# Literature Review and Perspective: Clinical Information Relating to Use of SureSkin® Hydrocolloid Dressings

## Literature Review and Perspective: Clinical Information Relating to Use of SureSkin®* Hydrocolloid Dressings

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### ABSTRACT

A systematic literature review summarized and critically evaluated the evidence on safety and efficacy of using hydrocolloid dressings (HCD) in acute, chronic and self-managed (OTC) minor wound management and summarized available evidence on Euromed SureSkin® II and SureSkin® Over The Counter (OTC) Hydrocolloid Dressings (SHD) within that context.

The highest level of evidence, at least two randomized controlled clinical trials or significant effects found in a meta-analysis or systematic review, supported the following effects of HCD compared to traditional gauze dressings: faster healing, better exudate management, improved patient comfort/reduced wound pain, skin and wound protection and cost effectiveness. One RCT supported improved scarring in HCD-dressed post-operative closed incisions and one RCT each supported autolytic debridement of venous or pressure ulcers dressed with a HCD.

Preclinical studies established substantial equivalence of SHD to market leading HCD in composition and clinically relevant performance measures including biocompatibility, absorbance, microbial barrier properties and moisture-retention.

Healing, exudate management, patient comfort, debridement and infection outcomes of 1080 chronic and acute wounds experiencing up to 20 consecutive SHD dressing changes were similar to the best reported clinical outcomes for marketed HCD.

After reviewing the combined evidence, the author concluded that SHD are safe, effective options for meeting functional chronic and acute wound needs and are substantially equivalent to other HCD dressings currently indicated for use on wounds managed by professionals or by consumers using hydrocolloid OTC products.

### BACKGROUND

Consistent, appropriate wound care helps optimize clinical outcomes while limiting costs and resource use (van Rijswijk, 2004; Kerstein et al, 2001). For a wound dressing to work well, ideally it should be applied within a protocol of care that includes the following steps (Hermans & Bolton, 2001):

- Accurate diagnosis and management alleviating the cause(s) of tissue damage,
- Evidence-based wound dressing selection to safely, effectively meet the subject's and wound's functional goals (van Rijswijk & Beitz, 1998)
- Reliable, valid measurement of wound progress to healing
- With follow-up including procedures to prevent recurrence

Appropriate dressing selection has become increasingly important in supporting wound care reimbursement. For example, in the United States reimbursement environment (CMS, 2004) the Centers for Medicare and Medicaid Services F-Tag 314 requires long term care facilities to select interventions consistent with residents' goals, needs and recognized standards of practice, specifically addressing pain, wound healing and pressure ulcer management.

Hydrocolloid dressings excel in each of these areas (e.g. Arnold et al. 1994 for pain; Kerstein et al. 2001 for healing and economic savings; Mulder et al. for autolytic debridement; AHCPR Panel 1992 for pressure ulcer prevention or peri-ulcer skin protection). Understanding the value that a hydrocolloid dressing brings to the wound care formulary and how its functions fit into wound care protocols can help improve wound care outcomes and reduce costs (Kerstein et al. 2001).

Clinical professionals select wound dressings based on a variety of criteria, including availability, convenience, cost, and reimbursement, wound or patient characteristics and dressing functionality. Despite well-documented benefits of moist environments, gauze primary dressings prevail (Jones, 2006). A confusing array of dressing categories based on dressing composition, "substantial equivalence" to products previously cleared by regulatory authorities or reimbursement categories focuses clinician wound dressing choices away from meeting the ultimate goals of patient and wound care (van Rijswijk & Beitz, 1998).

Effective hydrocolloid wound dressing choices can be based on evidence of the dressing's role in the following functions:

- Preserving physiological healing environments by retaining moisture (Bolton, 2007),
- Facilitating autolytic debridement of excess wound fibrin (Mulder et al, 1993) or necrotic tissue (Burgos et al. 2000),
- Preserving moist environments that minimize wound pain (Nemeth et al, 1991; Wyatt et al. 1990)
- Managing exudate by absorbing minimal to moderate wound fluid or preventing wound desiccation (Sprung et al., 1998),
- Reducing the frequency of required dressing changes, and permitting bathing with the dressing in place without contaminating the wound (Bolton & van Rijswijk, 1990; Schmidt et al., 1996)
- Reducing the costs of wound care by reducing frequency or duration of care (Colwell, 1993; Kerstein et al., 2001)
- Providing a barrier against microorganisms (Mertz et al., 1985; Bowler et al., 1993) in order to
    - reduce clinical infection likelihood (Hutchinson & McGuckin, 1990; Boulton et al, 1999)
    - isolate patients with MRSA-colonized wounds (Wilson et al, 1988)
    - foster healing progress of heavily colonized wounds (Gilchrist & Reed 1989) including those with β hemolytic Streptococci (Friedman & Su, 1984).

By selecting dressings based on evidence that they safely, effectively function in meeting such goals for similar wounds, wound care professionals position themselves for value to the patients, facilities and nations they serve.

## OBJECTIVE

The objective of this clinical literature review was to compile, summarize and critically evaluate the evidence on safety and efficacy of using hydrocolloid dressings in acute and chronic wound management, and summarize available evidence on Euromed SureSkin® II and SureSkin® Over The Counter (OTC) Hydrocolloid Dressings within that context.

## PROTOCOL

Methods:

A systematic literature search for the combined key words "hydrocolloid wound controlled" was conducted of databases supported by the United Kingdom National Institute for Health and Clinical Excellence (NICE), the Cochrane Collaboration®, Worldviews on Evidence-Based Nursing, Centers for Disease Control, the United States Agency for Healthcare Research and Quality (AHRQ) National Guideline Clearinghouse and National Institutes of Health MEDLINE database from 1966 through January, 2008. These searches were supplemented with derivative references and additional publications identified using search engines including Google.com, dynamicmedical.com and freemedjournals.com. Reviews and secondary sources were cited when access to the primary source was unavailable.

Published randomized (RCT) or non-randomized (NCT) controlled clinical trials, meta-analyses (MA) and reviews discussing use of hydrocolloid dressings (HCD) were systematically reviewed and summarized according to evidence of safety and/or efficacy in meeting functional needs for each wound etiology.[a] Available published and unpublished clinical evidence of SureSkin® II and SureSkin® OTC (SHD) safety and efficacy was provided by publication authors and by Euromed. This was reviewed in the context of SHD laboratory results supporting substantial equivalence of SHD to other HCD and clinical outcomes reported for other HCD. All relevant information identified in the searches was included in the review without regard to whether the published information could be interpreted as having a “positive” or “negative” effect on commercial product viability of any hydrocolloid dressing. The validity of the information was verified against existing published guidelines and reviews. This systematic review summarized HCD dressing risks and benefits in wound management as well as trial limitations. Studies that did not address at least one wafer-type HCD as described in Figure 1 were excluded from the review. For example studies of amorphous hydrocolloid gels or pastes, hydrocolloids containing active agents or gauze-impregnated hydrocolloid formulations were excluded as not relevant to safety or efficacy of HCD or SHD in wound management.

Levels of evidence used in the analysis were adapted from AHRQ (Formerly AHCPR) Pressure Ulcer Treatment Guidelines (Bergstrom et al. 1994) for generality to all clinical wounds. Specific levels include the following evidence:

A. Results of at least two or more randomized controlled trials (RCT) or one meta-analysis (MA) or systematic review (SR) in human wounds provide support for the claim.
B. Results of two or more historically controlled trials (HCT) or convenience controlled trials (CCT) or a HCT or a CCT and a RCT in humans provide support for the claim.
C. This rating requires one or more of the following:
   (1) Results of one controlled trial, e.g. RCT or CCT or HCT
   (2) Results of at least two case series over 20 subjects (CS) or a cohort study in humans
   (3) Expert opinion (EO)

As support for substantial equivalence of physical and chemical properties of SHD to those of other HCD, pre-clinical laboratory data from studies supported by Euromed were reviewed by the author and validated as fair, balanced and relevant, with appropriate statistical analyses before inclusion in this review. Those exploring the physical and chemical equivalence of the SHD to other HCD used in wound care were summarized. All interpretations were validated for relevance and accuracy by review of original source authors or appropriately knowledgeable colleagues.

[a] The search method followed guidelines for a systematic review of the literature from the Handbook for Postgraduate Research Students (www.pginfo.uhi.ac.uk/types_of_lit_review.htm as retrieved March 13, 2007.)

A summary table of results from clinical studies, systematic reviews (SR) and meta-analyses (MA) reporting relative safety and efficacy of HCD, without substantial confounding co-interventions was compiled and critically reviewed. Supplemental SHD pre-clinical physical and chemical safety data were reviewed and compared to that for other HCD to establish substantial equivalence of SHD. Clinical outcomes published using SHD in major uncontrolled or cohort studies were compared with those using other HCD to confirm clinical relevance of SHD similarity to other hydrocolloid dressings.

## RESULTS

### Critical Evaluation of Clinical Evidence of the Efficacy of Hydrocolloid Dressings

Evidence is reviewed on HCD efficacy (Appendix A). More than 61 controlled clinical studies involving HCD use on more than 5000 patients[b] with chronic or acute wounds, including 38 subjects with minor (OTC) wounds not requiring professional care, such as minor cuts, scrapes, abrasions, lacerations and burns, were identified and analyzed to compile support for HCD use to perform each major wound management function. Indications with A, B or C Levels of evidence for each function are listed in Table 1. HCD efficacy and safety were supported for the following claims and indications:

- Healing of a variety of acute, chronic and minor (consumer) wounds dressed with a HCD (Table 1) was supported by A-Level evidence (56 studies on more than 5253 subjects).
    - The conclusion that HCD improve healing compared to gauze based dressing is supported by Level A evidence: meta-analyses (Harding et al., 2000; Kerstein et al., 2001; Meaume & Gemmen, 2002) and systematic reviews (DeLaat, 2005; Bouza, 2005; Collum & Petherick, 2008; O'Donnell, 2006).
    - Some studies found differences between different HCD, some of which have been replaced by improved formulations (Day et al., 1994; Limova et al., 2002). This highlights the importance of evidence validating healing outcomes for a specific HCD, such as the cohort evidence presented below confirming acute and chronic dermal wound healing effectiveness for SureSkin® Hydrocolloid Dressings comparable to those reported in the reviewed literature for other HCD.
    - Four additional studies and one systematic review of 9 studies (Palfreyman et al, 2007) reported no significant healing difference between HCD-dressed wound healing and other modern or traditional dressing alternatives.
    - One study reported faster healing with a non-hydrocolloid polymer dressing than with a HCD. No studies favored healing in wounds dressed with traditional gauze dressings as compared to a HCD. .
- Autolytic debridement of venous ulcers was supported by 1 blind-evaluated RCT on 19 patients showing more debridement in venous ulcers with a primary HCD than without it under Unna's Boot compression (Mulder).
    - A 37-patient controlled study by Burgos and colleagues found no significant difference in debridement or healing efficacy for pressure ulcers which were HCD-dressed and those which were enzymatically debrided.

[b]Potential overlap of studies included in different reviews render estimates the total number of subjects imprece.

- No controlled studies could be found for acute and consumer wounds, which rarely require autolytic debridement.

– Exudate management One global systematic review (de Laat et al, 2005) supported HCD efficacy and safety for pressure ulcers citing more effective exudate management as a possible reason for reduced healing time with HCD dressings.

  - Six acute wound RCTs on 442 subjects with professionally managed acute wounds supported HCD efficacy in exudate management for amputation sites (Charpentier), burns (Wyatt), dermabrasions (Ulrich); surgical sites (Michie; Murharyo; Schmidt) and trauma sites (Hermans)
  - Five chronic wound studies (384 subjects) on venous (Caprio, Greguric, Friedman) and pressure ulcers (Dobrzanski) supported HCD efficacy in exudate management. One prospective cross-over RCT (Kreuger, 1995) identified natural growth factor effects of venous ulcer exudate beneath a HCD in place for up to 7 days under compression.
  - No controlled studies explored exudate management in consumer wounds, which normally have minimal exudate.
  - One study (Rohrich: 18 patients) reported that a transparent film comparator dressing managed exudate better than a HCD on patients with skin graft donor sites.

– HCD efficacy in limiting pain and/or improved acute or chronic wound patient comfort was generally supported by A-Level evidence. Twenty-one studies on 1171 patients with acute wounds, all favored HCD.

  - This conclusion is validated by a review conducted by Weichula, which concluded that HCD-dressed skin graft donor sites experienced less pain, faster healing and fewer infections. Ten chronic wound studies on 640 patients with HCD-dressed pressure ulcers, venous ulcers or pilonidal cyst excisions all reported less pain and/or greater comfort than that experienced by patients whose wounds were dressed with a conventional or impregnated gauze dressing.
  - No studies of pain in OTC wounds were found in the literature search.

– Microbial barrier. One meta-analysis wounds (Hutchinson & McGuckin 1990) of clinical infections reported in 35 controlled studies on 1351 HCD-dressed and 1085 conventionally-dressed chronic and acute wounds and one systematic review (Weichula, 2003) of 10 controlled studies of 640 chronic wound patients concluded that HCD-dressed wounds experienced fewer infections than gauze-dressed wounds.

  HCD-dressed leg ulcers with heavy bioburdens of pathogenic bacteria (Handfield-Jones, 1988), including Group B streptococci (Gilchrest & Reed, 1989) or Methicillin-resistant *Staphylococcus aureus* (MRSA; Wilson et al, 1988) healed without impairment while bacteria levels declined. In MRSA colonized cases, HCD use was a "valuable alternative to prolonged isolation" (Wilson et al, 1988).

  While HCD do not claim a direct antibacterial effect, evidence supports their microbial barrier function and use on colonized or infected wounds under professional supervision, as cleared by the United States FDA for some HCD (e.g. DuoDERM®, 1991).

  This evidence also suggests mechanisms of action for the observed decline in clinical signs of infection during up to 20 SHD dressing changes on a cohort of 1080 chronic or acute dermal wound patients (Gallego et al. 2005) At the first SHD application 22.6% of patients had a symptomatically

infected wound. During continued SHD use without antibiotics or topical antimicrobials the percent of patients experiencing symptoms of infection declined to 7.6%, while most wounds healed.

- Neutrophils, the patient's first line of defense against microorganisms, are viable and capable of phagocytosis in leg ulcer fluid harvested 24 hours after HCD application (Varghese et al. 1986)
- HCD can provide a two-way barrier to bacteria (Mertz et al., 1985) and viral particles (Bowler et al.1993)
- During the first 30 minutes after HCD dressing changes, less than ¼ the bacteria are released into each liter of treatment room air than with gauze (Lawrence, 1992)

– Wound protection. Two RCTs (on a total of 224 patients) supported efficacy of HCD in protecting surgical incisions during bathing (Schmidt; Young). HCD efficacy in reducing microbial burden and/or reported clinical wound infections was supported by A-level evidence from 9 acute wound studies on 1291 patients and 7 chronic wound studies on pressure, venous and diabetic ulcers, pilonidal cyst excisions and other chronic wounds, as well as one study of 7 subjects with OTC wounds.

– Cost effectiveness of HCD was supported by A-level evidence for chronic wounds (15 studies on 2070 pressure ulcers or venous ulcers) and A to B-level evidence for acute wounds. (2 RCTs on114 burn wounds and one study on 40 patients with traumatic wounds)

- The conclusion that HCD add value as cost effective wound dressings by reducing dressing change frequency is validated by two earlier meta-analyses by Kerstein et al (2001) and Harding et al (2000) concluding HCD are more cost effective than gauze dressings for pressure and venous ulcers in both US and European environments.
- No study was found to counter this conclusion.

– Mild scar amelioration has also been reported in surgical incisions dressed with a HCD in two small studies (Michie; Phillips).

- Michie & Hugill reported transient reduction of incision scar intensity in the HCD-dressed half of 40 split-wounds on 28 patients, with the other half of the wound dressed with impregnated gauze.
- Phillips reported reduction of scar symptoms by topical application of either a moisturizing lotion or a HCD.

Table 1. Levels of Evidence Supporting Efficacy of Hydrocolloid Dressing (HCD) Functions in Controlled Clinical Studies Summarized in Appendix A and Uncontrolled Clinical Studies Summarized in Appendix B. Table entries are: Clinical wound etiology (Level of evidence supporting HCD efficacy and safety.) Etiologies with only uncontrolled C2 level evidence support safety only.

| Hydrocolloid Dressing Function | Acute Wounds Professionally Treated | Chronic Wounds Professionally Treated | Self-managed (OTC) Minor Wounds |
|---|---|---|---|
| **Healing** | Amputation sites (B) | Diabetic foot ulcers (C1) | Abrasions (A) |
| | Biopsies (B) | Pilonidal excisions (A) | Blisters (B) |
| | Burns 2nd degree (A) | Pressure ulcers (A) | Superficial wounds (A) |
| | Circumcisions (B) | Scleroderma (C1) | |
| | Cryosurgery (B) | Venous ulcers (A) | |
| | Dermabrasions (B) | All chronic or acute (A) | |
| | Drainage tube sites (B) | | |
| | Skin graft donor sites (A) | | |
| | Trauma wounds (B) | | |
| | Epidermolysis bullosa (C2) | | |
| | Fracture blisters (C2) | | |
| | Radiation skin reactions (C2) | | |
| **Autolytic Debridement** | | Pressure ulcers (C1) | |
| | | Venous ulcers (C1) | |
| | | | |
| **Exudate Management**[c] | Amputation sites (B) | Pressure ulcers (C1) | |
| | Burns (A) | Venous ulcers (A) | |
| | Skin graft donor sites (A) | Various ulcers (C2) | |
| | Surgical excision sites (C1) | | |
| | Trauma wounds (B) | | |
| **Pain, Patient Comfort**[d] | Burns (A) | Pilonidal cysts (C1) | |
| | Circumcisions (B) | Radiation damage (C1) | |
| | Skin graft donor sites (A) | Scar (B) | |
| | Surgical incisions (A) | Scleroderma (C1) | |
| | Trauma wounds (A) | Venous ulcers (A) | |
| | | Various ulcers (C2) | |
| **Skin Protection** | | Pressure ulcers (A) | |
| | | Psoriasis (A) | |
| | | Various ulcers (C2) | |
| **Wound Protection**[e] | Catheter insertion sites (A) | Pilonidal cysts (C1) | Abrasions (A) |
| | Cryosurgery (B) | All chronic or acute (A) | |
| | Skin graft donor sites (A) | Diabetic foot ulcers (C2) | |
| | Surgical incisions (A) | Venous ulcers (C2) | |
| | Trauma wounds (B) | Various ulcers (C2) | |
| **Cost Effectiveness** | Burns (A) | Pressure ulcers (A) | |
| | Trauma wounds (B) | Venous ulcers (A) | |
| | | Various ulcers (C2) | |
| | | All chronic or acute (C2) | |
| **Improved scar** | Surgical incisions (A) | | |

[c] Mild to moderate exudate management as indicated by reduced leakage or dressing change frequency
[d] Includes pain related to wound or to dressing changes and quality of life in activities of daily living, e.g. bathing
[e] Includes protection from contamination or infection

**SureSkin® Clinical Safety in Perspective of Hydrocolloid Dressing Safety**

Wound safety of hydrocolloid dressings

The studies summarized in Appendices A and B present a perspective of safety or complications encountered during HCD use in the controlled efficacy studies described above supplemented by 5 additional uncontrolled cohort studies or case series on 494 acute wounds and 8 additional cohort or uncontrolled clinical studies on 3383 chronic wound patients dressed with a HCD.

