

WHAM evidence summary: Super-oxidised solutions for chronic wounds

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CLINICAL PRACTICE RECOMMENDATIONS

All recommendations should be applied with consideration to the wound, the person, the health professional and the clinical context.

Super-oxidised solutions can be used to reduce local infection and promote healing in chronic wounds, particularly diabetic foot ulcers (Grade B).

CLINICAL QUESTION

What is the best available evidence for using super-oxidised solutions to reduce infection and promote healing in chronic wounds?

SUMMARY

Super-oxidised solutions are a low cost topical antiseptic option for chronic wounds. Antibacterial, antimicrobial and anti-fungal properties of SOSs have been established in laboratory research¹⁻⁷ (*Level 5*). *Level 1* evidence from a systematic review⁸ and a randomised controlled trial (RCT)⁹ showed SOS was as effective as povidone iodine in reduction microbial bioburden. *Level 1* evidence from a systematic review⁸ and four RCTs⁹⁻¹² showed SOS was superior to both povidone iodine^{8, 9, 12} and saline⁹⁻¹¹ for promoting healing, established using different outcome measures (e.g. percent of wounds healed,⁹ mean reduction in wound surface area,¹² rate of healing⁹ and increase in granulation tissue).¹⁰ This evidence, together with additional *Level 2*¹³ and *Level 4*¹⁴⁻¹⁶ evidence, supported a *Grade B* recommendation (a weak recommendation).¹⁷

SOURCES OF EVIDENCE

This summary was conducted using methods published by the Joanna Briggs Institute.¹⁷⁻¹⁹ The summary is based on a literature search combining search terms related to SOSs and wounds. Only studies that used a solution described as super-oxidised on a chronic wound were included in the clinical evidence summary. Searches were conducted in CINAHL, Medline, the Cochrane Library and Google Scholar for evidence published up to December 2019 in English. Studies were assigned a level of evidence (see Table 1) based on JBI's hierarchy.¹⁷⁻¹⁹

BACKGROUND

Super-oxidised solutions are low concentration saltwater that have had an electrical current applied to increase ions in the solution.^{8,22} Super-oxidised solutions contain hypochlorous acid (HOCL) and sodium hypochlorite (NaOCL). However, not all HOCL solutions are super-oxidised. They are naturally acidic due to increased hydrogen ions, but some solutions are further processed to balance the pH (neutral).²² They may also be referred to as super-oxidised water, or most commonly by product names.[¥]

Table 1: Sources of evidence and the level

Level 1 Evidence	Level 2 Evidence	Level 3 Evidence	Level 4 Evidence	Level 5 Evidence
Experimental Designs	Quasi-experimental Designs	Observational – Analytic Designs	Observational –Descriptive Studies	Expert Opinion/ Bench Research
1b. Systematic review of RCTs and other study designs ⁸ 1.c RCT ⁹⁻¹²	Level 2.c Quasi-experimental prospectively controlled study ¹³	None	4.c Case series ¹⁴⁻¹⁶	5.c Bench research ¹⁻⁷ and single expert opinion ²⁰

¥ Super-oxidised solutions in common use include (but are not limited to) Microdacyn®, Dermacyn®, Electromycin™, Sterilox® and Microcyn®. This information is included to assist health professionals in identifying products as the term 'super-oxidised solution' may not be included in labelling. The WHAM Collaborative does not endorse any specific products.

Bench research reports that SOSs have antibacterial,^{1-3, 6, 7} antiviral⁵ and antifungal¹ qualities against strains commonly observed in chronic wounds, including antibiotic-resistant bacteria² and biofilm based organisms.^{20, 21} There is laboratory-based evidence that they reduce inflammatory markers⁴ (Level 5).

CLINICAL EVIDENCE

Reduction in local infection

- A systematic review reporting a range of studies reported that four studies showed SOSs are superior to povidone iodine as an antibiotic therapy, with bacterial clearance achieved after 3 weeks compared to 3.4 to 8.15 weeks for povidone iodine (Level 1).
- A single-blinded RCT at moderate risk of bias reported quantitative microbial analysis for post-surgical diabetic foot ulcers (n = 40) irrigated daily with either SOS or 50% povidone iodine/saline. The regimens were equally effective in controlling Gram positive and Gram negative bacteria, fungi and methicillin-resistant *Staphylococcus aureus* (p = not significant for all)⁹ (Level 1).
- In a prospective study at high risk of bias, infected diabetic foot ulcers undergoing surgery (n = 218) the odds ratio for successful reduction in bacterial burden when treated with an SOS compared with povidone iodine was 3.4 (95% confidence interval [CI] 1.7 to 7.0)¹³ (Level 2).
- In a case series at high risk of bias, 19/20 diabetic foot ulcers treated with SOS soaked gauze were cleared of bacterial infection after a maximum of five days of treatment¹⁶ (Level 4).

