

Wound Care™

Your independent guide to wound management

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Just say NO: An exciting possibility for wound care takes the Nobel prize

Knowledge has been around for years; now researchers are putting it together

The role nitric oxide plays in keeping our bodies healthy is one of the hottest topics in healing circles — and may be the most exciting news in wound care today.

Though known for decades mainly as an atmospheric pollutant, nitric oxide (NO) is also produced by cells in several tissues of the body.¹ Last October, the Nobel Assembly announced three Americans had won the 1998 Nobel Prize in Physiology or Medicine for discovering that NO acts as a signal for the cardiovascular system by telling blood vessels to relax and widen. Thanks to the work of these scientists, NO is now known to stimulate the body's wound-healing response, defend against infections, and act as a regulator of blood pressure and a "gatekeeper" of blood flow to different organs.

Ronald G. Scott, MD, medical director of the Wound Care Clinic of North Texas at Presbyterian Hospital in Dallas, says nitric oxide deficiency is a "possible explanation as to why some wounds with apparently the same causation or diagnosis do not respond to the same treatments in the same way or at the same rate." It seems astounding that this common air pollutant, formed when nitrogen burns, could beneficially influence human health—especially when you consider that NO is so unstable, it is converted to nitrate and nitrite within 10 seconds.

NO stimulates collagen production, appears to enhance macrophage and white cell activities, and is key in matrix remodeling and fibroplasia of the wound, according to **Joseph V. Boykin Jr.**, MD, medical director of Retreat Hospital Wound Healing Center and assistant professor of plastic surgery at the Medical College of Virginia in Richmond. "We're still testing this as a hypothesis," Boykin says, "and so far it does appear that nitric oxide is an extremely important regulator of the wound healing process."

Boykin says hyperbaric oxygen (HBO) therapy recently has been discovered to be an important source of nitric oxide production. "All diabetics are deficient in nitric oxide, so their wounds are deficient in NO. We are fairly certain that the poor wound healing diabetics demonstrate is linked to a nitric oxide deficiency as much as to any other thing. What this now allows us to do is to look at the experience that people have had with hyperbaric oxygen therapy

and diabetic wounds. For a long time, we've looked at the oxygen side of HBO, and felt very comfortable that this could explain a lot of what HBO did for wounds. But now that we know that HBO significantly increases the amount of nitric oxide in wounds that are probably deficient in it, we can go back and redesign that whole schema, and things really begin to make a lot more sense.

"Suddenly you begin to look at this diabetic patient," he says, "and you see that all of these things are in some way related to the unhinging of the physiology of these organs because of the absence of sufficient amounts of nitric oxide. This is why we got really excited about the wound healing part of it. The information we glean about nitric oxide's role in wound healing will do two things right off the bat: open up a whole new perspective on wound healing, and firmly establish HBO's credibility because we will be able to look at HBO as a delivery system, not only for high oxygenation but also for nitric oxide. That combination makes for a very exciting future for wound research.

"I just really became aware of the relationship between nitric oxide deficiency and diabetics in the last few years," Boykin says. "I talk about this with clinicians who've been working with diabetes for a long time, and they frown and look at me and ask, 'What do you mean?' And then we start reviewing it, and they say, 'My gosh, I didn't realize this.' This kind of information has been at a laboratory level, and now it's just beginning to come to the surface. It's the kind of news that's going to keep a lot of us busy looking at new ways of treating things."

Understanding the relationship between NO deficiency and diabetics means understanding how NO is produced in our bodies. There are two substrates for nitric oxide: One is oxygen, and the other is the semi-essential amino acid L-arginine, commonly called arginine. **Woodson Merrell**, MD, executive director of Beth Israel Center for Health and Healing in New York and assistant clinical professor in medicine at Columbia College of Physicians and Surgeons at Columbia University in New York, details the arginine-nitric oxide connection in his book, *The Arginine Solution*.²

"L-arginine is primarily a nitrogen donor, the primary nutrient the body uses to make almost all the nitric oxide that's in the body for virtually every physiologic process that uses it," Merrell says. "Arginine enhances the immune system in general. Part of wound healing, obviously, is having a strong immune system, so that's where arginine would be of particular benefit."

Merrell points out that arginine also stimulates the release of growth hormones from the brain and that one of its mechanisms for wound healing may be making more growth hormone available for tissue regrowth. Arginine may have effects reaching far beyond just providing a nutrient to the tissue to make protein.

Studies have shown that arginine speeds wound healing via several different mechanisms. In a clinical study reported in the August 1990 issue of *Surgery*, scientists recruited 36 healthy volunteers from medical and nonmedical hospital personnel. None of the subjects suffered from diabetes, smoked, or took drugs known to impair wound healing. The 36 subjects were randomly placed into three groups of equal size. Group 1 received 100 ml/day of an aromatic syrup as a placebo. Group 2 received 30 gm of arginine aspartate in 100 ml, while Group 3 received 30 gm of hydrochloride in 100 ml of aromatic syrup (the equivalent of 24.8 gm/day of free arginine). All supplements were taken throughout the day for two weeks.