Combined review of these controlled and uncontrolled studies yields the conclusions that HCD use on acute, chronic or minor OTC wounds is associated with faster healing, less wound pain and a lower incidence of wound infection than is reported using gauze or impregnated gauze dressings. These results suggest that, when used according to package insert instructions (See "Precautions" below.), HCD have a more favorable safety profile than conventional gauze or impregnated gauze dressings do.

Skin safety of hydrocolloid dressings

Isolated cases of HCD sensitization or allergenicity verified by patch testing have been reported. HCD sensitization is less frequent than allergic reactions to Balsam of Peru, fragrance mix or neomycin sulfate (Tomljanovic, 2007). It occurs mainly as a local cutaneous response to colophony, dioctyl adipate or their derivatives (Grange-Prunier, 2002). Care is required in verifying sensitization to HCD by patch testing to avoid mistaking other sources of skin irritation, such as that resulting from too vigorous or too early HCD removal, for an allergic reaction.

Overall, the literature reviewed supports the conclusion that HCD are generally safe when used according to package insert instructions on chronic and acute partial- and full-thickness wounds, including minor OTC wounds not requiring professional care.

Skin and wound safety of SureSkin® II and SureSkin® OTC Hydrocolloid Dressing (SHD)

Safety evidence specific to clinical use of SHD (Gallego, 2005) is presented in Table 2a and 2b based on study sample information provided by the authors (Table 2a). No cases of sensitization were reported during up to 20 dressing changes in the 1080 patients in this study pre-screened for hypersensitivity to any component of SHD. These results support the conclusion that SHD is safe for repeated use on skin and wounds and has the capacity to support increased epithelization and healing while autolytically debriding wound surface fibrin and necrotic eschar, and reducing the incidence of adverse events (Table 2b) during use on partial- and full-thickness acute and chronic wounds, which healed in an average of 35.5 days.

The reduction of granulation tissue and corresponding increase in epithelization reported during the study are consistent with the progression through granulation to epithelization, replacing the skin's epidermal barrier as healing occurred in a mean of 35.5 days.

These observations are consistent with effects reported in Appendices A and B during use of other HCD on similar wounds and confirm findings of SHD biocompatibility reported below under Preclinical Studies.

Table 2a. Evidence of SureSkin® II Standard, Thin or Bordered Hydrocolloid Dressing Safety During Clinical Use for Up to 20 Dressing Changes on Acute and Chronic Dermal Wounds (Gallego, et al. 2005) Study sample (Total N = 1080 patients) using SureSkin® II Border (61.6% of patients), Thin (20.8% of patients) or Standard (17.5% of patients)

| Wound Etiology | Number Of Patients |
|---|---|
| Pressure Ulcer | 416 |
| Venous Ulcer | 236 |
| Arterial Ulcer | 32 |
| Mixed Ulcer | 81 |
| Other Dermal Wound | 315 |

Table 2b. Clinical findings related to efficacy and safety reported during the study (Gallego et al., 2005) (Percent of patients experiencing each event)

| Related to Efficacy | Basal | Final | | Related to Safety | Basal | Final |
|---|---|---|---|---|---|---|
| Wound length | 3.71 cm | 2.96 cm | | Maceration | 29.2% | 12.5% |
| Wound width | 5.13 cm | 3.97 cm* | | Erythema | 37.6% | 13.1% |
| Wound epithelization | 43.2% | 71.9%* | | Eczema | 9.7% | 6.3% |
| Wound granulation | 69.1% | 60.6% | | Exudate leakage | 31.7% | 14.6% |
| Wound fibrin | 73.8% | 40.5%* | | Pain on dressing change | 53.8% | 24.4% |
| Wound surface eschar | 39.4% | 12.7%* | | Infection symptoms | 22.6% | 7.6% |

* $p < 0.0001$

**SureSkin® II and SureSkin® OTC Hydrocolloid Dressing (SHD) Clinical Performance**

On the first of up to 20 dressing changes Gallego et al. reported that SHD was rated easy to apply for 97.6% of patients, increasing slightly to 98.3% at the study end. . Patients (63%) rated SHD global performance as excellent or very good most frequently with 31.4% rating it as good, 4.5% as bad and 0.8% as unacceptable. When asked if they would use SHD in the future if necessary, 95.3% of patients said "Yes". Patient satisfaction was excellent or very good for 61.2% of patients, good for 33.6%, bad for 4.8% and unacceptable for 0.4%. SHD alleviated the symptoms enough to permit normal activities of daily living in 90.7% of the patients.

Hydrocolloid dressings have the capacity to maintain increasing adherence to moist skin or wounds with minimal exudate for the first 24-48 hours after application. Adherence to wound beds is reduced as wound fluid (also called exudate) forms a gel with the hydrocolloid adhesive. Gallego et al. reported that the last dressing removed before SHD initiation adhered to 50% of the wound beds. Most episodes of dressing adherence to the wound bed occurred while removing gauze (32%), hydrocolloid (23%), hydrogel (11%) or alginate (7%) dressings. In the 1080 patients in this cohort, dressing adhesion to the wound bed diminished to 36.5% of wounds during SHD use.

If clinical practice requires removal of SHD or any HCD earlier than indicated on the package insert remove the HCD with care, stretching the dressing in place on the skin before removal in order to loosen the bond between adhesive and skin. When possible avoid removing a HCD during the first 48 hours after application, when the adhesive is most adherent to the skin. If the HCD is removed too frequently or too vigorously, the outer layer of stratum corneum or newly healed wound tissue may be damaged or removed causing apparent cutaneous irritation or wound trauma. Also, as noted on many HCD package inserts,

SHD manage minimal to moderate exudate. For highly exuding or macerated wounds with excessive exudate consider using a primary absorbent (e.g. alginate) dressing to prolong wear of a secondary HCD while maintaining a moist wound environment protected from external contamination (ConvaTec, 2004).

**SureSkin® II Performance and Clinical Outcomes in Meeting Functional Wound Needs**

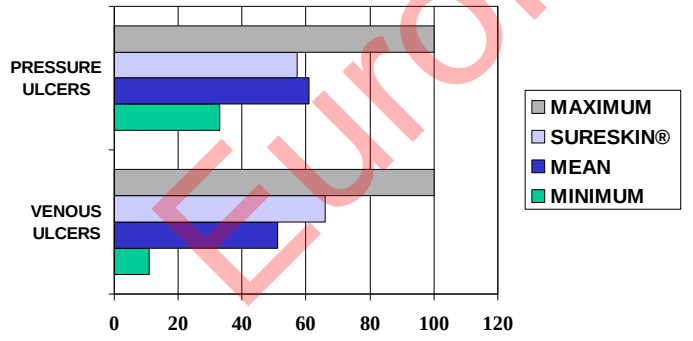
Clinical outcomes reported using SHD in the 1080-patient prospective cohort study (Gallego et al. 2005) are reviewed in the context of published results for each major wound function performed by HCD. Healing efficacy of SHD (Figures 1 and 2) described during clinical use was comparable for pressure and venous ulcer outcomes derived from a meta-analysis of clinical literature (Kerstein et al, 2001) and similar to cohort study outcomes in Canada (McIsaac, 2005) and the United States (Bolton et al, 2004).

Moist Wound Healing Outcomes Using SureSkin® II and SureSkin® Over The Counter (OTC)

Three publications reported healing outcomes on numbers of pressure and venous ulcers comparable to the 1080-patient study (Gallego et al., 2005) of SHD clinical outcomes (Appendix C). The first was a meta-analysis of healing and economic outcomes for all wound dressings with published data on more than 100 subjects. There were sufficient pressure ulcer evidence for analysis on two HCD and saline gauze and sufficient venous ulcer evidence for analysis on one HCD, one bioengineered skin construct and saline gauze (Kerstein *et al.* 2001).

SHD healing outcomes (Gallego et al.) for pressure ulcers and venous ulcers resembled those reported for the highest performing HCD in the meta-analysis and were within the HCD range of results reported in the meta-analysis (Figure 1).

Figure 1. SureSkin® Hydrocolloid Dressing Outcomes[1]
In Perspective of a Meta-Analysis of Chronic Ulcer Healing[2]
Mean, Maximum and Minimum Are Best Reported HCD Results[2]




[1] Gallego *et al.* 2005 data on 335 pressure ulcers and 349 venous ulcers provided by authors
[2] Kerstein *et al.* 2001 meta-analysis from highest performing HCD: 281 pressure ulcers and 530 venous ulcers

Table 3 and Figure 2 compare clinical pressure and venous ulcer healing outcomes using SHD (Gallego et al, 2005) with outcomes for comparable patients within other large cohort studies using different HCD in 20 home care settings in Canada (McIsaac, 2005) or in three long-term care facilities, one university hospital-based long-term acute care center and 12 home care agencies in the United States (Bolton *et al.* 2004).

Healing times reported in Table 3 for patients in other HCD cohort studies were comparable to those reported using SHD on similar depth wounds. There are too few (n=10) full-thickness venous ulcers dressed with SHD to generalize healing to a larger population.

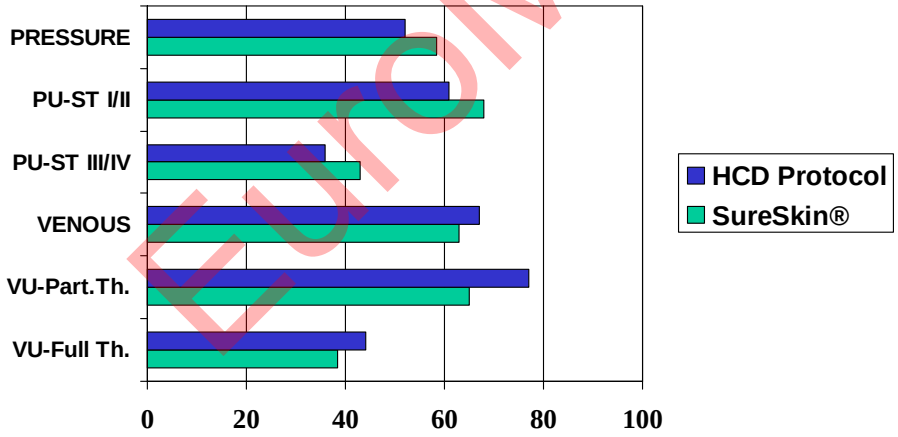
Table 3. Similar healing times from cohort studies using HCD or SHD in protocols of care including venous ulcer compression or pressure relief for pressure ulcers

| Etiology | SHD: Gallego (N of patients: Spain) | Other HCD: Bolton et al, 2004 (N of patients: United States) | Other HCD: McIsaac, 2005 (N of patients: Canada) |
|---|---|---|---|
| Pressure ulcers (All) | 35 ± 25 days (335) | | 7.3 weeks (208) |
| Partial-thickness | 30 ± 20 days (209) | 31 ± 41 days (134) | |
| Full-thickness | 47 ± 31 (126) | 62 ± 54 days (373) | |
| Venous ulcers | 41 ± 30 days (211) | | 6 weeks (133) |
| Partial-thickness | 41 ± 24 days (201) | 29 days (30)[a] | |
| Full-thickness | 86 ± 82 days (10)[a] | 57 ± 45 (124) | |

[a] Samples of < 100 subjects in cohort studies may have large errors of variability, inappropriate for generalization.

Figure 2 shows percents healed during 12 weeks (Bolton et al, 2004) or for SHD during up to 20 dressing changes (Gallego et al 2005). Results using SHD on the multi-center cohort of 1080 patients in Spain derived similar healing outcomes to those published on similar depths of pressure and venous ulcers during regular clinical use of mainly HCD within a standardized protocol to reduce sources of pressure for the pressure ulcers and aid venous return with appropriate compression for venous ulcers.

Figure 2. SureSkin® Hydrocolloid Dressing Outcomes[1]
In Perspective of Chronic Ulcer Cohort Outcomes[2]




[1] Gallego *et al.* 2005 data on 335 pressure ulcers and 349 venous ulcers provided by authors
[2] Bolton *et al.* 2004 data on a cohort of 507 pressure ulcers and 154 venous ulcers managed using mainly HCD and less than 5% gauze dressings.

Autolytic debridement using SHD

During up to 20 dressing changes, Gallego et al (2005) reported significant autolytic debridement of both fibrin and wound surface eschar or necrotic tissue (Table 3b) from the surface of a variety of chronic (n= 765) and acute/other (n=315) dermal wounds (Table 3a).

Exudate management using SHD

Maceration and exudate leakage at the final dressing change were both reduced to less than half of reported baseline levels during SHD use. Dressing wear time on moderately (47%) to minimally (34%) exuding wounds, Gallego et al. (2005) reported exudate management results comparable to the 2-4 day wear times and frequency of leakage or wound maceration reported using other HCD (Hermans, 1991; Day et al, 1995; Kerstein et al, 2001).

Pain and Patient Comfort Using SHD

Patients reported in 90.7% of cases that pain and other wound symptoms were alleviated during SHD use sufficiently for them to engage in activities of daily living. Dressing-related pain is usually maximal during dressing changes.

Gallego et al reported that at baseline, 33% of patients using gauze dressings noted pain on dressing change, 32% with no dressing reported, 26% using other HCD, 19% using hydrogels, 11% using alginates, 7% using foam dressings and 22% using other dressings.

SHD changes were associated with pain in less than half of these patients reporting pain during change of prior dressings at baseline.

Skin Protection Using SHD

SHD have capacity to manage fluids without adhesive disintegration comparable to or greater than fluid management properties of other commercially available hydrocolloid dressings (Tables 5 and 7). Tests have shown SHD to have good adhesive tack comparable to that of other HCD (Table 7), sufficient to seal the dressing to intact skin in the presence of moisture such as that surrounding a wound or a skin area requiring protection from moisture or contamination.

During clinical use, Gallego et al (2005) reported 20% of dressings were worn for the full 7 days and 15% changed due to leakage, with the most common reasons for dressing change being medical criteria (23%) or normal dressing change requirements (49%).

Wound Protection from Contamination and Infection Using SHD

During clinical use (Gallego et al, 2005), patients reporting symptoms of infection declined from 22.6% at baseline to 7.6% at final dressing change. Many wounds reporting symptoms of infection are inflamed due to non-microbial causes, so an unspecified small subset of the 7.6% of patients reporting symptoms were actually infected.

The decline of classic clinical infection symptoms during SHD usage on this cohort of 1080 acute and chronic dermal wounds supports safety of using SHD on clinically infected wounds according to typical HCD package insert instructions recommending bacterial culture and continuation of HCD use "during appropriate medical treatment at the discretion of the clinician." (ConvaTec, 1991)

SureSkin® II Hydrocolloid Dressings passed standard viral barrier testing proving them impenetrable by the bacteriophage Phi-X174, which is comparable in size to viruses or bacteria. It would be expected to have viral and microbial barrier properties similar to those of other HCD (Mertz et al., 1985; Bowler, 1993)

which have passed this test. When SHD are in place adhering to intact skin without leakage, they are deemed to have similar protective capacity to other HCD which have been associated with significantly lower infection rates in chronic and most acute wounds than gauze dressings (Hutchinson & McGuckin, 1990).

Cost Effectiveness

SHD clinical healing outcomes reported by Gallego et al (2005) are comparable to those reported in a meta-analysis of pressure ulcer and venous ulcer literature for HCD (Kerstein et al, 2001; Figure 1) and to those reported during clinical use of other HCD on similar wounds during large cohort studies (McIsaac, 2005; Bolton et al., 2004; Figure 2). Cost effectiveness is defined as the cost to achieve each unit of clinical outcome, such as complete healing (Bolton et al., 1996).

Based on cost, healing efficacy and wear time comparable to that reported for other HCD, SHD would be expected to be at least as cost effective as other HCD in achieving comparable pressure or venous ulcer healing outcomes.

Scar improvement

Based on physical moisture management and adhesive tack properties of SHD comparable to those of other HCD, SHD capacity to minimize scarring of incision or excision wounds would be expected to be similar to that reported for other HCD or occlusive dressings which are as effective as moisturizing topical formulations (Phillips et al., 1996).

