

World Wide Wounds

Frequently Asked Questions: Alginate Dressings

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Introduction

Alginates have been used in various forms for fifty years, and yet they remain a poorly understood and probably underused dressing. Compared to many modern dressings, the literature is sparse and inconclusive.

This article aims to provide answers to many of the questions that users might ask. It is *not* intended to be the final word; rather the opposite. These answers are written to be a starting point and no more. Like every article in *World Wide Wounds*, it can be amended or extended following readers' suggestions and additions.

What are alginate dressings?

Highly absorbent, biodegradable alginate dressings are derived from seaweed. They have been successfully applied to cleanse a wide variety of secreting lesions. The high absorption is achieved via strong hydrophilic gel formation. This limits wound secretions and minimizes bacterial contamination. Alginate fibres trapped in a wound are readily biodegraded [1].

Alginate dressings maintain a physiologically moist microenvironment that promotes healing and the formation of granulation tissue. Alginates can be rinsed away with saline irrigation, so removal of the dressing does not interfere with healing granulation tissue. This makes dressing changes virtually painless. Alginate dressings are very useful for moderate to heavily exuding wounds [2].

Reference 1: Gilchrist T, Martin AM., Wound treatment with Sorbsan--an alginate fibre dressing; *Biomaterials* 1983 Oct;4(4):317-320

Reference 2: Motta GJ., Calcium alginate topical wound dressings: a new dimension in the cost-effective treatment for exuding dermal wounds and pressure sores; *Ostomy Wound Manage* 1989;25:52-56

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How do alginate dressings work?

There have been few studies of the effect of alginate dressings on the processes of wound healing.

The healing of cutaneous ulcers requires the development of a vascularized granular tissue bed, filling of large tissue defects by dermal regeneration, and the restoration of a continuous epidermal keratinocyte layer. These processes were modeled in vitro in one study, utilizing human dermal fibroblast, microvascular endothelial cell (HMEC), and keratinocyte cultures to examine the effect of calcium alginate on the proliferation and motility of these cultures, and the formation of capillarylike structures by HMEC.

In the study, the calcium alginate increased the proliferation of fibroblasts but decreased the proliferation of HMEC and keratinocytes. In contrast, the calcium alginate decreased fibroblast motility but had no effect on keratinocyte motility. There was no significant effect of calcium alginate on the formation of capillarylike structures by HMEC. The effects of calcium alginate on cell proliferation and migration may have been mediated by released calcium ions.

These results suggest that the calcium alginate tested may improve some cellular aspects of normal wound healing, but not others.

Reference 1: Doyle JW, Roth TP, Smith RM., *et al*; Effects of calcium alginate on cellular wound healing processes modeled in vitro. *J Biomed Mater Res* 1996 Dec;32(4):561-568

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What are the main indications for alginate dressings?

Alginates have been shown to be useful in a variety of situation; sloughy wounds which also produce a degree of exudate may be dressed with alginate dressings such as Sorbsan, Tegagen, Kaltostat (or other gel forming polysaccharide dressings). The gel which is formed as these products absorb exudate forms a moist covering over the slough preventing it from drying out. These dressings require moisture to function correctly, so alginates are not indicated for dry sloughy wounds or those covered with hard necrotic tissue.

For shallow, heavily exuding wounds such as leg ulcers, fibrous sheet dressings made from alginate fibre may be used, while cavity wounds, traditionally packed with gauze soaked in saline, hypochlorite, or proflavine, are now more commonly dressed with alginate fibre in the form of ribbon or rope.

For epithelizing wounds, alginates have an advantage over cellulose dressings in that they can be removed without causing pain or trauma if they are first well soaked with sodium chloride solution.

Reference 1: [Full Text]: Dr Stephen Thomas A structured approach to the selection of dressings, World Wide Wounds, 1997:
<http://www.worldwidewounds.com/1997/july/Thomas-Guide/Dress-Select.html>

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Are there any side effects of alginate dressings?

Few studies mention side effects; certainly alginate use is characterised by convenience in application and removal, as confirmed by descriptive studies [1].

Foreign body reaction

One study considered two treatment protocols for the management of patients with non-infected cavity wounds, using data obtained from both the community and the outpatients clinic. Patients were treated with either a polyurethane foam hydrophilic dressing (Allevyn) or a calcium sodium alginate dressing (Kaltostat). Although alginate fibres were found to be incorporated in tissue, both dressing regimes were found to be easy to use, effective and acceptable to patients and clinicians [2].

However, there has been one report of a florid foreign body giant cell reaction seven months after the use of an alginate dressing to obtain haemostasis in an apicectomy cavity on an upper lateral incisor. The case suggests that alginate fibres left in situ may elicit a long-lasting and symptomatic adverse foreign body reaction. The authors suggest that alginates should be reserved for problematic haemorrhage and be removed from the tooth socket soon after haemostasis [3].

