

Welcome to the eighth edition of the Dressings Times in which Dr Keith Middleton of the Pharmacy Department, Northwick Park Hospital provides an interesting account of the use of sugar paste in wound management. As befits a Christmas edition, this issue also contains some suggestions for presents for anyone interested in dressings and wound care. It also provides some topical observations on occlusive dressings that were written fifty years ago!

Sugar Pastes in Wound Management

In 1976, Herszage and Montenegro of Argentina used ordinary sugar to treat the wounds of two patients with post-surgical necrotic cellulitis. Further successes followed and in 1980 they reported on the use of sugar paste in 120 infected wounds and recorded a cure rate of 99.2%. [1] The time taken for the wounds to heal varied between 9 days and 17 weeks, but it was observed that odour and secretion began to diminish within 24 hours and disappeared totally after 72 to 96 hours of treatment. In 1985, Trouillet et al [2] described the use of sugar in the treatment of 19 patients with acute mediastinitis following cardiac surgery. Wounds were packed every 3 to 4 hours with ordinary commercially available granular sugar (sucrose). The authors noted near complete debridement followed by the rapid formation of granulation tissue and eradication of bacterial infection after an average of 7.6 days of treatment.

Sugar was first used as a dressing in Northwick Park Hospital in 1982 when it was placed into infected radical vulvectomy wounds that had not responded to more conventional therapies. However, due to the nature of such wounds, packing with granular sugar was found to be impossible and therefore a thick paste was developed. Other early patients to be treated with sugar at Northwick Park were two hypogammaglobulinaemic individuals who had developed extensive tracking sinuses. For these, a thin paste was formulated that could be injected into the narrow wounds.

Thick sugar paste has a consistency similar to that of modelling clay and can be moulded in the gloved hand immediately prior to packing into cavities with large openings such as pressure sores. Thin sugar paste resembles thin honey; it is suitable for instillation into cavities with small openings with a syringe and fine plastic tube or catheter.

Formulae for sugar pastes

	Thin	Thick
Caster sugar (fine granular sucrose)	1200g	1200g
Icing sugar - additive free (powdered sucrose)	1800g	1800g
Polyethylene glycol 400	1416ml	686ml
Hydrogen Peroxide 30%	23.1ml	19ml

(Final concentration of hydrogen peroxide is 0.15% v/w.)

The pastes are prepared in the hospital pharmacy by combining the H₂O₂ with the PEG 400 and then incorporating this solution into the sugars with the aid of a mechanical mixer. When homogenous the paste is packed into screw capped plastic containers and stored at 4C. The pastes are chemically stable for at least 6 months from preparation.

Polyethylene glycol (PEG) 400 was chosen as the lubricant because it does not interact with other components of the paste and is used in a variety of pharmaceutical preparations. It is a synthetic polymer that is also used in the cosmetic industry and has significant anti-bacterial properties. [3][4] Polyethylene glycol 400 can be absorbed from mucous membranes and high blood levels may be nephrotoxic.[5] Although no toxic effects have been noted in our patients, many of whom are elderly and frail, sugar paste should be used with care in patients with impaired renal function as any absorbed polyethylene glycol is excreted renally.

Sugar paste has been used on most wound types but it has been found to be particularly effective for treating infected and malodorous wounds. Twice daily application are advised to provide the optimum antibacterial effect. This has been demonstrated both in patients with malodorous wounds (when the smell of infected necrotic tissue is removed after 2-3 days), and in patients with infected abscesses. Irrigation with thin sugar paste has achieved successful results in patients with chronic discharging sinuses who had previously failed to respond to other therapies. Repeated application over 3 to 6 weeks is generally required to bring about complete healing. Sugar paste lowers the pH of wounds to approximately 5 which may be important in infected wound although the paste does not stimulate or retard granulation tissue formation in clean wounds in the pig model.[6]

Sugar paste (thick and thin) is rapidly bactericidal against all organisms so far tested when challenged according to a modified British Pharmacopoeia antimicrobial preservatives effectiveness test. When samples of the paste were inoculated with *Staphylococcus aureus*, *Streptococcus faecalis*, *Escherichia coli* or *Candida albicans*, to give 10⁵ cfu/gram, less than 10 cfu/gram were detectable after 1 hour at 25C.[7] Pastes diluted with serum have a reduced bacteri-

dal effect - 75% paste in serum gave an 80% reduction in viable numbers of *S. aureus* within 2 hours and a 99% reduction in viable numbers of *Proteus mirabilis* within 1 hour[3].