Immediately prior to the study, and on days seven and 14, peripheral blood was drawn for analysis after an overnight fast. On the first day of the study, all the subjects underwent the creation of a "standard wound" (5 cm long, 1 mm in diameter) after receiving a local anesthetic. A catheter was inserted into the wound with one end sutured and left protruding from the skin. The wound then was covered with an occlusive, transparent dressing that was changed during the study as needed.

The primary finding of the study was that in both arginine groups, there was a significant increase in the amount of reparative collagen synthesized at the site of the wound. The scientists concluded, "To our knowledge, this is the first instance in which collagen synthesis has been shown to be enhanced to 'supranormal' levels." In the same study, there also was marked enhancement in the activity and effectiveness of peripheral T-lymphocytes in the bloodstream.³

How much arginine supplementation is safe?

Scott says arginine, which is present primarily in protein-rich foods, can be an important tool in helping stubborn wounds heal. "Some of the more expensive formulas for tube feeding that are necessary when the regular formulas aren't working are L-arginine-supplemented," Scott notes. "For a patient with bedsores that are failing to heal, even after they've been on good nutritional supplementation for a while, switching to a formulation with higher levels of L-arginine can result in improved healing. Some of the supplemental formulas provide 15-25 gm of arginine per day." Scott also

notes that it's difficult to get levels of arginine high enough to boost healing through diet alone, especially in the American Diabetes Association 1,800-2,000 calorie diet. He uses formula supplementation for older, debilitated, diabetic patients in skilled nursing facilities.

Patients not living in skilled nursing facilities can benefit from taking arginine supplements. Merrell says most studies have shown that 9,000 mg/day of arginine supplementation is statistically significant in helping reverse some of the damage in the small blood vessels in the body, including the coronary arteries. "A number of other studies have used anywhere from 3,000 to 6,000 mg," he says. "The intravenous studies were originally around 30,000 to 50,000. We say, start with 3,000 [mg arginine supplement/day] and move up to 6,000 if you need to. The average amount in the American diet is about 5,600."

Arginine can cause a drop in blood pressure

Merrell warns that arginine supplementation is not a "magic bullet." Dietary supplementation with arginine has been demonstrated to shorten wound healing times and rates, but wound care providers must be certain their patients do not have any conditions for which arginine supplementation is contraindicated. Boykin says most people can safely tolerate fairly hefty supplements of arginine, but cautions at the same time that a patient who has hypertension, heart disease, or thromboembolic problems could have serious problems from increasing the amount of this amino acid because it can cause blood pressure to drop.

"It's a very good substance for wound healing, but if given to the wrong person at the wrong time, it could lead to complications; however, I think looking at arginine-based therapy for diabetics will be the main entree on our plate for the new millennium," he says. "The news for the clinician at large is that nitric oxide-related deficiency in wound healing is something we're very keen on now, and we're beginning to look at how we can use this new information to better predict the patients that are at risk and help treat those that are already demonstrating problems related to wound healing."

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Burn wounds: The degree determines the protocol

Determining extent of burn wound isn't always easy

Knowing the degree of a burn wound is essential for correct wound treatment, but sometimes there are different degrees of burning within the same wound. Mastering the burn degree descriptions will help wound caregivers recognize a mixed-degree burn.

Steven E. Wolf, MD, assistant professor in the department of surgery at the University of Texas Medical Branch in Galveston and staff surgeon at Shriners' Burns Hospital, describes a first-degree burn as a sunburn, limited to the epidermis, that will blanch when the skin is pressed. "It's painful, but the epithelium will not denude and the burn is not at risk for infection. First-degree burns can be treated with topical salves, with or without aloe vera, and with a non-steroidal anti-inflammatory drug such as ibuprofen.

