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*LeAnn Chambers, Pharm.D. and Matthew Chambers, Pharm.D.*

## Individualized Approach to Wound Healing

**Wound Care** involves debridement (removal of dead tissue), cleansing (usually accomplished by irrigating the wound), maintenance of a moist environment, prevention of infection and further injury, and provision of materials needed to improve healing.

**Topical dosage forms such as gels and sprays** are used in conjunction with various dressings to treat wounds. Gels are water-soluble, tend to keep the area moist, and are easily removed from the wound using a gentle stream of warm water or saline. Almost any active ingredient can be formulated into a gel. Solutions are liquid preparations that contain one or more chemical substances dissolved in a suitable solvent. Solutions can be used for irrigation, baths, soaks and sprays. An advantage of sprays is that the wound area does not need to be touched and sprays can have a cooling effect. Although some medications are commercially available as creams, creams may be more difficult to remove from the wound cavity and may affect the granulation process. Therefore, it may be preferable to compound the active ingredients into a gel or solution. Medications can also be prepared as powders that can be dispensed in a bellows bottle and puffed onto the affected area.



***The use of topical formulations for treatment of wounds decreases the risk of adverse effects and potential drug-drug interactions associated with systemic medications, and can result in significantly improved healing.***

**Aloe Vera** has been utilized for many years to treat wounds and burns. Aloe improves blood flow to the wound and may work as a free radical scavenger. One study showed that, compared to those who received no treatment, wounded rats treated with topical aloe vera had 93% more collagen in the healing wound. Topical aloe vera has also been shown to have a synergistic effect with other medications used for wound healing.

**Antibiotics** can be included in wound preparations to prevent or treat infections, and can be chosen based on sensitivities of bacteria from wound cultures. Metronidazole is effective topically against anaerobic bacteria that cause foul and distressing wound odors. Elimination of these embarrassing odors can greatly improve the patient's quality of life. Exudate and associated cellulitis have also been observed to decrease significantly with topical metronidazole therapy. Adverse reactions (nausea, dizziness, metallic taste) characteristic of oral metronidazole have not been reported. Metronidazole oral rinse may alleviate odor associated with oral lesions.

**Benzoyl Peroxide** is a powerful oxidizing agent with broad spectrum germicidal activity and good liposolubility that may be useful for treatment of decubitus ulcers and prevention of wound infection in areas with high density of sebaceous glands.

**Estrogen**, when applied topically, has been found to reduce wound size, increase the rate of wound healing, and stimulate collagen production in both the male and female patients.

**Glyceryl Trinitrate (GTN, nitroglycerin)** has been used successfully to speed healing after hemorrhoidectomy and to treat chronic anal fissures. However, in comparison to topical calcium channel blockers, topical GTN use has been associated with a higher incidence of side effects such as headaches.

**Hyaluronic Acid** has been applied topically to improve the healing rate in chronic venous leg ulcerations. Research has shown the benefit of using a novel ester of hyaluronic acid to accelerate the healing process and effectively treat diabetic foot ulceration and other difficult-to-heal chronic wounds. A topical formulation combining hyaluronic acid and silver sulfadiazine for the treatment of superficial and deep second-degree burns significantly reduced the healing time and accelerated the reduction of local edema occurring shortly after injury, and was shown to have favorable antibacterial and local analgesic effects, together with a clear stimulatory activity on the re-epithelialization process.

**Phenytoin** may be used topically to promote wound healing by a number of mechanisms, including stimulation of fibroblast proliferation, facilitation of collagen deposition, glucocorticoid antagonism, and antibacterial activity. Topical phenytoin has been used to heal pressure sores, venous stasis and diabetic ulcers, traumatic wounds, skin autograft donor sites, and burns, and has compared very favorably with, and in some aspects was superior to, occlusive dressings. No study has reported significant adverse effects secondary to topical phenytoin therapy.

**Sucralfate**, commonly used as a protectant, can be formulated as a cream to treat second and third-degree burns, and has been shown to improve healing time by 25%. Topical sucralfate has also been used successfully to treat bleeding and diarrhea caused by radiation-induced proctitis.

**Bromelain** reduces edema, bruising, pain, and healing time following trauma and surgical procedures. **Glucosamine** appears to be the rate-limiting substrate for hyaluronic acid production in the wound.

Healing of wounds, whether from accidental injury or surgical intervention, involves increased cellular activity, which causes an intensified metabolic demand for nutrients. Vitamin A is required for epithelial and bone formation, cellular differentiation, and immune function. Vitamin C is necessary for collagen formation, proper immune function, and as a tissue antioxidant. Adequate dietary protein is absolutely essential for proper wound healing, and tissue levels of the amino acids arginine and glutamine may influence wound repair and immune function. Nutrients such as zinc, copper, and pantothenic acid (vitamin B5) also play key roles in wound healing. The typical Western diet is deficient in these nutrients, and appropriate dietary supplementation may be beneficial to promote wound healing in the shortest time possible, with minimal pain, discomfort, and scarring.

***Please call our problem-solving professionals to discuss the customized formulation and dosage form to treat a specific patient.***

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