**Preclinical Evidence: Substantial Equivalence of Sureskin® II Hydrocolloid Dressing To Currently Used Hydrocolloid Dressings**

Chemical Composition

SureSkin® II Hydrocolloid Dressings are similar in composition (Table 4, Figures 3, 4) and physical properties (Tables 5, 6) to other hydrocolloid dressings. The three formats, Standard (STD), Bordered (BRD) and Thin are described in more detail in their respective package inserts.

Table 4. SureSkin® II and SureSkin® OTC Hydrocolloid Dressing Formulation

| Dressing Component Commercial Name | Chemical Identity | Weight % | Function |
|---|---|---|---|
| **Film outer layer backing (Border and Thin products)** | Outer polyurethane film | n/a | Moisture, oxygen and microbial barrier similar to human skin |
| **Polyurethane foam (only in Standard products)** | Open-cell polyurethane foam bonded to outer polyurethane film | n/a | Cushions, protects from trauma |
| **Adhesive composition** | | | Moist tack seals in wound fluid; protects from leaking or external contamination. |
| **Elastomer** | Copolymer | 14-15 | Cohesive adhesive does not disintegrate easily. Maintains integrity for up to 7 days. |
| **Tackifier** | Petroleum based hydrocarbon tackifier resin | 31.5-40 | Sticks to moist surfaces reducing leakage, sealing in natural healing fluids. |
| **Extender** | Mineral Oil USP | 6-7.5 | Sticks to moist surfaces reducing leakage, sealing in natural healing fluids. |
| **Absorbent** | Cellulose-based | 40-46 | Absorbs small amounts of exudate. Forms autolytic gel when moistened |
| | **TOTAL** | **100** | |

Physical Properties

Test methods determining the physical properties of SureSkin® II Hydrocolloid Dressing and other hydrocolloid dressings are listed in Table 5.

Table 5.Testing methods used to determine physical properties of dressings

| Test Measuring Physical Property | Clinical Function Measured by Test |
|---|---|
| Water absorption | Wound moisture management |
| Probe tack | Dressing adherence to skin |
| Modulus | Dressing conformability |
| Peel Adhesion | Dressing removability |
| Viral penetration ASTM F1671 | Microbial barrier properties |

Table 6. Moisture management capacity, probe tack, modulus, and peel adhesion of SureSkin® II Border Hydrocolloid Dressing and other commercially available hydrocolloid dressings .

| SAMPLE | **Water absorption (g/10 $cm^2$/24 h)** *(Euromed procedure ELP101)* | **Probe Tack (g)** *(Euromed procedure ELP 108)* | **Modulus (N)** *(Euromed procedure ELP106)* | **Peel Adhesion (N)** *(Euromed procedure ELP 123)* |
|---|---|---|---|---|
| SureSkin® II Border * Lot # B0102151 | 3.02 | 2789.6 | 7.991 | 5.890 |
| Comfeel® Plus** Lot # 90884.01 | 2.424 | 5082.8 | 16.672 | 9.023 |
| DuoDERM® CGF® *** Lot # 7K00837 | 0.659 | 2571.6 | 12.246 | 8.563 |

Water absorption:

Water absorption of SureSkin® II Border Hydrocolloid Dressing over 24 hours is superior to that of two other commercially available HCD (Figure 5.). This suggests that its capacity to manage wound moisture is competitive with, if not better than, that of other HCD.

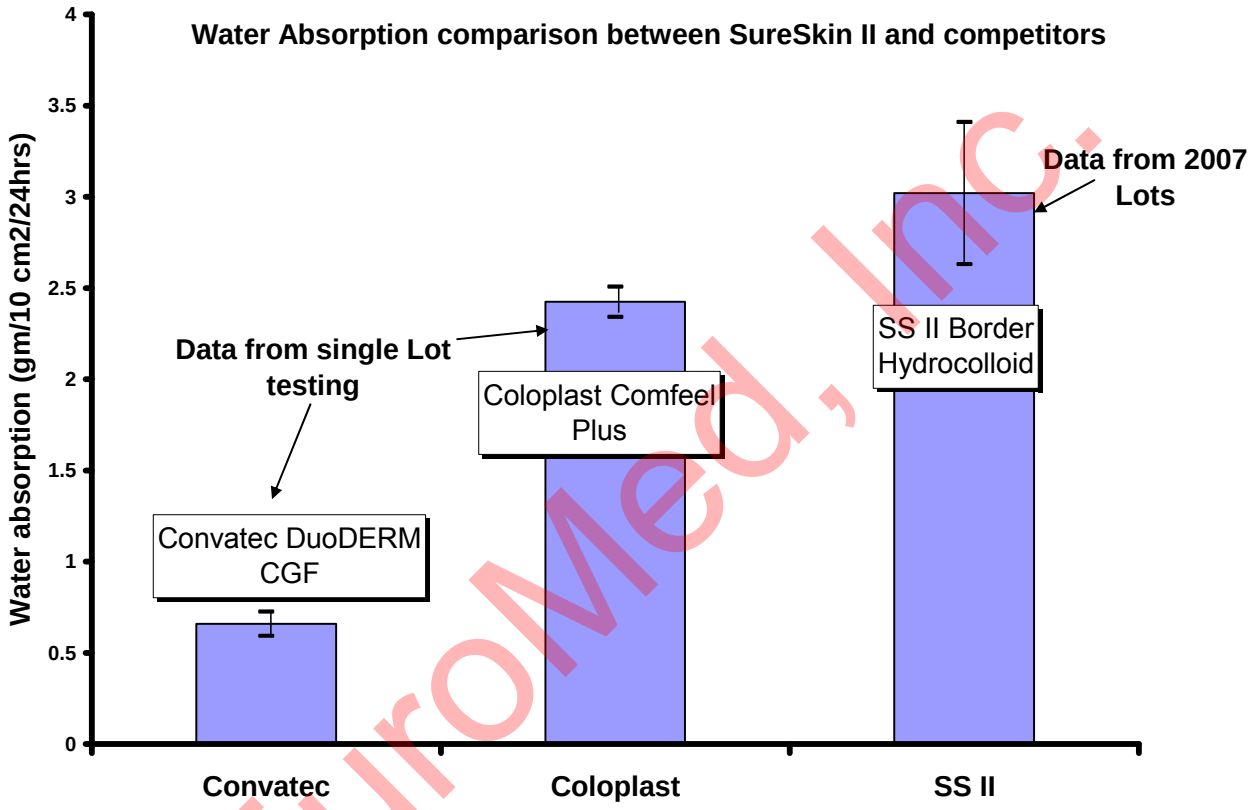



**Figure 5. Water Absorption Capacity of SureSkin® II Border (SS II) Hydrocolloid Dressing Compared to that of Two Other Commercially Available Hydrocolloid Dressings.**

Probe Tack

The probe tack of SureSkin® II Border Hydrocolloid Dressing compares to that of ConvaTec's DuoDERM® CGF® Dressing and is less than that of Coloplast's Comfeel® Plus Ulcer Dressing as in Figure 6. This suggests that SureSkin® II Border Hydrocolloid Dressing adheres about as strongly to surfaces as DuoDERM® CGF® but is not as aggressive as Comfeel® Plus Ulcer Dressing.

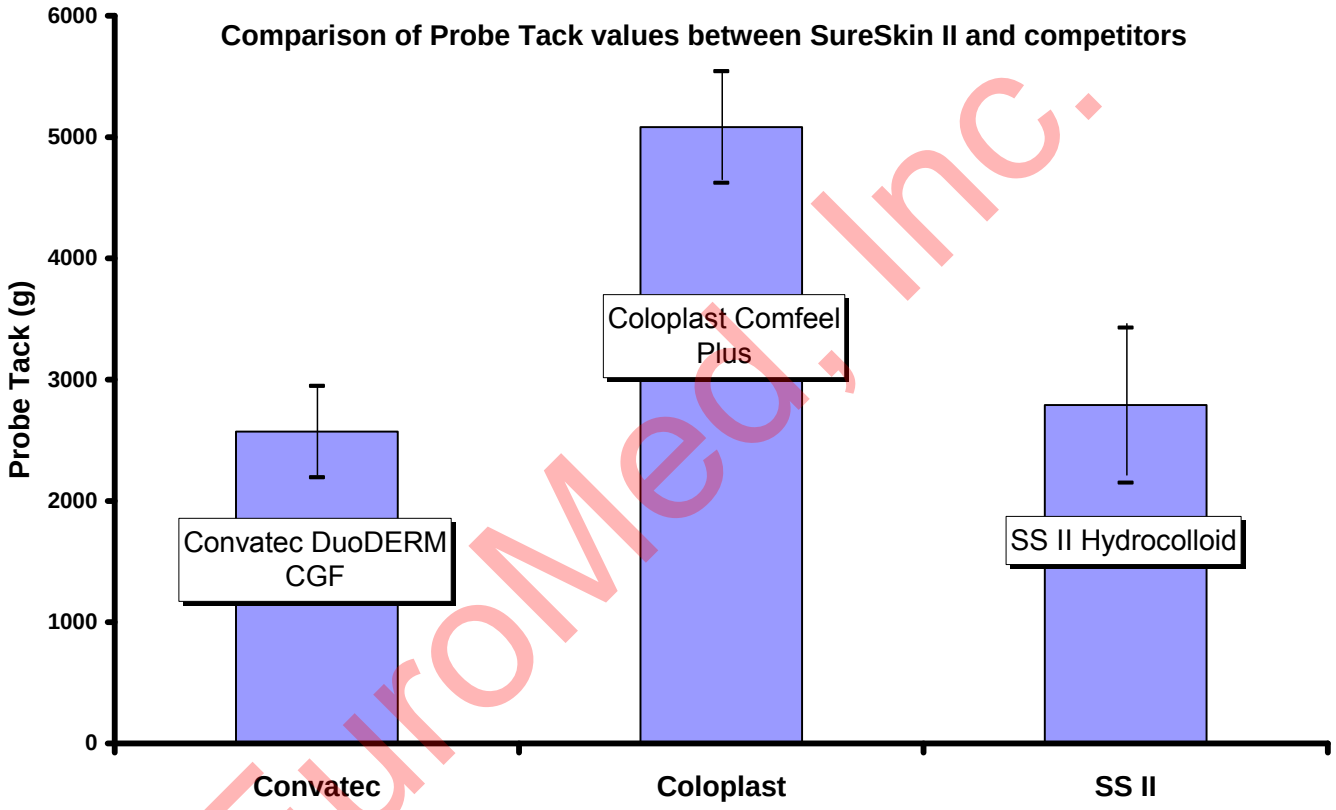



**Figure 6. Probe Tack of SureSkin® II Border Hydrocolloid Dressing Compared to Two Other Commercially Available Hydrocolloid Dressings**

Young's Modulus

Figure 7 shows that the modulus of SureSkin® II Border Hydrocolloid Dressing is lower than that of ConvaTec DuoDERM® CGF® and Coloplast Comfeel Plus, suggesting that it may be somewhat more conformable than the other two commercially available hydrocolloid dressings.

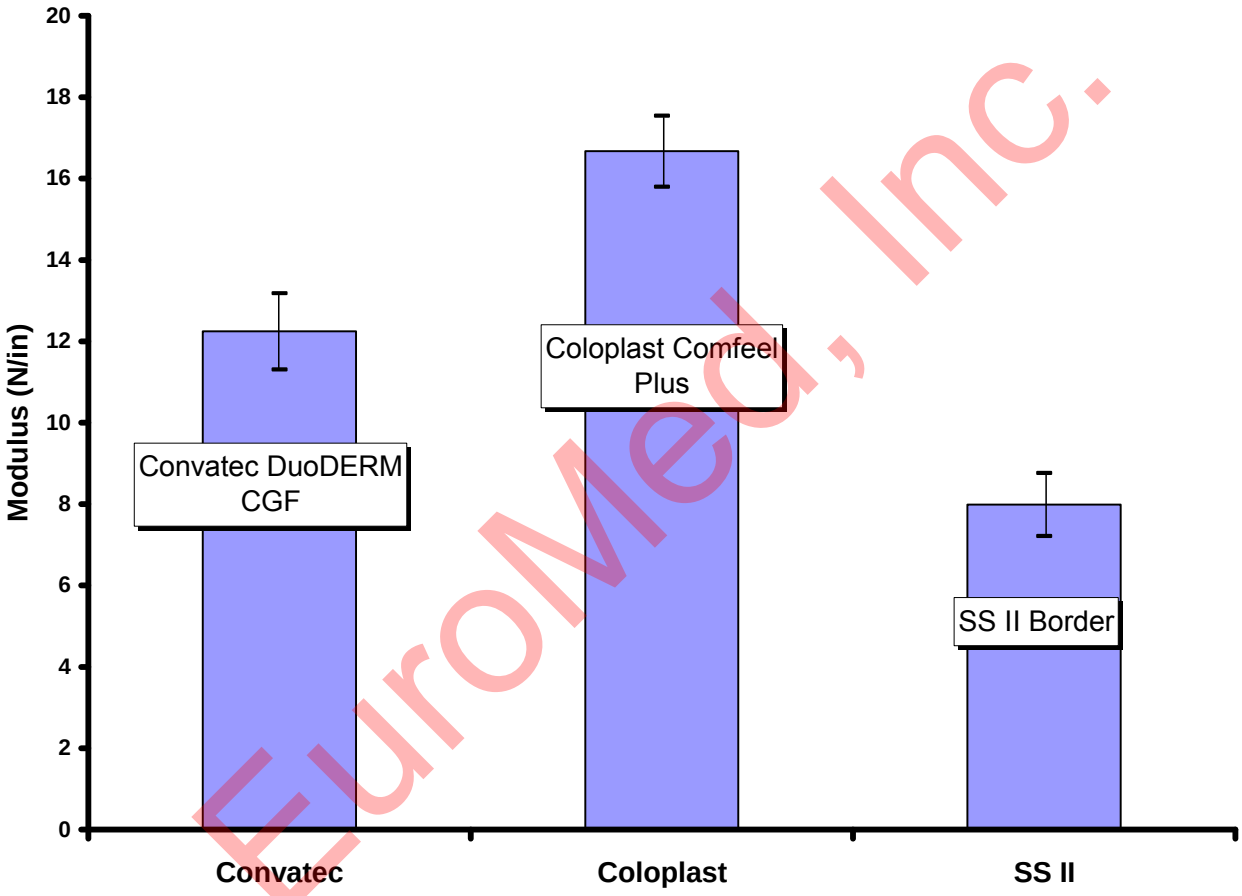





**Figure 7 Young's Modulus of SureSkin® II Border Hydrocolloid Dressing Compared to Two Other Commercially Available Hydrocolloid Dressings.**

Peel Adhesion

The peel adhesion or force to peel off the hydrocolloid adhesive of SureSkin® II Border Hydrocolloid Dressing from a steel test panel is somewhat lower than that for ConvaTec DuoDERM® CGF® or Coloplast Comfeel® Plus Hydrocolloid Dressings, as seen in Figure 8, indicating that SureSkin® II Border Hydrocolloid dressing may be slightly easier to remove.

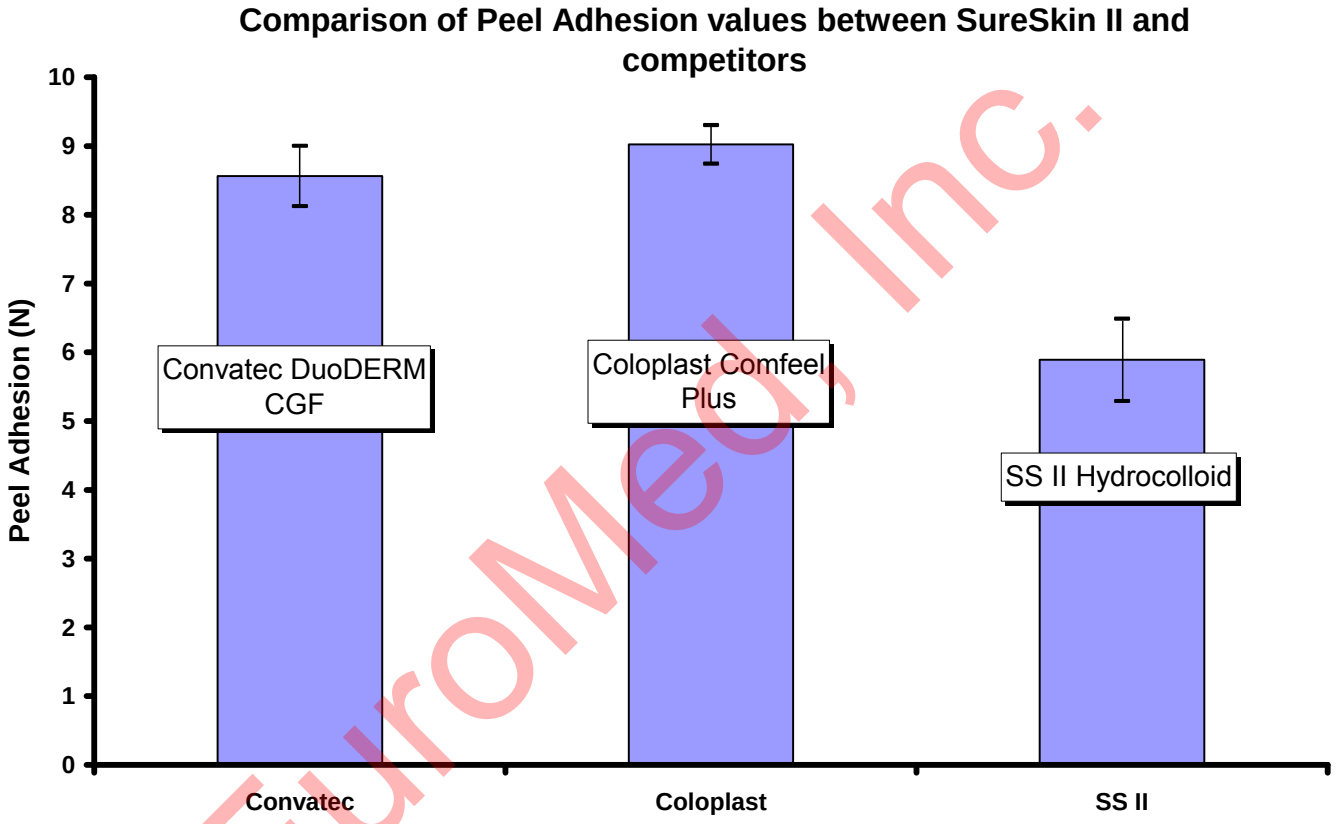



**Figure 8. Peel Adhesion of SureSkin® II Border Hydrocolloid Dressing Compared to That of Two Other Commercially Available Hydrocolloid Dressings.**

Viral Barrier Properties

The viral penetration properties of SureSkin II Standard and SureSkin® I.V. Hydrocolloid Dressing, the thinnest format of SHD, and therefore the most likely to be penetrated by a virus, were tested using ASTM Method F 1671. Though this procedure requires a minimum of three samples, 32 samples were tested according to ASTM statistical quality control sample size recommendations, which requires at least 29 of 32 samples to function as a barrier to the bacteriophage viral surrogate Phi-X174 under testing conditions described in the protocol simulating pressures anticipated for protective cover materials designed to act as viral barriers and at the surface tension of body fluids at a surface tension of 42 ± 2 dynes/cm.
The bacteriophage Phi-X174 is an accepted model for HBV, HCV and HIV viral pathogens because its morphology is similar and its environmental stability, low- or non-human infectivity, high assay sensitivity, rapid growth and high titer render it an ideal test surrogate for these more dangerous pathogens.
Under the testing conditions of ASTM Method F 1671, 30 of 32 samples of SureSkin® II Standard and SureSkin® I.V. Hydrocolloid Dressing functioned as a viral barrier, supporting a conclusion that SureSkin® II Hydrocolloid Dressings qualify as a viral barrier protective dressing.