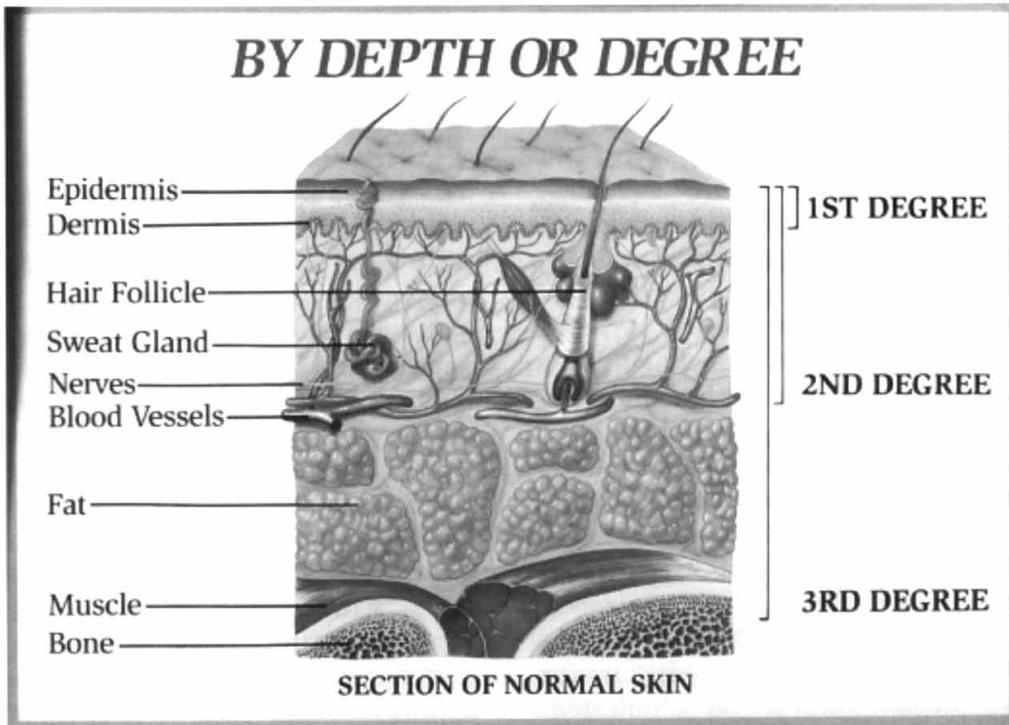
"Second-degree burns by definition include the epidermis and some degree of the dermis," Wolf says, "and both can be called dermal burns." There are two types of second-degree burns: superficial, which involves only the top of the dermis, and deep second-degree, or full-thickness burns. Clinically, the latter present with blistering and wounds that are wet and very painful. Usually these will heal in seven to 10 days; they are at risk of infection and should be treated with topical antimicrobials such as Silvadene. According to Wolf, deep second-degree burns are still sensate; however, they have an eschar and need to be debrided and treated with topical antimicrobials. Most also require excision and grafting. Partially because they have some keratinocytes remaining in the hair follicles, deep second-degree burns can heal within two to four weeks.

Burn degrees influenced by age

Because skin becomes thinner as people age, the degree of heat that would create a superficial second-degree burn in a young adult can easily cause a deep second- or even a third-degree burn in an elderly person. Also, as **Shannon Nelson**, RN, of the Grossman Burn Center at Sherman Oaks (CA) Hospital observes, patients often experience mixed degrees of burning. "A first-degree burn with a little bit of second can easily become infected," she says, "and patients often pick at

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Classifying Burn Wound Severity



BY EXTENT OR LOCATION

ADULT	FRONT	BACK
Head and neck	9%	9%
Each arm	9% (X 2)	18%
Each leg	18% (X 2)	36%
Torso	18% (X 2)	36%
Genitals	1%	1%
		100%*

ADULT **CHILD**

Figures shown are total of front & back

RULE OF NINES:

Assigning values of 9% to various parts of the skin surface is a useful method for estimating the percentage of burned skin.

* Relative proportions for head and legs are different for infants and children depending on age. The percentage allocated to the head and neck area ranges from 21% for an infant down to 13% for a child aged 10 - 14. Inversely, percentages for each leg range from 14% for an infant up to 17% for a child aged 10 - 14.

Source: Grossman Burn Center, Sherman Oaks (CA) Hospital.

burn wounds, which creates secondary infections.”

Third-degree burns extend through both the dermis and epidermis. Most if not all of these will require excision and grafting. According to Nelson, there are three kinds of grafts: xenograft (pigskin), which is widely used in burn centers; homograft, which is cadaver tissue; and autograft, which uses the patient’s own unburned skin. “Later, when the patient has healed sufficiently to have a tissue bed, grafts such as neonatal foreskin, Dermagraft TC, and Integra can be used,” Nelson says. She prefers Integra, especially in fasciotomies, in which flaying the skin open all the way to muscle leaves a crater. “My experience is that Integra seems to fill this better than other products.”

“No pain is the one thing you don’t ever want to hear, because if the wound isn’t hurting, the nerve endings have been destroyed.”

Patients often don’t realize the seriousness of third-degree burn wounds because there is no pain. Nelson says, “No pain is the one thing you don’t ever want to hear, because if the wound isn’t hurting, the nerve endings have been destroyed. We had a patient with a tar burn who was transferred to our burn unit from another hospital where personnel wanted to give him medication for pain. He was walking around with third-degree burns on his hands and face, saying, ‘Don’t bother, it doesn’t hurt.’ They didn’t understand that tar comes out of the pot at 550 degrees [F]. They were treating it with topical cleansing. Since the patient said he wasn’t having any pain, they figured he was OK and that in a couple of days he’d be healed and go home.”

Francis V. Winski, MD, assistant professor of surgery at New York Medical College in Valhalla and attending staff member of the university’s burn center, notes that while burn care unit physicians can see 300 to 400 patients per year, other physicians may not see that many during their entire careers. “We see a large number of patients at the office who really don’t end up requiring admission to the burn center because they were seen and treated by someone with sufficient experience in burn injuries.”

Winski says he likes to start all burn wounds with Silvadene dressing, which is usually well-tolerated and easy to apply. “I know a lot of people make a big deal about how to do it,” Winski says, “but it just takes a lot of common sense. When you’re going to do your

dressing, get everything that you’re going to need. Then, wash your hands thoroughly, remove the dressing, and wash the burned area with soap and water on a sterile gauze pad. In the burn center, everybody will put on sterile gloves and gowns so there’s no cross-contamination. If you’re caring for someone in their home, either clean gloves or sterile gloves would be fine. Gently wash and dry the area, then apply the dressing. If the burn area is small, it doesn’t necessarily need to be a sterile environment, it just needs to be a clean environment.” Winski warns against using, or allowing anyone else to use, a gel pack dressing. Though paramedics are often instructed to use gel packs, “all they [gel packs] do is make a mess out of things,” Winski says. “They make it very hard to get the wound cleaned.”