To date, this is the only published report concerning foreign body reaction to alginate. Thorough irrigation of the wound following alginate use is indicated; removal of debris, which might otherwise provide a focus for infection is good practice.

Reference 1: Torres de Castro OG, Galindo Carlos A, Torra i Bou JE., Pure calcium-sodium alginate dressing. Multicenter evaluation of chronic cutaneous lesions, Rev Enferm 1997 Sep;20(229):23-30

Reference 2: Berry DP, Bale S, Harding KG., Dressings for treating cavity wounds; J Wound Care 1996 Jan;5(1):10-17

Reference 3: Odell EW, Oades P, Lombardi T Symptomatic foreign body reaction to haemostatic alginate; Br J Oral Maxillofac Surg 1994 Jun;32(3):178-179

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Is there any difference between brands?

Yes.

A study compared four different calcium alginate dressings (Algosteril, Comfeel Alginate, Kaltostat and Sorbsan) with respect to wound fluid retaining ability, adherence, dressing residues, epithelialisation and inflammatory cell infiltration using a standardised partial-thickness wound model in domestic pigs.

Wound fluid spread laterally onto surrounding normal skin by about 40% more with Sorbsan than with the other alginate dressings after 24h ($P = 0.026$). The corresponding figure after 66h was 20% ($P = 0.030$). Algosteril (mean 1.7 [sem 0.3]) adhered significantly ($P = 0.014$) more to the wounds than Comfeel Alginate (mean 0.2 [0.2]). Kaltostat (mean 1.8 [0.3]) left significantly ($P = 0.038$) more dressing residues on the wound surface at dressing removal than the Comfeel Alginate dressing (mean 0.8 [0.2]). In the effect on epithelialisation or dermal inflammation there was no statistically significant difference at significance level 5% among the four alginate dressings, as assessed by light microscopy.

In summary, the four alginate dressings showed significant differences in important handling characteristics but did not differ significantly in their effect on epithelialisation.

Reference 1: Agren MS., Four alginate dressings in the treatment of partial thickness wounds: a comparative experimental study; Br J Plast Surg 1996 Mar;49(2):129-134

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Is alginate an effective haemostat?

The value of alginates in this area has been challenged; a prospective, randomised clinical trial to compare the effectiveness of calcium alginate swabs versus traditional cotton swabs in the control of blood loss after extraction of deciduous teeth included 101 healthy children, aged 3-5 years. Teeth were extracted under general anaesthesia and blood collected for measurement in order to compare blood loss using the two systems. The number of teeth extracted ranged from 1-14; total blood loss ranged from 0.53-78.13 ml with a median of 12.9 ml. Calcium alginate swabs, used in 51 subjects, were not found to produce any clinical or statistical advantage over traditional cotton swabs [1].

Reference 1: Henderson NJ, Crawford PJ, Reeves BC., A randomised trial of calcium alginate swabs to control blood loss in 3-5-year-old children. Br Dent J 1998 Feb 28;184(4):187-190

Does zinc make a difference to haemostatic performance?

Alginates act as calcium ion (Ca) donors as they contain mannuronic (M) or guluronic (G) groups with a high Ca content. A study compared the effects of calcium and zinc containing alginates and non-alginate dressings on blood coagulation and platelet activation to determine which was the best haemostat.

The study showed that alginate materials activated coagulation more than non-alginate materials. The extent of coagulation activation was affected differently by the alginate M or G group composition. It was demonstrated that alginates containing zinc ions had the greatest potentiating effect on prothrombotic coagulation and platelet activation [1].

Reference 1: Segal HC, Hunt BJ, Gilding K., The effects of alginate and non-alginate wound dressings on blood coagulation and platelet activation. *J Biomater Appl* 1998 Jan;12(3):249-257

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What is the role of alginate dressings in split skin graft donor sites?

Compared with paraffin gauze

In a prospective controlled trial, thirty patients were randomised to the calcium alginate group and 21 to the paraffin gauze group. The donor sites were assessed at 10 days post harvesting to determine if they were completely healed (100%) or not. Twenty one of the patients dressed with calcium alginate were completely healed at day 10, while only seven in the paraffin gauze group were healed ($p < 0.05$). There were two infections in the study, both occurring in the alginate group while there was no difference in dressing slippage between the two groups. Calcium alginate dressings provide a significant improvement in healing split skin graft donor sites [1].

Compared with scarlet red

Twelve paired wounds were covered with either calcium alginate or scarlet red in seven patients with burns undergoing skin grafting. The rate of reepithelialization was assessed by optical planimetry for the calcium alginate and by time for sloughing of the scarlet red. This comparison failed to demonstrate objectively any difference in the rate of wound healing between these dressings; however, calcium alginate did significantly reduce the pain severity and was favored by the nursing personnel because of its ease of care. Thus calcium alginate does appear to have clinical advantages as a dressing for skin graft donor sites [2].