Transparency of SureSkin® II Thin Hydrocolloid Dressing
Visual inspection and reading the package inserts of all four dressings investigated preclinically found SureSkin® Thin Hydrocolloid Dressing similar in transparency to similar formats of other thin HCDs. All four thin hydrocolloid dressings examined were sufficiently transparent to visualize normal skin conditions with the dressing in place. Thicker HCD formats are less transparent and may require removal to evaluate the wound and surrounding skin.

**Performance of Sureskin® Products Developed For Consumer Use (Over The Counter: OTC)**

Two OTC hydrocolloid dressings similar in composition to the SHD described in Table 4 were developed for consumer use, for example to protect blister sites. Performance relative to other commercially available blister dressings was tested on 5 samples of each dressing according to Euromed standardized testing procedures in Table 7 which consumers consider important aspects of dressing usage. Comparator dressings were a variety of formats of Johnson & Johnson® Activ•Flex® Dressing listed in Table 8 and Dr. Scholl's™ Blister Treatment.

Table 7. Euromed Test Procedures, Specifications and Sample Size for Consumer (OTC) Use Products

| Test | Test Range (Large) | Test Range (Small) | Number of Samples tested for each product |
|---|---|---|---|
| Water Absorption | 50-330 % | 50-330 % | 5 |
| Probe Tack Force | 200-1000g | N/A | 5 |
| Release from Liner | 1-3.5 N | 1-3.5 N | 5 |
| Package Peel | >1 N | >1 N | 5 |

Results of these tests presented in Table 8 showed Euromed OTC Blister Dressings to be within specifications on all parameters and comparable to the other OTC dressings in water absorption and probe tack which respectively reflect capacity of Euromed products to manage exudate and adhere to the skin. Euromed products were comparable to other OTC products with regard to, parameters supporting packaging integrity.

Table 8. Performance of Euormed Blister Dressings and Other Consumer (OTC) Products

| Testing Procedures | | | | | |
|---|---|---|---|---|---|
| **Manufacturer** | **Product** | **Water Absorption (% change)** | **Probe Tack Force (grams)** | **Package Peel Force (N)** | **Release from Liner Force (N)** |
| Blister Finger and Toes | Johnson & Johnson (Band-Aid) | 162.4 | 237.2 | 4 | 0.6 |
| Blister Block | Johnson & Johnson (Band-Aid) | 65.03 | 290.4 | 4.06 | 2.05 |
| Blister Ampoules | Johnson & Johnson (Band-Aid) | 80.4 | 326.87 | 3.98 | 1.62 |
| Activ•Flex Finger Care | Johnson & Johnson (Band-Aid) | 172.7 | 530.87 | 4.12 | 1.28 |
| Activ•Flex Large size | **Johnson & Johnson (Band-Aid)** | **75.72** | **273.25** | **4.02** | **0.7** |
| Activ•Flex Regular size | **Johnson & Johnson (Band-Aid)** | **72.3** | **387.92** | **3.93** | **1.37** |
| Blister Treatment | Dr. Scholl's | 147.75 | 336.04 | 3.17 | 1.11 |
| Small Blister | **Euromed Inc.** | **83.4** | **228.03** | **5.35** | **1.25** |
| Large Blister | **Euromed Inc** | **85.97** | **430.41** | **3.4** | **2.2** |

Biocompatibility

Biocompatibility studies were performed on SureSkin® II and SureSkin® OTC Hydrocolloid Dressings. These studies conformed to the standards of the Tripartite Guidance on toxicity testing and included the following specific tests:

- ISO Mem Elution using L929 Mouse Fibroblast cells: AppTec Laboratories Services
- ISO Intracutaneous Reactivity Test: AppTec Laboratories
- ISO Guinea Pig maximization Sensitization Test Method for Biomaterial Extracts: AppTec Laboratories

No toxic responses were reported to any of the SureSkin® Hydrocolloid Dressing products tested.

Summary of Chemical and Physical Properties

SureSkin® II, Bordered, Standard, Thin and OTC Hydrocolloid Dressings (SHD) are similar in chemical composition and physical properties including barrier properties and moisture management to other hydrocolloid dressings (HCD) currently used on chronic and acute wounds managed by professionals or by consumers using OTC products. The properties SHD shares with other HCD currently in clinical use to protect and dress wounds are the same parameters underlying the HCD benefits of faster healing, autolytic debridement, improved patient comfort and lower infection rates, when compared to gauze dressings, the most commonly used wound dressing option.

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The SureSkin® II family of dressings and SureSkin® OTC Hydrocolloid Dressing meet standards qualifying it as a biocompatible, viral barrier dressing similar in physical and chemical properties to other hydrocolloid dressings. Hydrocolloid adhesives are known for their capacity to stick to moist surfaces and protect intact and broken skin and have been used in wound and ostomy management since 1972. They are used with satisfactory results in meeting the functional needs of chronic and acute wounds managed either by wound care professionals or by the consumer.

## CONCLUSIONS

Available literature supports a conclusion that the family of professional use and OTC SureSkin® Hydrocolloid Dressings are safe, effective options for meeting functional chronic and acute wound needs and are substantially equivalent to other HCD dressings currently indicated for use on wounds managed by professionals or by consumers using hydrocolloid OTC products.

Safety or risks:

A review of RCTs concluded that no consistent evidence distinguished clinical safety of SHD from that of leading marketed HCD when used on professionally- or consumer-managed acute or chronic wounds. Cohort evidence supports similar safety of SHD to that reported for other HCD, including use on clinically infected wounds under appropriate supervision by a qualified clinical professional.

In general, hydrocolloid adhesives are tenacious during the first 1-2 days of wear and should not be removed frequently without care. Accumulated odor and dissolution of HCD adhesive are noticeable after prolonged wear and should not be mistaken for symptoms of infection.

Efficacy or benefits:

Studies report effectiveness of HCD in:

- cost effective autolytic debridement
- maintaining moist wound environments with healing benefits compared to gauze
- managing fluid from mildly to moderately exuding wounds
- limiting pain and the likelihood of infection,
- protecting wounds and surrounding skin from microbial, chemical or physical challenges.

These findings support published clinical practice guidelines (e.g. AHCPR, 1992) recommending HCD use in chronic and acute wound management.

Additional evidence reviewed on minor wounds managed by consumers supports similar efficacy of HCD, such as SureSkin® II and SureSkin® OTC Hydrocolloid Dressing in meeting the functional needs of these minor wounds.

Substantial equivalence to current hydrocolloid dressings: Review of laboratory data and comparative examination of selected commercially available HCD supported the conclusion that SHD are physically and chemically equivalent to HCD currently in clinical use around the world on chronic and acute wounds with evidence of safety and efficacy summarized in this literature review.

**FOOTNOTES**

* SureSkin® is a registered trademark of EuroMed Incorporated in Austria, Spain, Sweden, Denmark, France and Germany.
EuroMed Incorporated has pending trademark applications in other foreign jurisdictions.
** Comfeel Plus® Ulcer Dressing is a registered trademark of Coloplast Corporation, Humlebæk, Denmark.
*** DuoDERM® CGF® Sterile Dressing is a registered trademark of E.R. Squibb & Sons, L.L.C.

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**APPENDIX A. SYSTEMATIC REVIEWS, META-ANALYSES, RANDOMIZED (RCT) OR NON-RANDOMIZED (NCT) CONTROLLED CLINICAL EVIDENCE OF SAFETY AND EFFICACY OF HYDROCOLLOID DRESSINGS (HCD) IN WOUND CARE**

| **Indication**<br>**Reference** | **Dressings Studied (Subjects)** | **Study Design [Country]**<br>**Limitations** | **Significant Functional Results**<br>**(p<.0.05 if not noted; NS: p>0.05 )** |
|---|---|---|---|
| **Acute Minor or Superficial Wounds Not Usually Requiring Professional Care** | | | |
| Abrasions | | | |
| Claus et al. (1998) [USA] | Same subject 4 abrasions on volar forearm dressed:<br>Film dressing (14)<br>HCD D1 (14)<br>Absorbent island bandage (AIB)(14)<br>Air exposed control (14) | Prospective RCT with daily dressing removal and photography of standardized abrasion sites made with sandpaper, cleaned with 3% $H_2O_2$, then dressed. Healing and wound area were measured from photographs. Patient preferences were measured by survey. | All 3 dressings decreased healing time compared to air-exposed wounds. There were NS differences among the three dressings in healing time or area. Only HCD and Film significantly decreased final wound area compared to control. Subjects preferred AIB overall, and Film or HCD for protection. |
| Katz (1986) [USA] | Std HCD D1 (7)<br>Gel pad dressing (7)<br>Film dressing 1 (7)<br>Film dressing 2 (7)<br>Film dressing 3 (7)<br>Transparent food wrap (7) | Prospective random Latin-square blind evaluation of bacterial proliferation and re-epithelization in experimental scarification/abrasion wounds on healthy volunteers. Each wound was inoculated with $10^6$ *S. epidermidis, S. pyogenes, S. aureus* or *P. aeruginosa* . Measures were colony forming units (CFU) from quantitative microbial samples and re-epithelization by stereomicrographs. No uninoculated control or gauze control measured effects of occlusion or microbes. | All wounds re-epithelized at same rate and grew microorganisms. Fewer *S. aureus* or *P. aeruginosa* grew under HCD D1 than under any other dressing. Clinical signs of infection were correspondingly less than those seen under the three film dressings. Unable to assess effects versus non-occlusive dressings such as gauze. |
| Blisters | | | |
| Silverman et al (1989) [USA] | Std HCD D1 (6)<br><br>Film dressing O (6)<br><br>Film dressing B (6)<br><br>Air-exposed (6)<br><br>Adhesive strip dressing + triple antibiotic ointment (6) | Prospective study of five 8-mm diameter suction blisters on the volar forearm of each of 6 paid human volunteers studied for 4 weeks. Clinical healing and TEWL were evaluated on days 1-18, 24 and 32. Note HCD and film dressing daily removal is not indicated on low-exuding wounds such as blisters due to potential for surface disruption which may have affected TEWL values. | Clinical healing was reported for all 4 dressed sites on days 7-9, when crust still adhered to 5 of 6 control wounds, indicating that they may not have been healed. |
| Epidermal superficial wounds | | | |

| Indication<br>Reference | Dressings Studied<br>(Subjects) | Study Design [Country]<br>Limitations | Significant Functional Results<br>(p<.0.05 if not noted; NS: p>0.05 ) |
|---|---|---|---|
| Goetze et al. (2006) [Germany] | Std HCD H (8)<br>Control (8):antimicrobial cream + adhesive non-woven polyester fabric | Prospective RCT of 16 subjects 8-80 years of age experiencing 2nd intention healing of superficial seborrheic keratosis excision sites. Wound healing was evaluated blind to treatment at 7 and 10 days then daily until healed. | HCD-dressed wounds healed in 8.5 days compared to 10 days for control (p<0.05). NS differences in histology on 7 of the 16 subjects. |
| Khatri et al (2007) [USA] | HCD H[f] on ½ of laser skin resurfacing wounds with other half left open (10) | Open side cleaned 4 times per day according to standard practice, HCD was replaced if dislodged. Participants and a blinded professional rated healing one month after wounding | 8 of 10 subjects rated HCD side better healing at 1 month, remaining 2, equal. Professional rated HCD better on 6 of 10. |
| Intact skin sites | | | |
| Dykes (2007) [UK] | Soft silicone dressing, non-adherent gauze, one adhesive and one non-adhesive foam dressing, Std HCD C, Std HCD D (each applied to intact dorsal skin on 30 normal volunteers) | Standard Repeat Insult Patch Testing methods were used, applying each dressing to the same site 6 times during 14 days. Measures were cumulative irritation score (CIS) and transepidermal water loss (TEWL) on days 3, 5, 8, 10, 12 and 15 of the study. | CIS and TEWL were lower for the three non-adhesive products than for the adhesive products, including Std HCD C and Std HCD D. Neither of the HCD is indicated for such frequent removal on non-exuding skin sites. This may have caused skin stripping artifacts. |
| **Acute Wounds Requiring Professional Care** | | | |
| Amputation sites | | | |
| Charpentier (1988) [France] | HCD D1 (17)<br>Gauze (21) | Prospective randomized study of protection and healing of amputation sites in patients with arterial insufficiency | Wounds contracted faster with HCD, with fewer dressing changes than with gauze |
| Biopsy excisions | | | |
| Nemeth (1991) [USA] | HCD D2 (56)<br>Antibiotic ointment gauze (78) | Prospective randomized study of healing and pain relief of unsutured partial-thickness shave biopsy sites and full-thickness punch biopsy sites dressed for 3 weeks or to healing, whichever came first. | Less intense and shorter duration pain on both shave and punch biopsies dressed with HCD. Shave biopsies healed faster than those dressed with gauze. Patients preferred HCD 3 to 1 compared to gauze. |
| Burns | | | |
| Cassidy et al. (2005) [USA] | HCD D1 (36)<br>Biobrane (36) | Prospective RCT of pediatric burn patients with intermediate depth burns covering <10% of body surface area. Measures included healing, pain and dressing costs. | Pain and healing were NS different for the two dressings. Management with HCD cost significantly less than with Biobrane . |

[f] HCD H is Avery H2460, Avery Dennison, Turnhout, Belgium)

| Indication<br>Reference | Dressings Studied<br>(Subjects) | Study Design [Country]<br>Limitations | Significant Functional Results<br>(p<.0.05 if not noted; NS: p>0.05 ) |
|---|---|---|---|
| Hermans (1987) [Scandinavia ] | HCD D1 (Shallow PT 42; Deep PT 25) silver sulfadiazine 1%SSD Cream/gauze:(Shallow PT 3; Deep PT 2) Allograft: (Shallow PT 7; Deep PT 4) | Prospective controlled study on patients with mean 2.1% TBSA burns excluding 2 HCD patients who became infected and 1 a mis-diagnosed epidermolysis bullosa patient. Burns were classified as shallow partial-thickness (SPT) or deep partial thickness (DPT) | HCD-dressed SPT burns healed in 8 days vs 11 days with SSD gauze or 12.5 days with Allograft (p<0.001). HCD-dressed DPT burns healed in 12.5 days vs 19.5 days with SSD or 16.5 days with Allograft (p<0.01) |
| Hermans & Hermans (1984) [NL] | HCD D1 (66)<br>Silver sulfadiazine (3) (1%SSD Cream/gauze)<br>Human allografts (6)(HA) | Prospective controlled study on patients with burns ranging from superficial to deep partial thickness: studied to healing. | Superficial burns healed in 8 days dressed with HCD or 10 with SSD or 12 with HA. Deep partial-thickness burns healed in 12.5 days dressed with HCD or 19.5 days with SSD or 16.5 days with HA |
| Hermans & Chedorge (1987) [FR] | HCD D1 (61); Autografts (10 of above 61); 1% SSD Cream/gauze (5 of above 61) | Prospective open label study of superficial and deep burns and donor sites until healing. | Faster healing of deep and shallow burns and faster re-harvesting of donor sites; also greater comfort with HCD. No infections were seen. |
| Madden et al. (1989) [USA] | HCD D1 (23 burns;20 with mirror image donor sites) 1% SSD fine mesh gauze (23 burns;20 with mirror image donor sites) | Prospective randomized study of dressing's effect on burn and donor site healing and effect of growth factors in the wound fluid on human keratinocyte proliferation. | Burns and donor sites dressed with HCD healed faster and with less pain than gauze. HCD wound fluid stimulated human keratinocyte proliferation more than controls, similar to growth factor effects. |
| Reig et al (1991) [Spain] | HCD D2 (10 burns) with half of each wound dressed with a transparent film dressing (TFD) | Prospective comparative study of healing and complications of HCD vs TFD, using split-half wound experimental and control second degree burn sites and skin graft donor sites from same patients. Donor site results are reported in "Skin graft donor site section." | Burns: HCD-dressed sides healed in 7.4 d vs 13.8 d for TFD. HCD-dressed wound sections healed with less pain, fewer dressing changes and less than half the infection rate than if TFD-dressed. |
| Wright et al. (1993) [UK] | HCD D2 (34)<br>Ointment gauze tulle gras (28) | Prospective open-label, randomized parallel group study of healing and dressing performance on partial-thickness burns in a UK Emergency Dept. | Quality of healing, and patient ratings were better with HCD. |
| Wyatt et al. (1990) [USA] | HCD D2 (22)<br>1% Silver sulphadiazine cream (SSD) in Gauze (20) | Prospective controlled randomized study of burn healing, scarring, pain, cost effectiveness | HCD-dressed burns healed faster, with less erythema in scars, half the pain, with less cost and fewer dressing changes than those dressed with SSD gauze. |
| Cryosurgery wounds | | | |