Although the application of sugar to a wound creates an environment with low water activity (a_w) and high osmotic pressure, overall the wound remains moist. (The water activity of a solution is the ratio of its water vapour pressure to that of pure water at the same temperature so that $a_w = P/P_0$).

The effect of reducing water activity values on the growth of bacteria has been investigated by Chirife et al[8] who determined the limiting water activities at which different species of bacteria will grow. We have determined the water activity of our pastes, at different dilutions in serum, by measuring water vapour pressure at 25C with an electronic hygrometer. Undiluted pastes have an almost zero availability of water because the sugar (sucrose) is dispersed in Polyethylene glycol 400 which does not contain water. Sugar has an osmotic action which can be thermodynamically related to water activity by the following equation.[8]

$$= (RT/V) \times \log (1/a_w),$$

where π = osmotic pressure,
R is the gas constant,
T is the absolute temperature in degrees kelvin,
V is the partial molal volume of water and
 a_w is the water activity.

Thus, by determining water activity, the osmotic pressure can be calculated. From this equation it will be seen that a solution of low water activity has high osmotic pressure.

Because of the difficulty of conducting a controlled trial of sugar paste in human wounds, an animal study has been conducted[6] using a method similar to that reported by Winter and Scales.[9] Full thickness wounds 25 mm square, and 9 mm deep were made in the backs of pigs and around each was placed a colostomy stoma ring. This in turn was covered with a semipermeable plastic film dressing (Opsite) so as to form a moist chamber. Wounds were either covered with Opsite alone, or packed with thick sugar paste or cotton gauze soaked in various antiseptic solutions and then covered in Opsite. The results showed that there was no significant difference between wounds left unpacked, but covered with Opsite, and those Opsite covered wounds packed with sugar paste, indicating that although sugar paste did not stimulate the formation of granulation tissue, neither did it cause inhibition or toxicity. However, all wounds packed with antiseptics showed evidence of delayed healing, especially those containing chlorhexidine gluconate 0.2%. The pig model wounds were not infected so no conclusions can be drawn on the relative value of Opsite and sugar paste for healing infected wounds.

Conclusion

Sugar paste should be considered for the management of all infected and malodorous wounds. It is a far less expensive alternative to Debrisan and similar products which are of dubious efficacy and are often difficult to remove from wounds. In our experience, sugar paste is also superior to charcoal dressings for treating malodorous wounds as it removes the cause of the smell and in this respect is similar to metronidazole gel. However sugar paste may be preferable to metronidazole gel for treating such wounds as the use of topical antibacterials and antibiotics should be avoided.[10]

Sugar paste lacks the toxicity of most antiseptics and it does not disrupt the architecture of the healing wounds, as does packing with gauze.

The paste is self-sterilizing and can be produced in different viscosities to suit all kinds of wound and it is not painful to apply. It may cause bleeding when granulation tissue is well formed, at which stage simple, non-impregnated dressings should be applied which will keep the wound moist and allow epithelialisation to occur.

References

1. Herszage L. et al., Tratamiento de las heridas supuradas con azucar granulado comercial, Biol Trab Soc Argent., 1980, 41, 315-330.
2. Trouillet J.L., et al., Use of granulated sugar in treatment of open mediastinitis after cardiac surgery, Lancet, 1985, 2, 180-183.
3. Ambrose U. An investigation into the mode of action of Northwick Park Hospital sugar pastes. Hatfield Polytechnic, 1986, B.Sc. Applied Biology Thesis.
4. Chirife J., et al., In-vitro antibacterial activity of concentrated polyethylene glycol 400 solutions, Antimicrob. Ag. Chemother., 1983, 24, 409-412.
5. Wilson C.G. and Thomas N.W. Interaction of tissues with polyethylene glycol vehicles Pharm. Int., 1984, 5 94-97.
6. Archer H.G. et al., A controlled model of moist wound healing: comparison between semi-permeable film, antiseptics and sugar paste. J. exp. Path., 1990, 75, 155-170.
7. Gordon H., et al., Sugar and wound healing Lancet, 1985,

2, 663-664.