Wolf also uses Silvadene, which does not have a protein as its active molecule. He notes that the problem to date with effectively using topically delivered growth factors on burn wounds is that there are so many protease enzymes active on a burn wound site that the growth factor isn’t there long enough to work well. “Growth factors are dependent upon binding to a receptor and causing the cells there to do something,” he says, “and a lot of times the delivery system is inadequate.” Regarding the use of pressure garments for burn injuries, Wolf notes that “some studies have shown pressure garments have benefit in reducing or improving the appearance and functionality of scars; other studies have shown no benefit. The jury’s really still out.” ■

Y2K: No big deal for hands-on wound care

But check your devices and billing system anyway

Wound care professionals should double-check the status of their computerized accounting systems, but they probably won’t have any Y2K compliance problems when it comes to hands-on care.

According to **Alan Jackson**, computer specialist with Curative Health Services in Hauppauge, NJ, most companies that do medical billing re-evaluate their systems every few years due to the rapidity of changes within the information technology industry. “Just through recent computer system purchases, many Y2K issues would have been resolved,” Jackson says, “and a

Are you winning the reimbursement battle?

Editor's note: A major part of Wound Care's mission is to provide comprehensive, hands-on help for readers. We want to address all the issues that are important to you in your wound care practice. To do that, we need your input and feedback. With this issue, we begin a monthly question-and-answer column. Please send your questions to Wound Care, P.O. Box 740056, Atlanta, GA 30374, or fax them to the attention of Valerie Loner at (404) 262-5447. We'll find the expert answers you need.

Question: "I am constantly faced with denial of reimbursement for wound care. What can I do to get paid and protect myself in an audit?"

Answer: According to **Tamara D. Fishman**, DPM, president of the Wound Care Institute in North Miami Beach, FL, "There are really two questions here: Do you consistently get your due reimbursement? And do you know how to respond to an audit? Review your billing and documentation procedures. You must use the correct evaluation and management (E&M) documentation and coding. Codes must be to the most appropriate E&M documentation. You need to be sure you are not under- or overcoding."

"You can't avoid random computer selection for claim audits, so it's best to be prepared with the correct information and documentation in your clinic charts."

"Are you documenting adequately for your billing to stand up under a claim audit? You may never be audited, but every time you document in a patient's chart, you should be ready for one. You can't avoid random computer selection for claim audits, so it's best to be prepared with the correct information and documentation in your clinic charts. You must document your procedures and your evaluation of the patient at each visit.

"The key to success is understanding the codes and

self-contained, small office that prints its own bills could probably continue to do so. One product we have found very useful in identifying Y2K problems both at the hardware and shrink-wrap software levels is the program Norton 2000. On the hardware side, it will identify whether the hardware is certifiable and can even fix some hardware problems." Suggested retail price for Norton 2000 is \$49.95.

Wound care devices with computer chips such as irrigation pumps and wound vacs won't necessarily quit working on Jan. 1, 2000, because their functions aren't tied to time and date the way airline reservations and bank accounts are. **Sheila Robida**, manager for the Connecticut Hospital Association's (CHA) Y2K project, says many medical device manufacturers have told the FDA that most of their devices will be unaffected by Y2K problems, and those devices that might malfunction will have had possible Y2K problems resolved by the middle of this year. However, Robida points out that anything with a computer chip, from a magnetic resonance imaging system to a patient monitor, has a potential for failure. "It may be a pretty low potential, but the device should be checked out," she says.

To help health care providers ascertain the Y2K compliance of their equipment, CHA has formed Security Third Millennium (SIIM). SIIM's staff has developed a database on Y2K compliance by querying manufacturers of medical equipment. The information is offered to health care providers by subscription. Hospitals can either subscribe to SIIM's service and search its database for information on their particular devices and equipment, or send in their biomedical device inventory for review. In each case, the care provider receives a report relaying what manufacturers say has been done regarding the Y2K compliance of their products. Care providers other than hospitals may obtain query service on a case-by-case basis, the cost of which depends on the size of their inventories. "We are able to tell pretty quickly where you stand with Y2K compliance," Robida says. "We need a manufacturer's name, device model number, and serial number, if available. If the manufacturer is not yet contained in our database, we'll contact them and get the information." Subscription costs vary, depending on the institution type and its expenses. Prices range from \$2,500 for a hospital with expenses of less than \$6 million a year to \$20,000 for a hospital with expenses of more than \$150 million.

