Characteristics of an ideal topical agent for the treatment of wounds

Locally used therapeutic agents and dressings have to support the physiological wound healing process without doing harm to the cells involved or newly formed tissue. Depending on the phase of wound healing, local therapeutic agents have to cleanse the wound, reduce the microbial load, inhibit inflammation, and stimulate granulation or epithelialisation. The panel contains the properties of an ideal topical agent [1]:

Properties of an ideal topical agent

- proven efficacy for the claimed use, e.g. broad antimicrobial spectrum
- colourless, so assessment of the wound is not impaired
- painless administration
- non-toxic
- non-irritant
- minimal allergenic potential
- no systemic adverse effects
- no dehydration of the wound
- easily removed without residue
- good pharmaceutical quality
- physically and chemically stable
- easily available
- cost-effective

Wound disinfection

Minor wound contamination or colonisation by bacteria may not prolong the wound healing process. Decontamination of a wound may be considered for hospitalized patients with MRSA and those patients with large areas of burned skin. The use of antiseptic (antimicrobial) solutions may be recommended in traumatic wounds contaminated with pathogenic microbes and in wounds showing clinical signs of infection. If a...
wound is infected the wound healing process is hindered. Acute, traumatic wounds may tolerate the single use of a topical antiseptic with a certain degree of cell toxicity. Chronic wounds, such as chronic leg ulcers and diabetic ulcers need to be treated with disinfectants (topical antimicrobials) that do not cause damage to living cells. It may be necessary to use such products for several days [2].

**Disinfection of acute wounds**

**Povidone iodine**

Povidone iodine serves as sustained-release reservoir of iodine, which halogenates and oxidises bacterial enzymes. This process can be observed as a discoloration of the brown povidone iodine solution. Povidone iodine is microbicidal and is active against a range of Gram-positive and Gram-negative bacteria, though Pseudomonas aeruginosa, Staphylococcus aureus and Escherichia coli may only exhibit partial sensitivity. It is also effective against viruses. In vitro tests show that the substance inhibits the liberation of inflammatory mediators. Organic matter, such as blood, pus and exudate interfere with the effectiveness of povidone iodine, visible as a decrease in the brown colour.

Long term use of povidone iodine retards the wound healing process. Up to 4% of the applied iodine can be absorbed. Care should be exercised in people with impaired renal function, hyperthyroidism, full thickness burns, neonates and infants up to six months of age.

Povidone iodine is widely available as solutions and ointments at concentrations between 7.5% and 10%. A hydrogel containing 3% povidone iodine formulated in liposomes is also available. The manufacturers claim that it has a selective toxicity against bacteria and also better tissue tolerability.

**Octenidine**

Octenidine, used in some countries, reacts with the cell wall and membrane structures of microbes and thus leads to the destruction of cell functions. The product Octenisept contains phe-noxyethanol as a synergistic additive. Octenisept is an antiseptic with a broad antimicrobial spectrum against Gram-positive and Gram-negative bacteria, fungi and lipophilic viruses. There are reports of efficacy against MRSA. In vitro findings show cytotoxic properties, but good tissue tolerability has been shown in clinical practice.

**Disinfection of chronic wounds**

**Polihexanide (polyhexamethylenebiguanide, PHMB) and taurolidine**

In some countries other substances commonly used to disinfect chronic wounds include polihexanide (polyhexamethylenebiguanide, PHMB) and taurolidine. Polihexanide is a cationic polymeric biguanide with similarity to chlorhexidine. It acts by increasing the permeability of membranes, which leads to cell death by loss of potassium and other components of the cytoplasm. It is bactericidal to Gram-positive and Gram-negative bacteria (including activity against MRSA), enterococci, Aspergillus and Candida. Taurolidine is active against a variety of pathogens including staphylococcus aureus, Escherichia coli and Pseudomonas aeruginosa. It is applied topically by instillation into the bladder and for intraperitoneal irrigation. For full effectiveness the wound contact time of taurolidine has to be six to 24 hours.

**Other products**

The use of topical antibiotics is to be avoided. The most commonly used antimicrobials lack broad antibacterial activity; they may cause sensitivity reactions and lead to the emergence of antibiotic-resistant strains of bacteria. Organic matter, such as pus, slough and necrotic tissue prevent the diffusion of antibiotics to deeper infected tissues. However, topical metronidazole has a place in the treatment of malodorous wounds (due to infection by anaerobic bacteria) in an attempt to improve quality of life for the individual. Ethacridine lactate has only poor efficacy against Gram-negative bacteria, causes skin irritations and photosensitations. Potassium permanganate should not be used any longer as an antiseptic. Its efficacy is reduced by the presence of organic matter and if it is not completely dissolved it may have a corrosive effect on the skin. Crystal violet and brilliant green (used in some countries to treat superinfected eczema) have no place in the treatment of chronic wounds [3]. They prevent proper wound assessment and kill the cells involved in granulation.

**Summary**

Our increasing knowledge has led to the development of a variety of methods of disinfection and more sophisticated ways of delivering antimicrobials in an attempt to encourage the natural healing process of both acute and chronic wounds. Enzymatic and osmotic systems are becoming more widespread.

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**References**