Reference 1: O'Donoghue JM, O'Sullivan ST, Beausang ES *et al.* Calcium alginate dressings promote healing of split skin graft donor sites; *Acta Chir Plast* 1997;39(2):53-55

Reference 2: Bettinger D, Gore D, Humphries Y Evaluation of calcium alginate for skin graft donor sites; *Burn Care Rehabil* 1995 Jan;16(1):59-61

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Can alginates reduce post-operative donor site pain?

A prospective double blind controlled trial examined the differences in post-operative split skin graft donor site pain between sites dressed with three differently treated types of dressing; a dry calcium alginate dressing, a saline moistened calcium alginate dressing and a bupivacaine hydrochloride (0.5%) moistened calcium alginate dressing.

There was a significant reduction in post-operative pain in the calcium alginate and bupivacaine group (group 3) at 24 and 48h when compared to the other two groups ($p < 0.04$). There was no difference in ease of removal of dressings or the quality of wound healing on day 10 between the three groups.

This study suggested a significant reduction in post-operative pain in bupivacaine soaked calcium alginate, without reducing the beneficial effects of the calcium alginate on donor site healing [1].

Reference 1: Butler PE, Eadie PA, Lawlor D, *et al.* Bupivacaine and Kaltostat reduces post-operative donor site pain; Br J Plast Surg 1993 Sep;46(6):523-524

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Are alginates effective with full-thickness pressure ulcers?

A prospective, randomised, controlled trial of 92 patients with full-thickness pressure ulcers set out to compare the efficacy of an alginate wound dressing with an established local treatment with dextranomer paste. During treatment, a minimal 40% reduction in wound area was obtained in 74% of the patients in the alginate group and in 42% of those in the dextranomer group. The median time taken to achieve this goal was four weeks with alginate and more than eight weeks in the control group. Mean surface area reduction per week was 2.39 cm² (sd 3.54) and 0.27 cm² (sd 3.21) in the alginate and dextranomer groups respectively ($p = 0.0001$). This difference was still highly significant when the sub-groups of almost completely healed subjects at the end of the study were considered.

This striking healing efficacy of an alginate dressing suggests it possesses pharmacological properties which require further investigation [1].

Reference 1: Sayag J, Meaume S, Bohbot S., Healing properties of calcium alginate dressings; J Wound Care 1996 Sep;5(8):357-362

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How useful are alginates for packing deep wounds?

A controlled trial set out to compare calcium alginate with the more traditional saline-soaked gauze for packing abscess cavities, following incision and drainage. Patients were randomized to receive either calcium alginate (16 patients) or gauze dressing (18 patients). At the first dressing change the patient marked on a linear analogue scale the pain experienced; the nurse noted similarly the ease of removal of the dressing.

Calcium alginate was significantly less painful to remove after operation (P less than 0.01), and also easier to remove (P less than 0.01) than gauze dressings. If abscess cavities are packed after incision and drainage, calcium alginate appears to be an improvement on conventional dressings [1].

Reference 1: Dawson C, Armstrong MW, Fulford SC, *et al.*, Use of calcium alginate to pack abscess cavities: a controlled clinical trial; R Coll Surg Edinb 1992 Jun;37(3):177-179

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Does alginate packing affect scan results?

A study examined the CT and MR appearances of four packing materials commonly used in otolaryngologic surgery. Bismuth and iodoform paraffin paste, aqueous betadine gauze, calcium sodium alginate, and triadocortyl cream were examined.

CT attenuation values were measured using phantoms containing packing materials; MR characteristics were examined by packing the external auditory meati of volunteers. Two illustrative case reports also are presented.

Bismuth and iodoform paraffin paste has a high CT attenuation (> 3000 Hounsfield units) resulting in severe image degradation attributable to streak artifact. Aqueous betadine gauze was of high attenuation (258 Hounsfield units; SD, 16.5) but did not cause image degradation. The attenuation value of calcium sodium alginate coincided with that of muscle, and the attenuation value of triadocortyl creme coincided with that of fat.

On MR, calcium sodium alginate and bismuth and iodoform paraffin paste had imaging characteristics similar to muscle and aqueous betadine gauze had appearances similar to bone marrow. Triadocortyl cream had a high signal equal to that of fat on T1-weighted images but a lower signal similar to bone marrow on T2-weighted images.

The authors concluded that the presence of bismuth and iodoform paraffin paste can give rise to clinically important image degradation on CT. More seriously, residual packing material - including alginate - may be misinterpreted as infection or tissue necrosis [1].

Reference 1: Hartley C, Ng KL, Jackson A., CT and MR appearance of otolaryngologic packing materials; AJNR Am J Neuroradiol 1995 Sep;16(8):1697-1702

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