For further information, contact Security Third Millennium, Connecticut Hospital Association, P.O. Box 90, Wallingford, CT 06492-0090. Telephone: (203) 294-7247. Fax: (203) 284-9318. Web site: www.siiim.com. E-mail: robida@chime.org. ■

the procedures you are doing in wound care in order to be reimbursed. This means you must be knowledgeable about Medicare documentation and coding requirements, CPT diagnosis codes, and E&M codes. Managed care clearly has become a strong factor in both reimbursement issues and quality of care issues. Both the private health care industry and government insurance are making demands on providers to be as cost-effective as possible, which often translates into an decreased reimbursement. With managed care, you must know the amount of reimbursement your contract calls for. Just because you feel you deserve something doesn't mean that's your contract rate. You have to be familiar with your contract, what the reimbursement rate is, and how many times you can see, evaluate, and follow up on a patient based on those codes. That's going to vary from managed care plan to managed care plan. The bottom line is: Document, document, document."

Glenda J. Motta, BSN, MPH, ET, president of GM Associates in Mitchellville, MD, concurs that documentation will make or break your reimbursement. Prior to 1999, invoices for wound care supplies used in nursing homes were sent to one of four regional Durable Medical Equipment Regional Carriers (DMERCs), which was billed for the supplies costs. Nursing homes didn't have to be concerned about specific coverage requirements, billing information, or the quantities of supplies used. Now, all claims for supplies from skilled nursing facilities (SNFs) must be submitted to Medicare under the facility's own number. Motta says this change in reimbursement rules means SNFs must submit a great deal of documentation about the wound dressings they use and why they use them.

As bleak as this picture appears, there is help available to guide wound care providers through the maze of paperwork created by the new regulations. Motta and Kathi Whitaker, BSN, MSN, CETN, have co-written a 50-page booklet, *Defensive Wound Management*, that spells out wound documentation strategies for subacute facilities and SNFs. It's available for \$79.95 plus applicable sales tax from Pathways to Empowerment, 12300 Prospect Landing, Mitchellville, MD 20721. Telephone: (301) 390-4445. Fax: (301) 390-4446. E-mail: gmassoc@aol.com.

Fishman also recommends the Briggs Corp. manuals, a listing and description of which are available from the Wound Care Institute, 1541 NE 167th St., North Miami Beach, FL 33162. Telephone: (305) 919-9192. Fax: (305) 944-6260. Web site: www.woundcare.org. E-mail: Tamara@woundcare.org. WCI also has available a chart of dressing categories and their allowable usages. ■

Product POINTERS

Use of iodine as topical cleanser on wounds is still controversial

By **Liza G. Ovington**, PhD, CWS
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Long known and used as a highly efficient disinfectant for inanimate surfaces and as a broad-spectrum topical antiseptic for intact skin, iodine still generates controversy when used as a cleansing solution or topical antiseptic for open wounds. There are numerous sources of both *in vitro* (meaning literally "in glass" or in a laboratory experiment) and *in vivo* (meaning literally "in life" or in a living system) data about the effects of iodine on bacteria and on animal tissues or human tissues and cells. These data are often conflicting and confusing.

Pure or elemental iodine is a solid material that looks like purple or black crystals. Solid iodine is fairly uncommon, evaporates readily as corrosive purple fumes, and is highly irritating to the skin, eyes, and mucous membranes. The solid form of iodine is rarely encountered except by the laboratory chemist. Aqueous or alcoholic solutions of iodine are more common in everyday usage.

Iodine is just barely soluble in water — only about one-third of a gram of iodine will dissolve in one liter of water at room temperature. One way iodine can be rendered water-soluble is by chemically complexing it to a readily water-soluble material. The complex of iodine and a water-soluble material is called an *iodophor*. Iodophors dissolve in water and then release very small amounts of free iodine, which are responsible for antibacterial activity. Iodophors are sometimes called "tamed iodine." One of the most common (and most controversial) iodophors is povidone-iodine, which is iodine complexed with a polyvinyl pyrrolidone polymer. Most of the data concerning the effects of iodine on wound healing have been generated using povidone-iodine.

Povidone-iodine is available in several forms,

including an aqueous solution, an ointment, a cream, and a surgical scrub that includes a detergent. There are lab data to suggest that the antibacterial activity of the cream and the ointment formats is less than the aqueous solution or the scrub solution. The cream and ointment formulations have not been studied extensively in human chronic wounds. However, the existing data from animal studies and acute wounds in volunteers suggest that the vehicle portion of both products may have positive effects on healing. There have been both in vivo and in vitro studies of povidone-iodine solution and scrub that have demonstrated toxicity to cells such as fibroblasts, red blood cells, and neutrophils, as well as detrimental effects on wound breaking strength and capillary circulation. Toxicity of the povidone-iodine scrub has been attributed primarily to the detergent ingredient.

Studies focus on acute wounds, not chronic ones

Critics of these latter studies say animal data and data from cells in culture do not correlate with the human wound environment or experience with iodine. They cite other clinical studies where overall results of iodine usage in human wounds did not significantly delay healing. However, it should be noted that most of these studies have been carried out in acute wounds (such as surgical incisions, burns, and skin graft donor sites) as opposed to chronic wounds. The healing challenge presented by chronic wounds usually is different from (and more difficult than) the challenge presented by acute wounds. This is because chronic wounds have an underlying causative pathology as well as multiple factors contributing to delayed healing, such as poor nutrition or impaired blood supply.