| Indication<br>Reference | Dressings Studied (Subjects) | Study Design [Country]<br>Limitations | Significant Functional Results<br>(p<.0.05 if not noted; NS: p>0.05 ) |
|---|---|---|---|
| Hoffman et al (1995) [Germany] | Std HCD D2 changed once daily (40)<br>Paraffin gauze covered with sterile compression bandage fixed with adhesive tape changed twice daily (37) | Prospective RCT study of planimetrically measured healing time, treatment time, sonography to measure basiloma penetration depth, clinical wound infections and wound pH. All patients had cryosurgically treated basiloma on the face or neck. | Mean duration of treatment was 15.8 days for HCD and 20.4 days in gauze group (p=0.0001) Sonography showed reduction in lesion depth by day 21 post cryosurgery for HCD group (p=0.0009, but not the gauze group. Planimetry showed more reduction in surface area for HCD group than gauze group (p=0.0004). There were 2 HCD infections, 9 for gauze. |
| Catheter or drainage tube insertion sites | | | |
| Alsbjorn et al. (1990) [Denmark] | Std HCD D1 (21)<br>Petrolatum gauze (21) | Prospective randomized bilateral controlled study of pericardial drainage tube removal sites | Ten days post tube removal more wounds were healed using HCD than using gauze, without an increase in infection rate. |
| Nikoletti, 1999 [Australia] | Thin HCD C2 (62)<br>Transparent Film Dressing (63) | RCT of adult patients requiring insertion of a multilumen chronic venous catheter in intensive care. Outcomes measured were blood cultures, catheter tip, and hub and skin colonization. Blood cultures represented were mostly "potential contaminants" not meeting CDC definition of a Catheter Related Blood Stream Infection. | Skin and hubs were not significantly colonized. The HCD had higher levels of colonization than the film dressing(p=0.048) but these were accompanied by a lower infection rate than the polyurethane film dressing as indicated by fewer positive blood cultures (p=0.03). |
| Haffejee et al. (1992) [South Africa] | Transparent HCD D2 (8)<br>Polyurethane transparent film dressing (TFD) (8) | Prospective randomized study of microflora and infections at central venous catheter insertion sites with dressings changed every 3 days during first month, every 5 days during second month | Fewer normal and pathogenic microorganisms grew under HCD than TFD. When dressing was changed every 5 days, HCD sites had more microbe-free cultures. No infections were seen. |
| Circumcisions | | | |
| Murharyo (1996) [Singapore] | Std or Thin HCD D2 (32)<br>Non-adherent gauze (30) | Prospective RCT study of healing, pain during and between dressing changes, adherence of dressing to wound, ease of use, cosmetic aspect of dressing and overall comfort on circumcision patients old enough to report pain. | HCD-dressed patients reported significantly less pain and better (P<0.01) ratings on healing, ease of use, dressing aspect and adherence to wound and overall comfort. |
| Dermabrasions | | | |

| Indication<br>Reference | Dressings Studied (Subjects) | Study Design [Country]<br>Limitations | Significant Functional Results<br>(p<.0.05 if not noted; NS: p>0.05 ) |
|---|---|---|---|
| Ulrich & Kunhe (1995) [Germany] | Std HCD D2 or Tulle gras gauze (25 patients with tattoo-removal dermabrasion wounds same-patient controls) | Prospective RCT of outpatients experiencing demabrasion for tattoo removal. Measures were healing time, pain, bleeding, burning, clinical infections and patient dressing performance ratings. | HCD-dressed sites experienced healing in 13.4 days, gauze: 17days (p = 0.0137). Less pain, bleeding, burning with HCD, which was also rated higher by patients on being water tight, having good adhesion and appearance. One infection was reported in the tulle gras gauze group. |
| Neurovascular corns | | | |
| Petersen et al. (1991) [Denmark] | Std HCD D1 + Curettage (15)<br>Curettage alone (15) | Prospective randomized controlled study of 30 consecutive patients with neurovascular corns treated 6 times during 12 weeks with follow-up 3 months after the last treatment. Measures were corn size, discomfort, and overall judgment of the trial. | HCD provided no benefit of occlusion for symptoms of neurovascular corns. HCD-dressed patients were generally more satisfied with the trial than the control group. |
| Skin Graft Donor Sites | | | |
| Biltz et al. (1985) [Germany] | Std HCD D1 (12); Saline gauze (12 similar cancer or leg ulcer patients.) | Prospective randomized controlled clinical study of wound healing, healing time, pain and clinical practicability. Study duration was to complete healing | HCD-dressed wounds healed faster (7.2 days vs 13.5 days for gauze) and with less pain (p<0.01). |
| Brotherston & Lawrence (1993) [United Kingdom] | Std HCD D2 alone (10) or over silver sulphadiazine (SSD) cream (13); Tulle gras beneath absorbent wool, secured with crepe (12) | Prospective randomized study of healing and infection with colony-forming units (CFU) measured by quantitative swab before dressing application. Dressings were changed on leakage or on the 10$^{th}$ postoperative day. Dressing performance and patient opinions were recorded. | No wounds became infected despite >10$^5$ CFU colonization. HCD-dressed wounds healed in a mean of 13 days or 12.5 days in the SSD HCD group. Wounds dressed with the non-medicated tulle gras healed in a mean of 15.1 days. |
| Champsaur et al (1988) [France] | Std HCD D2 (20)<br>Tulle gras (20) | Prospective randomized study of healing, reinjury, pain, and time to re-harvest donor sites in a French burn unit | Healing time was 6.8 days with HCD or 10.4 days with tulle gras; re-harvest times respectively 10 or 15 days. 3.6 HCD were used or 1 tulle gras. More re-injury and pain with tulle gras. No infections observed. |
| Demetriades & Psaras (1992) [South Africa] | Std HCD D2 (10)<br>Tulle gras (10) | Prospective, randomized same-patient control study of wound healing time and patient comfort | Donor sites dressed with HCD healed faster and with more comfort than those on the same patient dressed tulle gras. |

| Indication<br>Reference | Dressings Studied<br>(Subjects) | Study Design [Country]<br>Limitations | Significant Functional Results<br>(p<.0.05 if not noted; NS: p>0.05 ) |
|---|---|---|---|
| Foyatier (1992) [France] | Std HCD D2 (34)<br>Paraffin gauze (34) | Prospective randomized open-label study of healing, pain, scarring in mirror image donor sites dressed once weekly | Faster healing with HCD (7.7 days versus gauze (13 days) and less pain. Scars were more moist and supple allowing earlier reharvest with HCD. |
| Mathwick & van Rijswijk (1996) [USA] | Std HCD (49)<br>Film dressing (33)<br>Dry gauze (40)<br>Impregnated gauze (114)<br>Composite dressing (52) | Meta-analysis of 10 prospective controlled clinical studies reporting time to heal, clinical infections reported and donor site pain at rest and while ambulating. | HCD-dressed donor sites healed fastest (in an average of 9 days), similar to other moisture-retentive dressings, with = fewer infections (0%) compared to dry or impregnated gauze (15%) and less pain at rest and ambulating. |
| Mitra & Spears (1990) [Italy] | Std HCD D2 (33)<br>Bismuth tribromophenate ointment in gauze (33) | Prospective, alternate assignment study of healing, pain, dressing adherence and cosmetic result | HCD-dressed donor sites healed with less pain and fewer days (8.6 days vs 13.5 days for gauze) but with more dressing changes. |
| Porter (1991) [United Kingdom] | Std HCD D2 (31)<br>Alginate (34) applied dry, held in place with layers of dry gauze, plaster wool and crepe. | Review of literature reporting healing times of split-thickness skin graft donor sites dressed with hydrocolloid and/or alginate dressings plus original study prospective RCT results reporting healing and pain in a United Kingdom Plastic Surgery and Burns Unit. | Review: hydrocolloid or alginate dressings accelerate donor site healing compared to fine mesh cotton gauze. RCT results: Mean time to heal for HCD was 10.0 days and for alginate was 15.5 days (p<0.05). No significant difference in pain. |
| Reig et al (1991) [Spain] | HCD D2 (13 donor sites on same patients as burn study cited). Half of each wound dressed with a TFD (transparent film dressing) | Prospective comparative study of healing and complications of HCD or TFD, using split-half wound experimental and control skin graft donor sites. | Donor sites healed in 7.1 days with HCD or 14.3 days for TFD. HCD-dressed wound sections healed with less pain, fewer dressing changes and less than half the infection rate than those dressed with TFD. |
| Rohrich & Pittman (1991) [USA] | Std HCD D2(9)<br>Transparent film dressing (TFD)(9) | Prospective randomized study of pain, healing, and exudate management on skin graft donor sties | HCD-dressed donor sites reported less pain, (p<.001) improved wound healing, greater ease of application and superior wearing comfort. TFD contained exudate better, needed fewer dressing changes, and was easier to clean. |
| Wiechula (2003) [Global review] | Moist dressings<br>Mainly HCD D or Films<br>Non-moist dressings<br>Mainly impregnated gauze | Cochrane review of all major databases and Dissertation Abstracts for studies objectively reporting healing, infection or pain. Analyses compared moist to non-moist dressings and if data were adequate moist to moist dressings. | HCD were significantly more effective than non-moist dressings in improving healing rates, infection and pain and decreased days to healing compared to other moist dressings. |

| Indication<br>Reference | Dressings Studied<br>(Subjects) | Study Design [Country]<br>Limitations | Significant Functional Results<br>(p<.0.05 if not noted; NS: p>0.05 ) |
|---|---|---|---|
| Surgical Incisions | | | |
| Burrows (2000) [Australia, Denmark, Sweden, USA] | Thin HCD D2 (77) vs gauze (92); Thin HCD D2 (40 wounds other half gauze dressed; Thin HCD C (36) vs gauze dressing (37) | Systematic review of prospective RCTs from 1990 to June 2000 comparing infection rates of surgical cardiac surgery, plastic surgery or clean abdominal surgery wounds dressed with HCD dressings compared to non-occlusive dressings | Sweden cardiac surgery: NS difference in infection rates between HCD and gauze. Denmark abdominal surgery: 3% HCD infection rate; 14% gauze infection rate—underpowered for statistical significance of this difference. USA plastic surgery: no infections reported with HCD or gauze. |
| Decaillet (1990) [France] | Carpal tunnel surgery patients: Thin HCD D2 (15); Antibiotic tulle (15) Hemostatic and gauze compresses were stacked over both dressings. | RCT evaluating healing, scarring, patient comfort, activities of daily living, ease of use and evaluation of wound. | Healing appeared equivalent with "perfect" scars in 6 patients who stayed on protocol using 1 HCD.. Ease of use, wound evaluation, patient comfort and ability to use and wash hands, lightness & size of dressing were better for HCD. Early bleeding: pooled under HCD in 9 cases causing maceration but no pathology. |
| Mitchie & Hugill (1994) [USA] | Thin HCD D2 (28) Bismuth tribromophenate ointment tulle gauze (28) | Prospective, randomized, split-wound, blinded evaluated controlled study of scarring and preferences. 40 surgical incisions on 28 patients | HCD contained exudate, protected the wound and facilitated personal hygiene and mobility, while producing more even, supple, normally colored scars than the tulle gauze. |
| Murharyo (1996) [Singapore] | Thin HCD D2 held in place 30 seconds (32) Tulle gauze (TG) taped in place.(30) Surgical circumcision wounds dressed immediately post operatively | RCT of circumcision wounds. Measures included: demographics, surgical information, whether patient bathed, dressing frequency and ease of removal, pain of removal (4-point scale) wound cosmetics 5 days post-op, dressing performance from medical perspective | Mean patient age: 9.03 yrs both groups (4-13 range). 31% bathed with HCD in place vs.. 17% of TG patients who reported that dressings became wet. 41% HCD leakage vs 3% ST. At 5 d 31% DDET and 17% TG reported healed. HCD adhered to surrounding skin 59% (7% TG) but not wound in 81% (40% TG in which 5 bled on removal ($\alpha$<0.01). Pain was rated as minimal by 81% of HCD and 0% of TG patients ($\alpha$<0.01). Final wound evaluation better for HCD ($\alpha$<0.01). |
| Rasmussen et al. (1993) [Denmark] | Std HCD D1 (49 children) Sterile strip adhesive dressings (39 children) | Prospective, alternate day assignment study of pain and complications in covering post-operative incisions. | Better quality of life, no infections and less pain on removal of HCD than was reported using strip adhesive dressings. |

| Indication<br>Reference | Dressings Studied (Subjects) | Study Design [Country]<br>Limitations | Significant Functional Results<br>(p<.0.05 if not noted; NS: p>0.05 ) |
|---|---|---|---|
| Schmitt et al. (1996) [France] | Thin HCD D2 (85) Hypoallergenic adhesive Tape (85) (microporous non-woven strips reinforced with polyester fibers, covered by protective adhesive film spray | Prospective RCT studying ease of use, dressing application time, duration of wear, patient bathing healing at 8±2 days after plastic, digestive, urogenital, orthopaedic or thoracic surgery (mostly urogenital: 26 HCD, 25 Tape) , maceration, infection or other adverse events, and scarring at 90 ± 7 d, 1 year | Similar healing: 89% of HCD, 95% Tape. HCD was easier to apply (p=0.003). HCD application time 20 sec vs 1.25 min (p=0.001) HCD stayed in place between dressing changes in 81% vs 45% for Tape. 68% of children had ≥ 1 baths or showers during the 8-days post-op vs 32% for Tape. Scars had more pruritis (p=0.049) and were 2.5 mm wide at 90 d with HCD vs 1.8 mm Tape (p=0.02). 1 year: no pruritis in either group and 1 mm scar width in both groups. |
| Wynne et al. (2004) [Australia] | Dry absorbent dressing (243); Thin HCD D1 (267); Transparent film (227) | Prospective RCT of closed sternotomy wounds dressed in the operating theater and assessed days 1-5 post-operatively and followed up on successive wards and at 4 weeks by telephone survey. Measures compared surgical wound infection (SWI), healing, dressing cost (not including labor) and patient satisfaction and comfort in the three groups. Increased surgery duration and day1-5 exudate was associated with increased dressing frequency in HCD group. | NS healing difference. No deep SWI in HCD-dressed; other groups: 2% each (p=0.056). Despite increased discomfort if HCD had to be removed day 1, patients were more satisfied with HCD days 1 and 2 than other dressings (p<0.03). HCD had fewer dressing changes overall, but higher costs. |
| Young & Weston-Davies (1985) [UK] | HCD D1 (28) Conventional gauze island dressing (26) | Prospective randomized, open-label controlled study of healing, convenience, quality of life and adverse events on post-surgical incisions in UK University hospital | All wounds healed normally without infection except two unrelated adverse events. HCD was easier to apply, especially to difficult wounds, and permitted bathing, enhancing quality of life. |
| Traumatic Wounds | | | |
| Heffernan & Martin (1994) [Denmark] | Thin HCD D2 (48) Conventional gauze dressing (48) | Prospective randomized, controlled study of abrasions, lacerations and sutured incisions measuring pain, quality of life as capability to engage in activities of daily living, healing time, ease of suture removal of minor wounds in an accident and emergency department. | Patients dressed with HCD experienced less pain, required less anesthesia and were better able to carry out activities of daily living than those dressed with conventional gauze. Also sutures were easier to remove. No difference in healing time. |

| Indication<br>Reference | Dressings Studied<br>(Subjects) | Study Design [Country]<br>Limitations | Significant Functional Results<br>(p<.0.05 if not noted; NS: p>0.05 ) |
|---|---|---|---|
| Hermans (1991) [Netherlands] | HCD D2 Std (39)<br>Ointment impregnated gauze tulle gras (41) | Open label prospective randomized study of healing, pain relief and wear time on cyclists' abrasions studied until healed. | Wounds dressed with HCD D2 healed faster (5.6 days vs 8.9 days for tulle), with less pain and longer average wear time (2.4 days vs 0.7 days for tulle) and no infections vs 10% infected wounds for tulle. |
| Sayers & Porter (1988) [UK] | Std HCD D1 (20)<br>Tulle Gras (20) | Prospective alternately assigned consecutive patients with finger tip injuries in Emergency Room. Measures were pain on dressing change, treatment cost, healing time and patient and professional preferences. | Similar healing rates for HCD and tulle-gras. HCD-dressed group experienced less painful dressing changes with overall lower treatment costs. HCD was preferred by both patients and staff. |
| **Chronic Wounds or Conditions** | | | |
| Diabetic Foot Ulcers | | | |
| Laing (1994) [UK, USA] | - Debrided HCD D1,TCC (36 diabetic 10 non-diabetic)<br>-Homologous platelet releasate moist gauze (49) and (21) gauze both no total contact cast (TCC)<br>-Debrided, no TCC, various dressings (80 with severe vascular disease)<br>-Debrided + TCC (33)<br>-Debrided, TCC (30 with forefoot and 25 with non-forefoot ulcers | Review of studies reporting diabetic neuropathic foot ulcer (DNFU) healing using TCC or no TCC for off-loading the affected foot. Measures were % healed and mean or median healing time. Each entry beginning with a dash (-) represents one study. | No TCC<br>-Platelet releasate: 59% healed in 140 days; gauze: 31% healed in 140 days<br>-Debridement: 38% healed in120 days<br>TCC<br>Debrided: 82% healed in 43 days<br>Debrided, HCD on DNFU:79% in 42 days; on non-diabetic NFU:90% in 49 days<br>Debrided forefoot median heal time 5 weeks; non-forefoot, 6 weeks. |
| Pilonidal cyst excisions | | | |