8. Chirife J., et al., In-vitro study of bacterial growth inhibition in concentrated sugar solutions: microbiological basis for the use of sugar in treating infected wounds, Antimicrob. Ag. Chemother. 1983, 23, 766-773.

9. Winter G.D. and Scales J.T. Effect of air drying and dressings on the surface of a wound Nature, 1963, 197, 91-92.

10. Morgan D. Formulary of Wound Management Products (3rd edition), 1989, Clwyd Health Authority, Preswylfa, Hendy Road, Mold, Clwyd CH7 1PZ.

The Good Old Days!

On the eve of the introduction of nurse prescribing, it is interesting to reflect on the changes that have taken place in the profession over the years. A recent edition of a well known womans magazine recently included part of an article, first published by them in 1916, that showed the relationship that existed between medical and nursing staff at that time. The item in question is reproduced below with the kind permission of Woman's Weekly.

No nurse must address a doctor when on duty unless he first speaks to her. Even a "Good morning" is not permissible. Doctors and nurses when they meet off duty, must not speak to each other on any pretext whatever, Any infringement of this regulation is liable to be reported to the matron. Doctors and nurses must make no arrangements to meet outside

the hospital. If it is known that a nurse is privately acquainted with one of the doctors before he enters a particular hospital, her application is liable to be rejected. No nurse should sit down when the doctor is on the ward.

Nothing new under the sun (or dressing!)

Most people associate the concept of moist wound healing with the name of Dr George Winter following his pioneering work in the 1960s. However this graphic account of the benefits which may result from the use of an occlusive dressings recently came to light in a textbook of nursing published in 1940.

`An occlusive dressing is one which entirely seals, or shuts in, the wound or excoriation, thus causing any exudate to remain in contact with the damaged surface. It has been proved beyond question that the semi-purulent exudate which collects upon such surfaces can be left with advantage for days together, provided the septic re-infection from without is not permitted.

Elastoplast wound dressing provides an occlusive and undisturbed type of dressing, as opposed to the general practice of frequently changed dressings which disturb the forming granulations. The formation of a scab is the natural process of healing, partly excludes the air, and protects the delicate growing tissues. Elastoplast forms an artificial, watertight scab, and to obtain the best results it should be left undisturbed as long as possible - several days - provided no unusual pain is experienced.

The explanation of the beneficial results of this form of treatment appear largely to lie in the protection and support given to the damaged tissues. Two factors are of importance to obtain the best results. First the dressing should extend for some distance beyond the margins of the lesion, and, secondly, the bandage must be in contact with the lesion; the interposition of some dressing such as plain gauze appears to interfere with the process of healing and is a definite disadvantage.

If these two factors are observed in applying the dressing, the patient will experience an immediate sensation of relief, the blister, boil, burn, or other wound is less painful because it is protected and supported, further injury is avoided and natural healing or repair allowed to take place under more or less ideal conditions.'

The author, A.M. Ashdown, was clearly almost half a century ahead of her time!

Correspondence

Ann Iles, from the Drug Information, Gloucester Royal Hospi-

tal has recently sent us the following suggestions that some readers may find of interest.

A piece of sterile plastic cut from a sterile disposable glove makes a useful covering for Scherisorb gel when applied to low exudate wounds. Tape is not usually required as the sheet can generally be held in place with a bandage or a piece of tubular net. In this way any trauma resulting from the removal of an adhesive film dressing can be avoided. If surgical tape is required, the size of the plastic film can be varied, reducing repeated trauma to the same area of skin.

An adhesive semi-permeable film dressing can be used to strengthen and protect fragile skin around a wound and act as a base for the attachment of tape. A window is cut from the film before application and the sheet can be left in-situ until it wrinkles off.

Writing the date of application upon the outer surface of a hydrocolloid dressing prevents premature removal and facilitates monitoring of the frequency of dressing changes.

In return, Ann asks if any readers have any information on dressings (other than the paraffin gauze products) used on wounds or donor sites after pinch or split thickness skin grafting.

Last minute Xmas gifts

Are you stuck for ideas for a suitable gift for the man (or woman) who has everything? How about a copy of our full colour wound management chart, a bargain at 2.50 with discounts for bulk purchasers available upon request. Please make your cheques or orders payable to Mid Glamorgan Health Authority and send them to the address below.

For that really special person in your life a copy of a new book on wound management and dressings is sure to be well accepted and make interesting reading during the Xmas break. Full details and an order form are enclosed.

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