There are relatively few studies of the use of povidone-iodine in chronic wound healing by secondary intention. One study in pressure ulcers compared the effects of silver sulfadiazine (SSD), povidone-iodine solution, and saline gauze on reducing bacterial bioburden as determined via quantitative tissue biopsy.¹ The investigators found that SSD was 100% effective at keeping the tissue bioburden below 10^5 (wound infection is often defined as greater than 10^5 organisms in the tissues), saline gauze was 79% effective, and povidone-iodine was only 64% effective.

The majority of the other studies of the use of iodine in chronic wounds have examined the effects of a different iodophor: cadexomer iodine. Cadexomer iodine is a unique complex of iodine with a starch-based polymer (cadexomer). The starch molecule has been modified so it is a hollow, perforated sphere. The iodine molecules, which are larger than the starch molecule's perforations, are encapsulated inside the

sphere. Imagine the starch molecule as a Whiffle ball and the iodine as marbles inside. The starch molecules are absorbent; as they absorb fluid, they expand, and the perforations get larger. Eventually, the perforations are large enough for small amounts of the iodine molecules to escape.

It is this free iodine that is responsible for the documented antibacterial effects of the product. It has been shown that as the cadexomer iodine complex absorbs wound exudate, a concentration gradient of free iodine is created such that the lowest concentrations are at the wound surface. As the iodine leaves the cadexomer spheres, wound exudate, debris, and bacteria are taken up inside. A benefit of this iodophor, beyond antibacterial activity, is that it also acts as an absorbent product and may assist in autolytic debridement. The cadexomer can absorb up to six times its weight in wound fluid and organic matter from the wound.

The wound healing effects of this particular iodophor have been studied in nine randomized controlled trials. The majority of the studies targeted venous leg ulcers²⁻⁸; however, diabetic foot ulcers and pressure ulcers were addressed in two of the trials.^{9,10} Overall, these clinical studies in chronic wounds have consistently shown that the cadexomer iodine product is not only effective at reducing bacterial counts in the wound; it also appears to positively affect the healing process when compared to standard treatments (usually gauze and saline) and to the cadexomer starch vehicle alone. Noted effects are increased rate of granulation, epithelialization, and debridement; reduced exudate; and patient reports of reduced pain. Cadexomer iodine has shown effectiveness against methicillin-resistant *Staphylococcus aureus* in an animal model¹¹ and against *Pseudomonas aeruginosa* in a venous leg ulcer clinical trial.¹²

Regarding potential adverse effects, in several studies, a few patients reported a transient burning sensation in the wound upon application of the cadexomer iodine. The literature also revealed two case reports of hyperthyroidism when the cadexomer was used on fairly large (8 cm² and 12 cm²) leg ulcers in elderly patients.¹³

A laboratory study of the mechanism by which the cadexomer iodine product may be enhancing the healing process suggests it may be macrophage-mediated. In vitro cultures of human macrophages were co-cultured with the cadexomer iodine, cadexomer iodine-conditioned media, or free iodine in the presence of bacterial lipopolysaccharide and monitored for cytokine production. The investigators found that all three conditions stimulated the macrophages to produce inflammatory cytokines (TNF alpha and IL6). It is postulated that such an increase in production of these

cytokines in a wound may result in a local influx of monocytes and lymphocytes that subsequently triggers a healing response.¹⁴

Cadexomer iodine may at last be a truly "tamed iodine" for use in chronic wounds to control bacteria and provide additional beneficial effects on the wound management process.

Cadexomer iodine is known commercially as Iodosorb Gel or Iodoflex Pad (a form that is more putty-like in consistency and moldable). It is distributed in the U.S. by HealthPoint Medical. Telephone: (800) 441-8227. Web site: www.healthpoint.com.

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NEWS BRIEFS

AAWM Internet update

The American Academy of Wound Management has two new Web sites. The first, at www.aawm.org, provides information on AAWM's wound care board certification and includes a list of certified wound specialists and an application for board certification.

Wound care information and resources at www.wound.net include The Wound Care Forum, an open discussion on wound care issues; wound care resources; wound care companies and facilities; and a wound care meetings calendar. ▼

Growth factor for wound healing starts clinicals

Keratinocyte growth factor-2 (KGF-2), a member of the fibroblast growth factor family, is beginning phase two clinical trials in the process of applying for FDA approval. **William Haseltine**, PhD, chairman and chief executive officer of Human Genome Sciences in Rockville, MD, manufacturer of the growth factor, says KGF-2 has finished both its animal and safety trials and is now being tested for use on patients with large, persistent venous ulcers in double-blind, placebo-controlled tests. Haseltine, a former professor of pathology and cancer biology at Harvard Medical School and Harvard School of Public Health, expects KGF-2 to be used in a topical formulation applied directly to the wound.