| Indication<br>Reference | Dressings Studied (Subjects) | Study Design [Country]<br>Limitations | Significant Functional Results<br>(p<.0.05 if not noted; NS: p>0.05 ) |
|---|---|---|---|
| Viciano et al. (2000) [Spain] | Std HCD D1(12)<br>Std HCD C (11)<br>Gauze (15) | Prospective RCT of chronic pilonidal sinus excisions healing by second intention dressed to healing and followed for 74 months. Measures were healing, infection, intolerance, pain, comfort, ease of management, leakage and recurrence. | Median healing time 65 days (range 40-137) for both HCD and 68 days (33-168) for gauze. 1/3 of gauze-dressed cultures grew pathogens and 1/23 of HCD-dressed (p=0.03). Less pain weeks 1-4 with both HCD dressing than with gauze dressings. |
| Pressure Ulcers | | | |
| Bouza et al. (2005) [Spain] | Hydrocolloid (239) or conventional (233) or other advanced dressings | Meta-analysis of wound dressings with published healing outcomes on pressure ulcers. | There was sufficient evidence to conclude that only HCD showed greater efficacy compared to conventional dressings. |
| Burgos (2000) [Spain—7 centers] | Std HCD D2 with optional paste applied once every 3 days or more often if needed (19) Iruxol Collagenase [C] prescription ointment applied under gauze once daily 1-2 mm thick layer to wound surface (18) | Prospective RCT of patients at least 55 years of age with a Stage III PU of less than 1 year duration. Measures were ulcer area, percent of wound covered with granulation tissue, exudate, odor, necrotic tissue removal and pain outcomes, reported at 1-week intervals as well as calculated cost effectiveness, cost of care. | NS difference in percent healed at 12 weeks (16% HCD, 17% C) , efficacy measured as mean $cm^2$ reduction in ulcer area, efficiency, i.e. cost to heal each $cm^2$ of ulcer area or adverse events. Staff time per patient per day was less for HCD subjects (p=0.03) resulting in a lower portion of overall costs attributable to staff (p=0.0001) |
| Colwell (1993) [USA] | Std HCD D2 (33) vs Wet/wet saline gauze (37) remoistened every 4 hours to prevent drying | Prospective RCT in a university hospital setting studied cost effectiveness (materials & labor) and healing of Stage II and III pressure ulcers, dressed for at least 8 days. | Lower materials and labor costs for HCD of $3.55/day vs $12.26/day with gauze. Faster healing with HCD may have resulted from random assignment of fewer Stage III PU to HCD than to gauze group. |
| Cullum & Petherick (2006) [Global review] | Systematic review includes<br>Bradley (1999)<br>Bouza (2005)<br>Hollisaz (2005) | Systematic review of two systematic reviews, one of 5 RCTs covering 396 wounds and one of 6 RCTs including 4 RCTs covering 286 people) and one RCT (Hollisaz, reviewed below). One trial did not explore a wafer type hydrocolloid dressing pertinent to the subject of this literature review. One trial included HCD sequentially used with alginate dressings. | Reviewers found some limited evidence that HCD improved ulcer healing compared to gauze soaked in saline, hypochlorite, or povidone iodine at up to 12 weeks. An added RCT found NS difference between HCD and standard dressings in pressure ulcer healing. |

| Indication<br>Reference | Dressings Studied<br>(Subjects) | Study Design [Country]<br>Limitations | Significant Functional Results<br>(p<.0.05 if not noted; NS: p>0.05 ) |
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| Day et al. (1995) [USA—8 acute care hospitals] | Triangular Bordered (BRD) HCD D2 (52) vs Standard (STD) Oval bevelled HCD T1[g] (51) | Prospective RCT of patients >18 years of age with a NPUAP Stage II or III sacral PU. Measures were wear time, healing and dressing performance on sacral pressure ulcers and dressing positioning for 6 dressing changes. | BRD-dressed patients had higher rate and percent ulcer healing, less pain and fewer adverse events than STD. Longer wear with triangle point down of BRD. |
| de Laat et al (2005) Global review | All wound care modalities reporting measured effects of dressings on pain, odor or exudate management. | Systematic review of pressure ulcer outcomes dealing with pain, odor and exudate management. | HCD may positively influence healing time because the absorption of exudate is more effective. Two topical anesthetics manage pain. |
| Dobrzanski et al (1990) [2 UK hospitals] | Std HCD D1 (11) versus a more cohesive Std HCD D2 (16). Both with optional HCD paste | Prospective RCT of patients with a full-thickness PU measuring dressing wear time until leakage for up to 8 dressing changes | More cohesive Std HCD stayed in place without leaking 0.6-1.5 days longer than Std HCD; adding HCD paste shortened wear time |
| Fellin (1984) [USA] | HCD D1 (2) vs Wet-to-dry gauze (2) | Prospective crossover study of daily costs to dress pressure ulcers. | Daily dressing cost with the HCD was lower ($1.09) than for gauze ($7.89) |
| Flam (1991) [USA] | HCD D2 Thin (7) | Prospective study of sheet friction and sheer levels of dressings applied to sacral skin of healthy volunteers | HCD protected skin from both friction and sheer forces without being dislodged. |
| Gorse & Messner, 1987 [USA hospital] | Std HCD (76 ulcers, 26 patients) Dakins wet-to-dry gauze (52 ulcers, 26 patients) | Prospective randomized study of weekly costs and healing of Stage II and III pressure ulcers studied to healing, hospital discharge, or treatment failure. | More Std HCD-dressed ulcers healed (87% vs 69% for gauze), with lower weekly cost of supplies ($6.20 vs $52.50 for gauze). |
| Graumlich et al, 2003 [11 USA nursing homes] | Medifil BioCore Collagen (35) daily<br>Std HCD (30) twice per week | Prospective randomized controlled trial of ulcer healing during 8 weeks topical care of residents in 11 nursing homes in central Illinois. | Mean healing times and area healed per day were similar in the two groups. “Collagen was more expensive and offered no major benefits to patients otherwise eligible for hydrocolloid treatment.” |
| Harding et al, 2000 [EU Review] Kerstein et al. 2001 [US Review] | Std HCD D[h] (9 studies: 281 ulcers) Std HCD C[i] (3 studies; 136 ulcers) Saline gauze (6 studies; 102 ulcers) | Retrospective literature review of weekly costs, healing and costs to heal Stage II and III pressure ulcers studied to healing, hospital discharge, or treatment failure. Cost models generated by expert European panel input | More Std HCD D-dressed ulcers healed by 12 weeks (61% vs 51% for gauze or 48% for Std HCD C), with lower cost to heal each wound for both HCD than with gauze. |

[g] HCD T: Tegasorb® (T1) later replaced by Tegasorb® Hydrocolloid Dressing (T2), 3M Health Care, St. Paul, MN, USA.
[h] HCD D: DuoDERM® (D1) or DuoDERM® CGF (D2) including Extra Thin and Transparent versions or SignaDress®, an early form of DuoDERM® Signal (DS) Dressings, ConvaTec, Skillman, NJ, USA. DuoDERM and DuoDERM CGF are registered trademarkes of E. R. Squibb & Sons, L.L.C.,

| Indication<br>Reference | Dressings Studied<br>(Subjects) | Study Design [Country]<br>Limitations | Significant Functional Results<br>(p<.0.05 if not noted; NS: p>0.05 ) |
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| Hollisaz et al. (2004) [Iran] | Std HCD D (31 ulcers)<br>Phenytoin cream (PC: 30)<br>Simple gauze (SG: 31) | Prospective RCT of 83 young paraplegic men with Stage I or II pressure ulcers dressed for 8 weeks in long term care units. Measure was percent healed at 8 weeks. | Regardless of site or stage, HCD healed more than other groups. HCD:75%; PC: 40% (p<0.01) and SD 27% (p<0.005). |
| Hondé et al. (1994) [France] | STD HCD C (84)<br>Copolymer membrane (84) | Prospective multicenter 8-week RCT of patients hospitalized with a Shea Stage II to IV pressure ulcer measuring percent healed and Kaplan-Meier estimates of healing time. | NS difference in % healed. Healing time was 32 days for membrane or 38 days for HCD C (p=0.044) |
| Ohura (2005) [Japan] | STD HCD D2 (7)<br>Hydropolymer (7)<br>Hydrofoam (7) | Prospective in-vitro study measured coefficient of friction between the outer dressing layer and fabric, adhesiveness between the inner dressing layer and skin, as well as transmission of shear force by the dressing. | Lowest coefficient of static friction for HCD (0.48); or 1.01 for hydropolymer, 0.72 for hydrofoam. Lowest shear transmission for hydrofoam. |
| Seaman et al, 2000. [USA, home care] | Std HCD D2 with signal for dressing change (17) versus Std bevelled HCD C+ without signal (18) | Prospective study of healing and ease of teaching, ease of use of treatments on Stage II and III pressure ulcers in home care patients for 5 dressing changes or until healing occurred. | 35% of HCD D2 protocol wounds healed versus 6% of HCD C+ wounds ($\alpha$<0.04). Both were rated high on ease of use and ease of teaching non-professional caregivers. |
| Seeley et al (1999) [USA] | Std HCD D2 (20)<br>Adhesive Hydrocellular foam (20) | Prospective controlled study of healing, pain, odor, speed of dressing changes and ease of dressing use on patients with Stage II or III pressure ulcers | Median healing time was 17 days for HCD and 32 days for foam. Greater ease of use and speed of dressing change for foam. |
| Shannon & Miller, 1988 [USA hospital] | HCD D1 (2) versus<br>Gauze + A&D Ointment® (2) | Prospective study of healing and costs per week of treatments on matched pressure ulcers on spinal cord-injury patients hospitalized for 3 or 6 weeks. | Healing rates were similar, but there was less recurrence and lower costs per week with HCD ($6.46 vs $18.46 for gauze. |
| Xakellis & Chrischilles, 1992 [USA long-term care facility] | HCD D2 (18) versus wet-to-moist gauze (21) | Prospective university-based randomized parallel-group study of healing, skin condition and cost of 6 months treatment in a long term care facility.. | Median time to healing 9 days for HCD vs 11 days for gauze (p<0.12). Less total cost to endpoint for HCD, for which p=0.04 if calculations used appropriate national wages |
| Psoriasis or other inflammatory conditions | | | |



Princeton, NJ, USA. DuoDERM and DuoDERM CGF are also respectively called Granuflex and Granuflex E or DuoActive and DuoActive E in some countries.

[i] HCD C: Comfeel® Ulcus (C1) or Comfeel® Ulcer Dressing (C2) also marketed as RepliCare® in some countries or Comfeel® Plus (C+) Dressings. Comfeel is a trademark of Coloplast Corp, Humlebaek, Denmark. RepliCare is a trademark of T.J. Smith & Nephew, Inc, Hull, UK.

| Indication<br>Reference | Dressings Studied<br>(Subjects) | Study Design [Country]<br>Limitations | Significant Functional Results<br>(p<.0.05 if not noted; NS: p>0.05 ) |
|---|---|---|---|
| Gottlieb et al. (1990) [USA] | Thin HCD D2 (10);<br>UVB (6)<br>Methotrexate® (1);<br>Anthralin® (1);<br>Etretinate/psoralin/UVA (2) | Prospective blinded same-patient Thin HCD site for all 10 patients receiving the last 4 treatments elsewhere on the patient's body with similar plaque. Thickness, scale and erythema of psoriatic plaques were rated blind to treatment weekly for 10 weeks of treatment. | After 2 weeks the scale and thickness of psoriatic plaques dressed with the HCD was reduced and remained so for the rest of the study. Also hyperproliferative cell markers were reduced versus controls. |
| Kragballe & Larson (1991) [Netherlands] | Thin HCD D2 (every 3rd day: 19);Thin HCD D2+1% triamcinolone acetonide (TACA) (19)<br>Clobetasol propionate twice daily (19) | Prospective randomized open study of localized palmo-plantar pustulosis treated for 4 weeks | More complete clearance of the psoriasis with HCD + TACA (63%) every third day than with Clobetasol propionate .05% cream twice daily. |
| Van de Kerkhof et al. (1994) [Netherlands] | Std HCD D2 (40)<br>Std HCD D2 + 1% TACA (40)<br>Porous transparent film + 1% TACA (40)<br>1% TACA lotion (40) | Prospective blinded weekly comparison of psoriasis symptom intensity; scaling, induration, and erythema, with all four treatments applied to matched sites on each patient for 6 weeks. | HCD with or without triamcinolome acetonide (TACA) were the only two treatments which reduced all 3 measures of psoriasis from week 1 onward. The porous transparent film failed to reduce scaling. |
| Radiation induced hyperkeratosis | | | |
| Petersen et al. (1991) [Denmark] | Curettage + HCD D1 (14)<br>Curettage alone (15) | Prospective randomized blind evaluation of pain and efficacy in reducing radiation-induced plantar hyperkeratoses. | Curettage + HCD reduced pain and hyperkeratosis size vs Curettage alone. Total healing occurred in 86% of wounds dressed with HCD vs 47% without (p<.07). |
| Scars | | | |
| Phillips et al, (1996) [USA] | Thin HCD D2 (10)<br>Moisturizing cream (10).<br>(9 hypertrophic scars and 1 keloid in each group) | Prospective RCT evaluating scar size, volume, color ratings on Vancouver scale, patient reported pain and itching on Visual Analog Scale, transcutaneous oxygen tension during 8 weeks of treatment and at 1 month after last treatment. Evaluating physician was blinded to treatment group. | Scar itching (p=0.03) and pain (p=0.08) decreased and pliability increased 10% during two months use of both topical modalities. There was no change in physical parameters of the scars in either group. Effects of both modalities were NS different on any scar parameter. |
| Scleroderma ulcers | | | |
| Milburn et al. (1989) [UK] | Std HCD D1(10) matched sites to: Dry gauze, daily soaks (10) | Prospective paired-comparison study of matched, same patient scleroderma ulcers of the hand | Faster healing and more pain relief in the HCD - dressed ulcers versus dry gauze dressings with daily soaks. |

| Indication<br>Reference | Dressings Studied (Subjects) | Study Design [Country]<br>Limitations | Significant Functional Results<br>(p<.0.05 if not noted; NS: p>0.05 ) |
|---|---|---|---|
| Venous ulcers | | | |
| Arnold & Stanley (1994) [USA, UK] | Std HCD D2 (35)<br>Bismuth tribromophenate ointment-impregnated gauze (35) | Prospective, randomized, blind evaluation, controlled comparison of dressings under compression on venous leg ulcers in United States and United Kingdom leg ulcer clinic settings | More pain relief with HCD-dressed ulcers. 71% of HCD group healed and 43% of gauze group, both during an average of 7.2 weeks (NS). Mean HCD time to healing was 7.1 weeks or 8.2 weeks for gauze (NS) |
| Burton (1994) [US, UK] | Std HCD D1 or D2 (5 studies: 181 subjects)<br>Std HCD C (1 study: 30 subjects)<br>Gauze or Unna's boot (3 studies: 54 subjects) | Review of venous ulcer studies using compression and reporting healing times and/or % wound contraction per week and summary of protocol of care and infection rates experienced in Duke University ambulatory leg ulcer clinic. | Infections noted at 1% of weekly dressing changes despite heavy colonization.<br>Healing review:<br>HCD D family: 50% healed in 12 weeks to 82% healed in 50 days.<br>HCD C: 43% healed in 12 weeks<br>Gauze/Unna's boot: 23-43% healed in 12 weeks. |
| Caprio et al. (1994) [Italy] | Std HCD D2 (49)<br>Collagen Dressing (49) | Multicenter, prospective randomized controlled, blind evaluation study of venous leg ulcers in Italy conducted in 1992 | Std HCD D2 was associated with 50% faster healing and 48% longer wear time than collagen; and was more cost effective |
| Charles et al (2002) [UK] | Std HCD D2<br>Std HCD C<br>Foam dressing | Prospective RCT of venous ulcer patients treated for 12 weeks with accompanying compression short-stretch bandage. Pain, healing and ease of use were measured. | NS differences among dressing groups on any measure. |
| Cordts et al, (1992) [USA] | Std HCD D2 + a self-adherent compression wrap (30)<br>Unna Boot (30) | Prospective, randomized, blind evaluation, controlled study of well-documented venous leg ulcers dressed in an outpatient clinic for 12 weeks. | HCD primary dressing under compression permitted 2.5 times faster reduction in % wound area, NS due to large variance in Unna Boot subjects. Patients rated HCD protocol higher on comfort, cosmesis and adhesion than Unna's Boot compression. |
| Greguric et al. (1994) [Croatia] | Std HCD D2 + two layers of tubular compression bandages (55)<br>Conventional magnesium sulfate paste with gauze + double layer elastic compression bandage (55) | Open controlled, prospective parallel group study of venous ulcers for 10 dressing changes at 2 dermatology hospital clinics | HCD-dressed ulcers healed 32 sq mm/d or 21 sq mm/d for gauze. 50% epithelization was achieved in 6 visits for HCD or in 10 visits for gauze. 3 healed in HCD group, 0 in gauze group. HCD permitted less discomfort and longer intervals between dressing changes. |

