

Multiple website enhancements include the addition of a section for abstracts. We also added online registration for new APWCA members. Additionally, registration for the 2006 national conference was also made available online. This electronic registration will be available next year as well.



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Treatment Options for Biochemical Relief from Pruritus (continued from page 2)

Why do certain products work to reduce pruritis?

Products with the following components have been found to reduce itchiness and pruritus based on clinical observations*:

1. Hydroxytyrosol (olive extract)

Hydroxytyrosol, through its anti-oxidant and free radical elimination activity, reduces inflammation (oxidation = inflammation⁷, in general terms) and reduces the formation of the harmful chemicals, such as leucotrienes, whose harmful activities are explained above.

2. Aloe barbadensis leaf juice (aloe)

This contains a chemical, alprogen, that prevents mast cells from degranulating. Alprogen inhibits the antigen/antibody-mediated release of histamine and leucotriene from mast cells, therefore inhibiting the sequelae⁸.

3. Vitamin B₃ and B₆

These nutritional factors also prevent the degranulation of mast cells. To reiterate the role of the mast cell granules, their release starts the "itching" cascade; thus, any agent that prevents degranulation also reduces itching. Vitamin B₃ is also known to reduce the sensitivity of the nerve fibers.

4. Vitamin A

A deficiency in this vitamin in skin leads to inflammation⁹, leading to the release of the harmful chemicals (leucotrienes, prostaglandins) implicated in mast cell degranulation. A skin care product that addresses any possible skin deficiency of Vitamin A will help in the prevention of itchiness.

5. Silicones

Excessive drying of skin inflames the stratum corneum, leading to the creation of harmful biochemical triggers of degranulation of mast cells, which further leads to the itching cascade. Silicones prevent excessive drying of skin through their controlled barrier properties. Studies have shown that products containing silicones^{10, 11}, for example, conserve four times the water in skin as the control.

6. Phospholipids

Drying of epidermis can also be caused through the use of harsh soaps and cleansers that remove from the "brick and mortar" structure of the stratum corneum the "mortar", which would be the essential natural oils. Phospholipids are gentle amphipathic molecules that possess bipolar structures, a configuration that allows dirt and greasy substances to be gently lifted away from skin, without the excessive dryness through the stripping of all natural oils away from skin^{12, 13}.

In conclusion, itchiness or pruritus is a biochemical process, in which histamine, the chemical that has the most potentially damaging property on skin health, is released. Histamine levels can be well controlled directly by managing mast cell degranulation, and also indirectly by manipulating chemicals that, in turn, control mast cell degranulation.

Skincare products may be formulated with certain key components that are proven to be beneficial at controlling, both directly and indirectly, the release of histamine. In doing so, such products may alleviate itching and allow the skin to heal. Such products restore the skin health by pulling it out of the vicious cycle that uncontrolled itching causes, and subsequently drives the damaged skin into a virtuous cycle of relief from itchiness, and consequent healing.



***REMEDY Advanced Skin Care products, Medline Industries, Inc., Mundelein, IL, U.S.A.**

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