"KGF-2 has a distinct advantage over other growth factors that have been tested because it regenerates —

at least in preclinical animal studies — epidermal and dermal tissues that are well-vascularized with strong connective tissue,” Haseltine says. “We know of no other growth factor that has the favorable properties of KGF-2. It’s the growth factor your body uses to repair wounds to the skin and to mucosal epithelial tissues, as well as the lining of the lung and bladder.” HGS also hopes to use KGF-2 systemically for healing wounds to internal mucosa, primarily those wounds induced by high-dose chemotherapy, with which it would be delivered simultaneously.

Growth factors are natural substances, usually proteins, that the body makes to promote the proliferation of cells. One gene specifies one protein, and that protein is a specific growth factor. There are several growth factors currently used as medications. One is human growth hormone, a protein made from a gene expressed in the pituitary gland that is a general growth factor for many types of human tissues. Another is platelet-derived growth factor, which helps promote granulation of wounds. (See related story in *Wound Care*, March 1999, p. 25.)

Thomas A. Mustoe, MD, professor and chief of plastic surgery at Northwestern University Medical School in Evanston, IL, did some of the work with KGF-2 during its animal trials. “The animal experience with several wound healing models showed that KGF-2 is highly effective,” Mustoe says. “I personally think that growth factors have a lot of promise for wounds. We just have to figure out how to put them on.” One of the problems with using growth factors has been that the protease enzymes present at wound sites that defend the wound from bacteria also destroy growth factor proteins. Mustoe observes that KGF-2 is resistant to proteases, but says its application may need to be combined with protease inhibitors.

HGS has assembled an automated, computer-driven gene isolation and characterization system that Haseltine describes as “the equivalent of using an assembly line to create new knowledge about human genes. We were able to isolate and characterize what we believe are 98% of all human genes between January 1993 and December of 1995.” Genes are isolated by extracting messenger RNA from human tissue and converting it to complementary DNA. Reading the text of the genes’ nucleotide sequence allows scientists to predict which of them may be growth factors. Haseltine says the 40 novel growth factors reviewed by HGS prior to selecting KGF-2 for further study have not been previously described in scientific literature.

For further information, contact Human Genome Sciences, 9410 Key West Ave., Rockville, MD 20850. Telephone: (301) 309-8504. Web site: www.hgsi.com. ▼

New manual can steer you through Y2K

With the year 2000 deadline fast approaching, hospitals, other health care providers, and the medical device industry are scrambling to complete a process that in many cases was started too late. What may have once been a logistical issue is burgeoning into an overwhelming problem, compounded by scarcity of time, rising costs, and a lack of programming resources and expertise.

The health care industry has found itself under increased pressure as the realization dawns that it is behind the curve in preparing for Y2K. According to a recent Modern Healthcare/PricewaterhouseCoopers survey, the biggest Y2K-related worry among 69% of health care providers is that patients will be “affected due to faulty monitoring gear,” followed by concern over “inaccurate lab tests and pharmacy orders” (36%), problems with patient records (34%), and worries about billing and paychecks.

As the Y2K problem moves far beyond a solely technological issue, American Health Consultants, publisher of *Wound Care*, has published the *Hospital Manager’s Y2K Crisis Manual*, a compilation of resources for nontechnical hospital managers. This 150-page reference manual includes information in nontechnical language on the problems your facility could face, the potential fixes, and the possible consequences, including:

- Will your computers and software work in 2000?
- What does Y2K mean for patient care?
- What will happen to your medical devices?
- How can you make sure your vendors are Y2K-compliant?
- Are you at legal risk due to Y2K?
- Are you prepared if Y2K delays HCFA payments?

Jan. 1, 2000, is not a moving target. Either your computer systems, medical devices, and suppliers can handle the date change and maintain business as usual, or they can’t — in which case your entire organization may face serious problems. *The Hospital Manager’s Y2K Crisis Manual* is available now for \$149. For more information on the *Hospital Manager’s Y2K Crisis Manual*, contact American Health Consultants’ customer service department at (800) 688-2421 or www.ahcpub.com. ■

Larvae, leeches, and bees bridge the millennia

“**B**ridging the Millennia,” a two-day conference on the use of living organisms in medicine, will be held on June 10-11 at the Grand Pavilion, Porthcawl, South Wales, UK. The conference will consider the use of sterile larvae (maggots), leeches, and bee products in wound management. The program will contain presentations of recent scientific developments in all techniques and illustrate the use of these powerful therapies in clinical practice.

Steven Thomas, MD, director of Surgical Materials Testing Laboratory at Princess of Wales Hospital in Brigid, UK, says his Biosurgical Research Unit (BRU) is the only supplier of sterile maggots in the UK. “We supply maggots to about 500 centers in the UK,” Thomas says. “We’ve supplied just under 5,000 treatments so far, which took in excess of a million maggots.” BRU has a proprietary process for sterilizing maggot eggs. Maggots that hatch out of these eggs are bacteria-free.

Maggots are used in wound care to debride dead tissue and combat infection. Thomas says maggots combat infection in three ways: They ingest and kill bacteria; they raise the wound’s pH to about 8.5, which makes it difficult for organisms like staphylococci and streptococci to grow; and they may produce natural antibiotic-like materials that have an antimicrobial effect on the wound. These materials have not yet been isolated or identified. “Work was done some years ago in which maggots were washed with saline solution, and the washings injected into mice which were then exposed to infection,” Thomas says. “The mice that received washings survived; the others didn’t. Maggots have been shown to kill bacteria that are resistant to antibiotics, including methicillin-resistant *Staphylococcus aureus*.”