| Indication<br>Reference | Dressings Studied (Subjects) | Study Design [Country]<br>Limitations | Significant Functional Results<br>(p<.0.05 if not noted; NS: p>0.05 ) |
|---|---|---|---|
| Handfield-Jones et al (1988) [UK] | Std HCD D1 (8 patients with 10 ulcers randomly assigned to start with either HCD or paraffin gauze then crossed over. | Prospective randomized cross-over study for 3 weeks, with cross over to other dressing for 3 weeks. Measures were area reduction, clinical infection or bacterial counts. | HCD group had 22% ulcer area reduction/week compared with 17% for gauze: NS. Higher bacterial counts with HCD were not associated with delayed healing. No clinical infections were seen. |
| Koksal & Bozkurt (2003) [Turkey] | STD HCD C + medical elastic compression stocking (30)<br>Unna's Boot (30) | Prospective controlled study of venous ulcer patients visiting an ambulatory clinic. Measures included healing rate, time and patient-reported pain during wear and on dressing removal, ease of use and time spent changing dressings. | HCD+ elastic stocking was rated better on pain during application and at home and ease of use. NS difference in healing or other parameters. |
| Kreuger et al. (1995) [USA] | Std HCD D2 (7)<br>Std HCD C (7) | Prospective blind evaluation, controlled study of venous ulcers randomized to either dressing for 2 weeks then 2-week cross over to other dressing | HCD D exudate significantly increased proliferation of human keratinocytes showing that it contained natural growth factors. HCD C exudate did not. |
| Lindholm (1995) [Sweden] | Std HCD D1 (changed when needed or once a week (15); or wet-to-dry saline gauze changed twice a day (15) | Prospective RCT comparing wound pain and all costs to reduce wound area by 1 percent for the two dressing groups during 6 weeks treatment (1234 dressing changes) in the primary care setting. | There was less pain (p < .0.003) at a lower total cost of care (p<0.009) and a lower cost to achieve each percent reduction of leg ulcer area in the HCD group (p=0.026) than in subjects dressed with gauze. |
| Lyon et al (1998) [USA] | Oral 250 mg/day (TxA2I) thromboxane-A2 inhibitor (83) or Placebo (81)<br>HCD D2 dressing, plus alginate primary if needed to manage high exudate. Compression: Unna boot with added elastic layer. | Multicenter, prospective blind RCT for 12 weeks of chronic long duration (27 month average duration) venous ulcers in outpatient clinics. Subjects visited the ambulatory care clinic for their once weekly dressing and compression changes. Primary measures were percent healed at 12 weeks and time to heal. | At 12 weeks 55% of TxA2I and 54% of placebo patients healed. Median time to healing 9.6 weeks for Ifetroban patients, 11.0 weeks for placebo. (NS). |
| Moffat (1992) [UK] | Std HCD C (30)<br>Nonadherent gauze (30)<br>Both with compression | Prospective RCT of chronic non-healing leg ulcers studied to healing or 12 weeks, whichever came first. Primary measure was % of patients healed in 12 weeks.. | HCD: 43% healed in 12 weeks<br>Gauze: 23% healed in 12 weeks |
| Mulder et al. (1993) [US, UK] | Std HCD D1 under Unna Boot plus an elastic compression wrap (9)<br>Same treatment without the HCD (10) | Randomized blind evaluated, prospective controlled study of venous ulcers evaluated in an outpatient clinic before and after one week with dressing and compression in place. Autolysis was rated histologically as pericapillary fibrin cuff thickness. Angiogenesis was rated as capillary frequency in appropriately stained ulcer biopsies. | Reduction of deep and shallow pericapillary fibrin cuffs was seen in 40% of the group without HCD or 89% of the group with HCD (p<0.04). There were no other histological differences or differences in healing measured by planimetry.. |

| Indication<br>Reference | Dressings Studied<br>(Subjects) | Study Design [Country]<br>Limitations | Significant Functional Results<br>(p<.0.05 if not noted; NS: p>0.05 ) |
|---|---|---|---|
| Nelson et al. (2007) [UK] | 1. 1-layer Adhesive Compression Bandage (100)<br>2. 4-layer: orthopedic wool, crepe, and elastic bandage<br>Within groups 1 and 2 HCD or knitted viscoses were randomized primary dressings. | RCT using a 2 x 3 factorial design. Single-layer versus multi-layer compression combined with comparisons of hydrocolloid versus knitted viscose dressing and Pentoxifylline versus placebo. Healing was measured from tracings every 4 weeks, which may not have been able to detect subtle healing differences. | 49% healed in 6 months in group 1 as compared to 67% in group 2 (p = 0.009). No interaction between drug, compression bandages and dressings. Viscose healed 58%; hydrocolloid dressing healed 57% (p = 0.88). Pentoxifylline healed 62% vs 53% for placebo. Significant only with Cox regression analysis: relative risk of healing 1.4 (CI =1.0- 2.0) |
| O'Donnell (2006) [Global review] | Systematic review including: HCD studies by: Charles, Limova, Koksal, Thomas | A review of 20 RCTs involving 1820 VU included trials too heterogeneous for a meta-analysis on dressings (8 trials, 867 patients) | Two dressing studies, including one comparison of 2 HCDs, led to author's conclusion that HCD dressings may significantly affect healing. |
| Ohlsson et al. (1994) [Sweden] | Std HCD D1 + short stretch compression bandage (15); Saline gauze + short stretch compression bandage (15) | Prospective, randomized, comparative study of venous leg ulcers in a Swedish primary health care center, measuring healing, pain and costs of care during 6 weeks. | Area reduction was 51% for HCD D1 or 19% for gauze-dressed ulcers (p= 0.16) (NS). HCD D1 reduced ulcer pain vs gauze. Daily wound care costs with HCD D1 were less than half those with gauze. |
| Palfreyman et al. (2007) Global review | Std HCD (397)<br>Low adherent dressings (mainly hydrogels, alginates, foams (395) | Systematic review of 9 trials comparing HCD dressings to advanced dressings for effects on venous ulcer healing. Gauze dressings were not compared to HCD for venous ulcer healing effects. | Current evidence does not show HCD more effective than low adherent dressings used beneath compression (46% healed with HCD; 44.5% with low-adherent dressings) |
| Phillips et al. (1994) [USA] | Std HCD D1 or D2 (12 chronic wound patients dressed for mean of 10 weeks)<br>Non-hydrocolloid, e.g. gauze, alginate (10 similar patients) | Retrospective histological evaluation of routine biopsies including margin and base of chronic wound beds, stained with eosin and hematoxylin. Epidermal, dermal and subcutaneous tissues were rated by two dematophathologists blinded to dressing for inflammation, foreign body reactions, scar, edema or inclusions. | No differences were seen between hydrocolloid and non-hydrocolloid dressed wounds. Granulation tissue, seen in all specimens contained no cavities, eosinophilic inclusions, polarizable material or multinucleated giant cells. NS histology difference was seen between the groups. |
| Robinson (1988) [UK] | Std HCD D1 (72)<br>Zinc paste bandage (61)<br>Both groups compressed with an elastic shaped tubular bandage | Prospective, randomized controlled study of only dressing costs per square cm of venous ulcer healing in the community setting in the UK. | At each dressing change the HCD healed 63 $cm^2$ at a cost of £4.42/$cm^2$.or 43 $cm^2$ for zinc paste (p<0.05) at a cost of £3.75 (NS). Allergic reactions forced withdrawal of 4 zinc-paste bandage patients and none for the HCD group |

| Indication<br>Reference | Dressings Studied<br>(Subjects) | Study Design [Country]<br>Limitations | Significant Functional Results<br>(p<.0.05 if not noted; NS: p>0.05 ) |
|---|---|---|---|
| Robinson (1992) [UK] | Std HCD D2 (26)<br>Std HCD D1 (30)<br>(both with compression) | Prospective, randomized, comparative study of healing and cost effectiveness (dressing costs to heal each $cm^2$ of area of venous ulcers dressed in a community clinic in the UK. | HCD D2 had longer wear time, lower cost and healed more ulcer area per day of treatment than HCD D1. More withdrawals due to leakage for HCD D1. |
| **Acute or Chronic: Varying Etiologies** | | | |
| Baxter (2000) [UK] | Thin HCD D2<br>Thin HCD T | Prospective comparative evaluation of ease of application, removal, conformability, patient comfort and safety on all wound care patients. | Pain reduction was reported in pressure ulcers and trauma wounds. |
| Bolton et al. (1996) [USA, Sweden Review] | Review of RCTs that compared HCD D2 versus gauze on pressure ulcers, burns and leg ulcers | Literature summary includes basic definitions of direct (e.g. materials and labor) and indirect costs and cost effectiveness in wound care calculated from published controlled studies | HCD was more cost effective compared to gauze-based protocols of care in pressure ulcers, burns and leg ulcers. |
| Bolton (2007; 2000) [Global review] | Review tabulating results of HCD, foam, film, gauze dressings | Review of controlled studies comparing healing rates of pressure or venous ulcers and acute wounds dressed with dressings of different moisture transmission rates. | HCD use was associated with fastest healing. Within the category HCD, healing rates differed. |
| Bradley et al. (1999) | Pressure ulcers<br>HCD D or C (205)<br>Gauze (191)<br>Venous ulcers<br>HCD vs Gauze (9 trials)<br>Surgical wounds<br>No HCD results reported. | MEDLINE, EMBASE and CINAHL databases and derivative references were reviewed for controlled studies reporting healing efficacy and cost effectiveness of dressing effects on venous or pressure ulcers or surgical wounds healing by second intention. | The only statistically significant HCD difference reported was 50% pressure ulcer healing with HCD or 31% healed with gauze. NS differences reported between HCD and low adherent dressings for venous ulcers or in cost effectiveness. No other dressings reported an advantage over HCD for any indication. |
| Chaby et al. (2007) [Global review] | Acute or chronic wounds<br>All modern dressings including HCDs, alginates, films, hydrofiber or gauze | Review of MEDLINE, EMBASE and Cochrane databases 1990-2006 and derivative references for studies reporting wound healing, pain, infection or dressing exudate management, and trauma on removal or ease of use. | 11 RCTs and 3 meta-analyses led to conclusion that HCD were only form of dressing with strong evidence of healing advantage over impregnated gauze |
| Fonder et al (2008) [USA costs] | Std HCD D<br>Std HCD C+<br>Std HCD T | Review of dressings used chronic wound care management, describing advantages, disadvantages, indications and estimating dressing costs to manage a 5 cm x 5 cm wound for 1 week assuming dressing changes every 4 days. | Estimated dressing costs ranged from $13-$19, similar in range to foams, hydrogels or alginates and higher than films. |
| Friedman & Su (1984) [USA] | Std HCD D1 (22, 7 with >1 ulcer)<br>Wet 1:32 Sweitzer's Gauze (another ulcer on 7 of above patients) | Prospective paired-comparison controlled study of 7 venous, diabetic or arthritic ulcers, plus an added 15 leg ulcers dressed with Std HCD D1. | NS difference in healing for two treatments; greater comfort with HCD, which was changed once for every 10-15 gauze dressing changes. |

| Indication<br>Reference | Dressings Studied (Subjects) | Study Design [Country]<br>Limitations | Significant Functional Results<br>(p<.0.05 if not noted; NS: p>0.05 ) |
|---|---|---|---|
| Harding et al, (2000) [Europe] | Std HCD D (12 studies: 509 leg ulcers; 9 studies, 281 pressure ulcers) Std HCD C (3 studies: 136 pressure ulcers); Human skin construct (1 study; 278 leg ulcers); Tulle gauze (4 studies; 205 leg ulcers; 6 studies, 102 pressure ulcers) | Literature review and summary with analysis of healing times and costs to heal venous ulcers with appropriate compression or pressure ulcers with appropriate pressure off loading, studied to healing or treatment failure. Cost effectiveness analysis was based on a Delphi panel for parameters of European clinical practice | Significantly lower costs to heal each pressure ulcer with HCD D (£422) than with HCD C (£643) or gauze (£2548). Similarly significant results for venous ulcers: HCD D (£342); gauze (£541) or Human skin construct (£6741). |
| Hutchinson & Lawrence (1991) [Global review] | Occlusive dressings: HCD, films, foams or hydrogels (all occlusive: 50 controlled studies 2064 wounds)<br>Gauze or impregnated gauze (50 controlled studies 1787 wounds) | Systematic literature review of all controlled studies comparing occlusive to non-occlusive gauze dressings that reported clinical infection rates as defined by the clinical signs of infection. | HCD: 29 studies with 823 gauze-dressed wounds, 1104 hydrocolloid dressed. Films: 16 studies with 754 gauze-dressed and 743 film-dressed. Foams/hydrogels: 5 studies: 210 gauze-dressed; 217 occlusively dressed. Infection rates: 5.37% for gauze 3.25 occlusive (p<0..001). Greatest differences were for ulcers or donor sites. For dressing types, HCD lowest: 1.9%; film: 4.4%; foam/gel: 6.0% |
| Hutchinson & McGuckin (1990) [Global review] | HCD (1351; 35 studies); Occlusive films (1021; 28 studies); Foams (617; 12 studies);Non-occlusive dressings (1085; 36 studies) | Retrospective review and meta-analysis of published controlled and uncontrolled studies reporting clinically infected wounds from 1962 to 1990 on occlusive dressings (hydrocolloids, foams, films, gel dressings) vs non-occlusive dressings (gauze or alginates) | Infection rates were: 1.3% for HCD, 4.5% for occlusive films, 2.4% for foams and 7.1% for non-occlusively dressed wounds (p<0.001 for HCD vs non-occlusive). This trend was significant for ulcers, donor sites and surgical/other wounds, but not burns. |
| Hutchinson (1994) [UK, USA, NL] | HCD D2 (34 burns; 37 donor sites;37venous ulcers); Impregnated gauze (39 burns; 46 donor sites; 41 venous ulcers); SSD + HCD D2 (29 burns 13 donor sites;16 venous ulcers) | Prospective randomized blind evaluated study of wound microorganisms harvested at dressing application by quantitative swab and clinical infections defined by the classic clinical signs and symptoms of infection in donor sites, venous ulcers and burns. | Seven gauze-dressed wounds (5.38%), developed clinical infections as did two (1.9%) in those dressed with HCD and none in the SSD + HCD group. |

| Indication<br>Reference | Dressings Studied<br>(Subjects) | Study Design [Country]<br>Limitations | Significant Functional Results<br>(p<.0.05 if not noted; NS: p>0.05 ) |
|---|---|---|---|
| Kerstein et al. (2001) [Global review, USA cost basis] | Venous ulcers:<br>HCD D1 or D2 (12 studies: 530 ulcers); Human skin construct (1 study; 130 ulcers); Impregnated gauze (5 studies; 223 ulcers)<br>Pressure ulcers:<br>HCD D (9 studies: 281 ulcers); HCD C (3 studies; 136 ulcers); Impregnated gauze (6 studies; 102 ulcers) | Retrospective literature review and summary with analysis of healing times and United States-based clinical practice costs to heal each type of ulcer derived from a Delphi panel of chronic wound care experts estimated as the cost to manage venous or pressure ulcers to healing or until treatment failure. Only modalities with at least 100 subjects were included in the meta-analysis on which to base cost model assumptions in order to assure adequate sample size for general clinical relevance. | Venous ulcers: more hydrocolloid-dressed VU healed by 8 weeks (34.7%) than those dressed with gauze (25.6%; p<0.05) with human skin construct intermediate. HCD cost least ($1873) to heal each wound; followed by gauze ($2239) then human skin construct ($15053).<br>Pressure ulcers: More HCD D-dressed PU healed at 8 or 10 weeks than gauze-dressed PU or than HCD C-dressed PU at 12 weeks (p<0.05). HCD D cost least ($910) to heal each PU; followed by HCD C ($1267) then impregnated gauze ($2179). |
| Meaume & Gemmen (2002) [France] | Pressure ulcer (519) and venous ulcer (843) outcomes from 15 studies. | Literature review of clinical outcomes described in Harding et al. A Delphi panel approach was applied to derive cost per ulcer healed based on assumptions clinically relevant to pressure and venous ulcer care in France. | HCD D1 was more cost effective per pressure or venous ulcer healed than saline gauze, in spite of the lower cost per dressing for gauze. |
| Singh et al. (2004) [Global review] | Combined meta-analysis of Std HCD D or C-dressed (431 ulcers) or gauze- or conventionally dressed (388 ulcers) pressure or venous ulcers or pilonidal cyst excisions. | A MEDLINE search to 2001 and derivative references identified 83 studies comparing HCD to conventional dressings on chronic wounds. Of these 12 RCTs met inclusion criteria of studies published in English which included only chronic wounds and clearly described time to healing. Higher quality trials are encouraged with clearer measures of time to healing. | During 12 weeks, 51% of HCD-dressed or 38% of conventionally-dressed wounds healed (p=0.02) in a combined analysis of 5 pressure ulcer studies, 6 venous ulcer studies and 1 pilonidal cyst excision study. Odds ratio (fixed effects) of healing was 1.72—so 72% more ulcers completely healed with HCD than with gauze dressing. |