The conference will include presentations on larval therapy and the diabetic foot, larvae in plastic surgery, and clinical applications of leeches, which are used in biosurgery to restore venous return to areas that have become venous-congested, as when a severed finger is sewn back on a hand. The healing properties of honey and a report on the work of the apitherapy commission are also on the agenda. **(For a discussion of honey as an antibacterial, see *Wound Care*, January 1999, p. 10.)**

The two-day conference costs £180 (about \$295). For reservations, contact Tony Fowler at the Biosurgical Research Unit. Telephone: +44-1656-752820. Fax: +44-1656-752830. E-mail: bioconf@smtl.co.uk. A draft of the conference program is available at www.smtl.co.uk/WMPRC/BioSurgery/Conference/prog99.html. ■

The Wound Calendar

- “Positive Outcomes in Dermal Wound Management” seminars will be held on: May 6 in Detroit; May 7 in Chicago; May 20 in Memphis, TN; May 22 in Houston; June 10 in Kansas City, MO; June 12 in Denver; June 24 in San Francisco; and June 26 in Seattle. Contact: Health Management Publications, 950 West Valley Road, Suite 2800, Wayne, PA 19087. Telephone: (800) 766-6014.

- “Optimum Wound Management: A Cost-Effective, Comprehensive Approach” seminars, presented by Bonnie Sparks-DeFries, PT, CWS will be held on:

May 7-9, Albuquerque, NM

June 11-13, Las Vegas

June 25-27, Philadelphia

Aug. 14-15, Dallas

Aug. 28-29, Chicago

Sept. 11-12, Sarasota, FL

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Sept. 25-26, Denver, CO

Contact: Illume, 15505 E. 590th Road, Inola, OK 74036. Telephone: (918) 543-6933. Fax: (918) 543-3334. Web site: <http://www.illume-ed.com>.

• “Taking Charge of Wound Management” seminars will be held on:

May 10, Charlotte, NC

June 7, Florence, SC

Aug. 23, Nashville, TN

Sept. 20, Charleston, SC

Contact: Donna Morgan, Professional Rehabilitation, Inc., Easley, SC. Telephone: (800) 447-2059.

• “Introduction to Problem Wound Management” will be held on May 10-12 in Conroe, TX. Directed by Robert Warriner, III, MD. Contact: Sherill White, SE Texas Center for Wound Care and Hyperbaric Medicine, P.O. Box 988, Conroe, TX 77305. Telephone: (409) 539-7074. Fax: (409) 539-9100. E-mail: swhite@woundcarehbo.com.

• “Wound Care Specialty Course” will be held on May 10-29 in Charleston, SC. Sponsored by the Medical University of South Carolina College of Nursing, 99 Jonathan Lucas St., Charleston, SC 29425. Telephone: (843) 792-2651. Fax: (843) 792-3680. E-mail: kellerhals@muscd.edu.

• “Advanced Wound Healing: Normal and Pathological Wound Healing Mechanisms” seminars will be held on:

May 15-16, Minneapolis

June 26-27, Minnetonka, MN

Contact: Wound Care Associates, 177 Cherry St., Williams Bay, WI 53191-9704. Telephone: (414) 245-6812. Fax: (414) 245-6912. E-mail: feedar@woundcareresources.com.

• 21st Annual Wound Management Workshop will be held on May 19-22 in San Diego. Sponsored by the School of Medicine, University of California at San Diego. Telephone: (619) 467-9010. Fax: (610) 467-9310. Web site: www.amainc.com/wmw/wmw.html.

• “Current Concepts in Wound Healing” seminar will be held on: May 22-23, Minnetonka, MN; and June 12-13, Hot Springs, AR.

Contact: Wound Care Associates, 177 Cherry

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St., Williams Bay, WI 53191-9704. Telephone: (414) 245-6812. Fax: (414) 245-6912. E-mail: feedar@woundcareresources.com.

• Wound Healing Course will be held on May 24-29 in Miami. Sponsored by the department of dermatology and cutaneous surgery, University of Miami. Contact: Robert Kirsner, MD, CWS. Telephone: (305) 325-3920.

• Wound Ostomy and Continence Nurses Society (WOCN) annual national meeting will be held June 20-24 in Minneapolis. Telephone: (888) 224-9626.

If you have a conference, seminar or other wound care-related event you would like listed in the calendar, please send the information to: Wound Care, P.O. Box 740056, Atlanta, GA 30374. ■

Coming in Future Issues

- Benchmarking: How to determine quality
- Light therapy and healing: What's being done here now
- Magnets: Help or hoax for wounds?
- Recognizing Stevens-Johnson syndrome

CE objectives

After reading each issue of *Wound Care*, the health care provider will be able to:

- identify management, clinical, education, and financial issues relevant to wound care;
- describe how those issues affect wound care providers and patients;
- describe practical ways to solve problems commonly encountered by care providers in their daily activities. ■