## APPENDIX B. SUPPLEMENTAL UNCONTROLLED CLINICAL EVIDENCE OF SAFETY AND CLINICAL OUTCOMES USING HYDROCOLLOID DRESSINGS ON ACUTE AND CHRONIC WOUNDS

| Indication<br>Reference | Dressings Studied (Subjects) | Study Design [Country]<br>Limitations | Significant Risk or Benefit Results (p<.0.05 if not noted; NS: p>0.05 ) |
|---|---|---|---|
| **Acute Wounds** | | | |
| Epidermolysis bullosa | | | |
| Eisenberg (1986) [USA] | Std HCD D1 compared with non-adherent gauze or paraffin gauze tulle gras on 3 children with 44 sites total | Prospective open-label study of healing of epidermolysis bullosa blisters dressed daily for 1 week, then weekly | HCD-dressed sites reached 50% healing faster than sites dressed with the other two dressings, without adverse effects |
| Fracture blisters | | | |
| Johnson (1986) [USA] | Std HCD D1 primary dressing (3) | Case series of 3 patients with lower leg fracture blisters caused by pressure, friction or edema during early cast wear without HCD | "Almost total re-epithelization by days 19 and 22 days" after HCD application. HCD discontinued on 3rd patient due to excess exudate from infected laceration |
| Laser resurfacing | | | |
| Liu (2000) [China] | HCD D1 (27) with optional alginate or non-adhering gauze days 1 and 2 | Case series of 12 patients receiving laser resurfacing for wrinkles and 15 for acne scars. Healing and cosmetic results were evaluated. | Wrinkle cases healed by 7 days; acne scars by 10 days. Non-adhering gauze left fewer fibers in wound than alginate. |
| Radiation skin reactions | | | |
| Hamburg et al. (1997) [USA] | Thin HCD D2 primary dressing on moist desquamation (320) | Prospective 3-year case series of out-patients at an oncology center. Standardized measures were healing, infection, bolus effect and patient-reported pain during 1994, 1995, 1996 | 90% of patients healed within 14 days after irradiation; 15 patients healed during radiation. 98% of patients reported immediate pain relief as HCD was applied. No bolus effect was reported. <1% required a break in radiation due to skin reaction. |
| Ohrsted (1989) [Canada] | Std HCD D1, edges fixed with tape (1 patient with erythema, moist and dry desquamation sites) | Case study of breast-lumpectomy patient after completing 5 weeks of postoperative radiation therapy. Patient complained of pain and drainage and was treated in a hospital ostomy clinic. Experience led to HCD use in similar patients who were capable of adhering to protocol and had continuity of care. | "Relief" was experienced after HCD application. Leakage required removal days 3, 6 (as an outpatient), 7, 9,11,14 then twice in home care, with complete healing at day 22 after initiation. |
| Surgical wounds | | | |

| | | | |
|---|---|---|---|
| Hulten (1994) [South Africa] | Std HCD D1 or D2 (340 consecutive patients during January 1982-January 1992) | Open-label prospective, historically controlled cohort study of patient comfort and quality of life for subjects with incisions following colorectal surgery. | Using the HCD increased patient comfort. Quality of life improved because there were fewer dressing changes with HCD, which facilitated personal hygiene. The 8% infection rate using HCD was below that reported in the literature for similar procedures. |
| Ogawa et al. (2005) [Japan] | Thin HCD K[j] (147 cardiac surgery patients dressed with HCD K for first 7 days post-op, immediately switched to gauze if a problem arose) | Prospective cohort study of post-surgical incisions on patients undergoing cardiac surgery in a Japan hospital from August 2001-August, 2002. During first 7 days after surgery, all incisions were dressed with HCD K. Healing, infections and complications were reported. | 128 (87%) patients used only HCD days 1-7; 19 (13%) were switched to gauze. 3 experienced chest wound infections unrelated to dressing: 2 with fat necrosis; 1 with electrocautery burn injury. HCD was deemed safe and able to reduce staff work load. |
| **Chronic wounds** | | | |
| Diabetic Foot Ulcers | | | |
| Boulton et al (1999) [UK diabetic clinic] | Std HCD D2 used at least once (107 ulcers). Gauze only (143 ulcers) 250 ulcers on 121 patients | Retrospective chart review from January 1998-June 1999 recording dressing use and presence of clinical infection. Protocol included appropriate off-loading. | 2.5% of HCD-dressed diabetic foot ulcers became infected. 6% of those dressed solely with gauze became infected ($p < 0.02$) |
| Laing et al, (1991) [UK diabetic clinic] | Std HCD D1 or D2 on<br>• 36 Diabetic foot ulcers<br>• 10 Hansen's disease foot ulcers | Prospective convenience sample measuring healing of diabetic and non-diabetic neuropathic foot ulcers. Protocol included HCD primary dressing on ulcer with total contact cast off-loading. Patients visited clinic once weekly to change cast and dressings. | 90% of Hansen's disease ulcers healed in a median of 7 weeks. 79% of diabetic neuropathic foot ulcers healed in a median of 6 weeks. |
| Pressure ulcers (PU) | | | |
| Jones & Fennie (2007) | 114 subjects with pressure ulcers managed with any types of dressings. | Retrospective structured data abstraction of cohorts of subjects in skilled nursing facilities (SNF) or other long term care or home care settings including 82 with 6 months of continuous care for which variables favoring healing were analyzed for their association with healing by 6 months. | Topical care variables associated with 6-month healing were: dressing type constant; use of HCD, modern, or exudate management dressings; avoiding gauze, non-silver antiseptics or mechanical debridement and failure to debride slough. % healed at 3- 6 months were Stage 2: 27.3-76.5%; Stage 3:10.2-33.3%;Stage 4: 2.5-13.3% |

[j] HCD K is Karayahesive, a transparent karaya-containing hydrocolloid dressing marketed by Alcare, Inc, Japan.

| | | | |
|---|---|---|---|
| Sheridan & Jackson (1989)[USA] | HCD D1 (6 cancer patients with 16 full-thickness pressure ulcers) | Prospective convenience sample of hospitalized patients immunosuppressed by concomitant chemotherapy or radiotherapy from an oncology unit and a medical-surgical unit. All were assessed over a 14-day period for ulcer size, stage and microbial swabs, discontinued if ulcer progressed to involve muscle or bone. | In all 13 ulcers were evaluable with average treatment duration of 12.6 days. 5 ulcers (38%) resolved in 4-17 days. 1 patient withdrawn due to ulcer progression; no infections reported. |
| Smitten et al. (2005) [USA] | Standardized protocol of care including HCD D (all formats) as the main hydrocolloid and fibrous absorbent dressings with appropriate pressure relief (331 ulcers with dressings recorded) | Prospective cohort study of 295 patients with 821 Stage II-IV pressure ulcers from 3/2001- 12/2002 assessed by trained professionals using validated wound assessments. Measures included healing time, pain and infection. | Full-thickness PU healed in a mean of 55 days, partial-thickness, in 27 days ($p<0.0001$) Controlling for depth, mainly use of hydrocolloid and fiber primary dressings was associated with faster healing than gauze ($p<0.02$). > 20% contraction in first 14 days of care predicted healing in 12 weeks. |
| Tudhope (1984) [UK hospital] | HCD D1 (23 patients, 5 with diabetes; 30 PU: 80% full-thickness) | Prospective open label study of healing and safety during 2 month treatment time or to healing in a hospital setting preparing patients for discharge to extended care. | 47% of ulcers healed, 33% had marked improvement; one deteriorated. 4 of the 5 ulcers on diabetic patients healed. |
| van Rijswijk (1993) [USA] | HCD D1 and HCD D2 (48 patients, 56 ulcers) | Retrospective analysis of full-thickness pressure ulcer data from earlier RCT evidence. All patients were studied for 2 months or until healing of their pressure ulcers, whichever came first. | 37% of ulcers healed in a median of 56 days. 28% showed marked or moderate improvement. 47% contraction during first 2 weeks predicted healing. |
| Yarkony et al. (1984) [USA] | HCD D1 (21 patients with 25 pressure ulcers cleansed with 3% $H_2O_2$) | Prospective study of hospitalized patients compared with prior responses to pressure ulcer treatment during a mean of 2.5 months which was mainly gauze or a dry environment. | In average treatment time of 27$\pm$3 days 56% of ulcers improved or healed with HCD compared to 8% with prior care. Less frequent dressing changes with HCD. HCD was left in place for up to 7 days without interfering with routine hygiene or hydrotherapy. |
| **Venous ulcers** | | | |
| Bjellerup et al. (1993) [Sweden] | Std HCD D1 with two layers of compression (22) | Open label prospective study of therapy resistant (average duration 49.2 months) venous ulcers in Swedish outpatient setting. 19 patients followed for 10 months | 9 patients healed; 7 reduced in area by $\geq$70%, 2 by 30-40%. All but one ulcer improved or healed in 10 months or less. |
| Mani et al. (1985) [UK] | HCD D1 primary dressing with tubular gauze and elastic tubular compression (7) | Prospective open label study of oxygen tensions in non-arterial leg ulcers, i.e. venous and mixed venous-arterial ulcers with transcutaneous oxygen tension ($TCPO_{2)}$ < 40 mm Hg, typically associated with non-healing. Conducted in a hospital setting, measuring healing and oxygen tension every 4 weeks | Five of 7 venous ulcers with $TCPO_2$ < 40 mm Hg healed in 28 weeks, when dressed with HCD with sustained lower leg compression. $TCPO_2$ rose during healing. |

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| van Rijswijk (1993) [USA, Belgium, Denmark, France, Germany, Sweden] | Std HCD D2 (total of 72 full-thickness leg ulcers with appropriate compression) | Retrospective analysis of clinical study data on 72 full-thickness leg ulcers of venous, diabetic, arterial or mixed etiology | 54% healed in average of 56 days. Risk factors for non-healing included male gender or diabetes. >30% area reduction after 2 weeks of treatment predicted that the ulcer would progress to healing |
| Varghese et al. (1986) [USA] | Std HCD D1 (9)<br>Polyurethane film dressing (9) | Prospective, open-label study of 14 chronic full-thickness leg ulcers of various etiologies on 9 patients, exploring pH, microbiology, oxygen tension and immunology, 24 hours after dressing application. | HCD wound fluid was pH 6.1 vs 7.1 for film. Normal functioning neutrophils were found under both dressings. Lower oxygen tensions (which tend to favor angiogenesis) were found under HCD than under film dressing. |
| Wilson et al (1988) [UK] | Std HCD D1 (6)<br>Conventional gauze and isolation (historic control) | Prospective open-label exploration of management of Methicillin-resistant *S. aureus* (MRSA) in leg ulcer patients, maintaining ambulation with appropriate compression in a UK hospital setting. | Within 2 weeks of beginning HCD dressings, 5 of the 6 patients were free of MRSA which they all had at study initiation. The dressing effectively isolated the wounds, preventing MRSA transmission. |
| **Acute or chronic: varying etiologies** | | | |
| Sayag J. (1988) [France] | Std HCD D1 (626 total)<br>Venous ulcers (356)<br>Mixed arterio-venous (127)<br>Arterial or diabetic (49)<br>Trauma or burn (18)<br>Neurotrophic foot ulcer (15)<br>Pressure ulcer (7)<br>Buerger's disease (1)<br>Connective tissue disease (3); Lymphoedema (2);<br>Sickle cell anemia (1) | Department of Dermatology reports experience using HCD on patients hospitalized with wounds (726 episodes) from 1981-1987. Before applying dressing, wound was cleansed with 3% hydrogen peroxide for at least 1 minute, then rinsed with saline and dried with sterile gauze. Dressings were applied overlapping wound edges at least 3 cm and remained in place until detachment or up to 7 days. No other local treatment or form of debridement was used. No systemic antibiotics, corticosteroids, non-steroidal anti-inflammatory agents or hyperbaric oxygen was used. Previously prescribed anticoagulants or peripheral vasodilators were continued. | During the first 6 months of HCD use, complete healing occurred in 88% of wounds with initial diameter less than 2 cm and in 78% of those with diameter more than 4 cm. Total healing occurred in 89% of wounds enduring less than 6 months, 50% of those with longer duration. Healing was "shorter than that found with traditional dressings" and reduced length of hospital stays and costs of care. |
| **Acute or chronic: varying etiologies** | | | |
| Flam & Raab (1991) [USA] | HCD D2 Thin (7 healthy volunteers) | Open label prospective study of friction levels similar to those of bed sheet friction against human sacral tissue and sheer displacement forces twice the friction forces on the sacral area of 7 healthy volunteers. | Thin HCD protected the skin from all friction and sheer forces applied without being dislodged from the skin or moving relative to the skin. |

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| Bolton et al. 2004 [United States] | 767 wounds on 433 patients treated with mainly HCD D2 and less than 5% gauze:<br>373 Stage III-IV PU, 134 Stage II<br>124 Full-thickness VU, 30 partial-thickness | Prospective cohort study in 12 home care agencies, 3 long term care facilities and a University hospital based Long Term Acute Care setting using Solutions® algorithms of care March-October 2001. Standardized care required extra work to consult wound care protocol to optimize care decision. Participating wound care professionals selected patients as appropriate for the standardized mainly HCD protocol mostly those with full-thickness (FT) wounds they had been unable to heal. | 77% of 30 partial-thickness (PT) VU and 61% of 134 PT PU healed in 12 weeks; mean healing times: 29 ± 7 days for PTVU and 31± 7 days for PTPU. 44% of 124 full-thickness VU and 36% of 373 FTPU healed in 12 weeks; mean heal time = 57 ± 7 days for FTVU and 36 ± 7 days for FTPU |
| Gallego et al. 2005<br>[Spain] | Chronic and acute dermal ulcers managed with SureSkin® II HCD (1080) Border (61.6%;n= 665), Thin (20.8%;n=225) or Standard (17.5%;n=189) | Prospective cohort study in 7 centers explored healing, pressure, venous, mixed or arterial ulcer maceration, erythema, pain, healing, infection and dressing performance and ease of use for a study duration of up to 20 dressing changes. | Mean healing time was 36 days (PU), 41 days (VU or Mixed) or 42 days (Arterial). Infection or inflammation decreased from 22.6% to 7.6%. Maceration, erythema and eczema and pain on dressing change similarly reduced. 90.7% of subjects said symptoms were alleviated sufficiently to carry on activities of daily living. |
| McIsaac (2005) [Canada] | *Solutions*[k] protocol adapted for chronic and acute wounds (891 Nova Scotia home care clients with chronic or acute wounds in 20 agencies). | Prospective cohort study using mainly HCD D2 Std, Brd or Thin with alginate or Hydrofiber® to manage excess exudate. Measures included time to healing or discharge to family practice over first 5 years of protocol use and costs to manage 50 patients pre- vs post protocol | During first 4 years reduced time to healing or discharge for all chronic and acute wounds managed by at least 80% while saving Nova Scotia Health Authorities more than $900 per client per month. |
| Mulder (1988) [USA] | Three different Std HCD used successively on each of (5) patients with fibrin-covered wound surfaces. | Crossover, open-label prospective study of autolysis of fibrin in traumatic wounds, pressure ulcers or venous ulcers containing fibrin coagulum on their surface. | During interval dressed with HCD D1 autolysis degraded fibrin clots which accumulated during coverage with the other two dressings. |



[k] Solutions® Wound Care Algorithm, accessible at http://www.guideline.gov/summary/pdf.aspx?doc_id=8534&stat=1&string=

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| van Rijswijk et al (1985) [Belgium, Denmark, Germany, France, Sweden] | Std HCD D1 (133 patients with 152 leg ulcers refractory to other forms of local therapy including Unna's boot, povidone iodine, zinc paste and wet-to-dry gauze dressings). Ulcers were cleansed with 3% hydrogen peroxide. | Prospective, open-label, multicenter, historically controlled study of leg ulcers treated in USA and European clinics. Study included patients with leg ulcers of all etiologies and protocol included appropriate medical management of the underlying etiology. | During mean duration HCD use of 58 days, 62% of patients (94 ulcers) healed in a mean of 51 ± 5 days. No ulcer became infected. There was a mean of 4.6 days between dressing changes. Ulcers present > 1 year healed more slowly. Etiology did not affect healing rate, but poor general health and having diabetes showed NS trends toward lower %s healed. 10% peri-wound maceration alleviated by changing dressings more frequently. |
| van Rijswijk (1993) [Belgium, Denmark, Germany, France, Sweden, UK, USA] | Std HCD D1 or D2 (total of 72 full-thickness leg ulcers) | Retrospective analysis of clinical data on 72 full-thickness leg ulcers of venous, diabetic, arterial or mixed etiology | 54% healed in average of 56 days. Risk factors for non-healing included male gender or diabetes. >30% area reduction after 2 weeks of treatment predicted that the ulcer would progress to healing during clinical trials lasting up to 12 weeks. |

**Appendix C.**
**Healing Outcomes Using SureSkin II Standard, Bordered or Thin Dressings on a Cohort of 1080 Patients (Gallego et al. 2005)**

| | | Venous ulcers | Mixed ulcers | Arterial ulcers | Pressure ulcers |
|---|---|---|---|---|---|
| Complete healing | Total | 236 (100.0%) | 81 (100.0%) | 32 (100.0%) | 408 (100.0%) |
| | Yes | 156 (66.1%) | 41 (50.6%) | 23 (71.9%) | 233 (57.1%) |
| Days until complete healing | N | 153 | 37 | 21 | 222 |
| | Mean (SD) | 41.08 (31.69) | 41.00 (25.35) | 41.86 (21.69) | 36.15 (24.82) |
| | Median | 35.0 | 35.0 | 37.0 | 30.0 |
| | (Q1; Q3) | (23.0; 55.0) | (23.0; 50.0) | (28.0; 56.0) | (20.0; 46.0) |
| | N missing | 83 | 44 | 11 | 186 |

Note: Complete healing=Yes includes those patients with the outcome “Complete healing” as the reason for study finalization.

## Appendix D. Author's Curriculum Vitae (Omitted for Brief Form of Literature Review)

## APPENDIX E. HISTORY PAGE

| OLD REVISION | NEW REVISION | DATE OF CHANGE | CHANGES | DCR |
|---|---|---|---|---|
| UNRELEASED | A | 2/16/2008 | 1. Add fluid management reports<br>2. Add viral barrier report<br>3. Add Appendices A and B providing perspective of SureSkin® II Hydrocolloid Dressing performance, safety and efficacy relative to those of other hydrocolloid dressings. | |
| RELEASED | B | 4/9/2008 | 1. Add minor wound analyses relevant to SureSkin® OTC Hydrocolloid Dressing | |
| RELEASED | C | 5/27/2008 | 1. Add clinical evidence and prior approval for substantially equivalent product for SureSkin® II Hydrocolloid Dressing use on infected wounds at professional discretion. | |