Improvement in wound healing outcomes

No evidence on topical coconut products for use in treating human wounds was identified.

- A systematic review reported that six studies showed healing rate range with SOSs was 6.9% to 65% compared to 50 to 62.5% with povidone iodine. Healing times reported in four studies were 5.1 to 5.3 weeks with SOS compared with 5.16 to 8.7 weeks with povidone iodine⁸ (Level 1).
- A single-blinded RCT at moderate risk of bias showed healing rates for post-surgical diabetic foot ulcers (n = 40) irrigated daily with SOS were superior to those with 50% povidone iodine/saline. Super-oxidised solution was associated with significantly greater percent of the wounds reaching complete healing at six months (90% versus 55% for povidone iodine, p = 0.002). Mean healing time was also faster for SOS (10.5 ± 5.9 weeks versus 16.5 ± 7.1 weeks, p = 0.007)⁹ (Level 1).
- A single-blinded RCT at moderate risk of bias reported outcomes at 20 weeks for infected diabetic foot ulcers

(n = 37) treated with SOS compared to treatment with saline. The SOS group experienced significantly better outcomes for reduction of cellulitis (80.9% versus 43.7%, p = 0.01) and advancement of granulation tissue (90.4% versus 62.5%, p = 0.05). Participants in both groups received concurrent systemic antibiotics¹⁰ (Level 1).

- In an RCT at high risk of bias conducted with infected diabetic ulcers (n = 60), SOS dressings were associated with a significantly greater mean percentage reduction in area compared with povidone iodine dressings (58.90 ± 5.21% versus 40.90 ± 8.76%, p = 0.024)¹² (Level 1).
- In a single-blinded RCT at high risk of bias, individuals with diabetes-associated wounds received twice daily application of either SOS-soaked or saline-soaked gauze. The SOS treatment was associated with statistically significantly more wounds being downgraded in severity after seven days (p < 0.05)¹¹ (Level 1).
- In a prospective comparative study at high risk of bias, infected diabetic foot ulcers receiving surgery (n = 218) the median healing time when treated with an SOS was 43 days compared with 55 days for treatment with povidone iodine (p < 0.0001)¹³ (Level 2).
- Two case series at high risk of bias^{14, 15} reported good outcomes with SOS. In the first, chronic wounds of mixed aetiology (n = 13), had a statistically significant reduction in wound surface area (p < 0.01) at one month, with about 53% of the wounds showing 20 to 40% reduction in wound area.¹⁴ In the second case series, there was a 100% limb salvage rate and healing within a mean duration of 6.8 weeks for diabetic foot ulcers treated following surgical management of osteomyelitis (n = 14)¹⁵ (both Level 4).

CONSIDERATIONS FOR USE

The following points could be considered when using SOSs:

- Super-oxidised solutions can be used as a wound irrigant, or can be applied to the wound as a gauze-soaked dressing,^{11, 14, 15} or can be used as an immersive soak to debride a wound¹⁰ (Levels 1 and 4).
- A SOS might help manage wound odour. In an RCT, SOS was associated with significant reduction in wound odour compared with saline treatment (100% versus 25%, p = 0.001)¹⁰ (Level 1).
- A SOS might help manage wound pain. A case series at high risk of bias a SOS was associated with statistically significant reduction in wound pain scores (p < 0.001). The majority of participants had a main score of 5/10 or lower prior to treatment¹⁴ (Level 4).

- The studies included in this evidence summary reported no major side effects associated with using SOS to treat a chronic wound.

CONFLICTS OF INTEREST

The author declares no conflicts of interest in accordance with International Committee of Medical Journal Editors (ICMJE) standards.

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ABOUT WHAM EVIDENCE SUMMARIES

WHAM evidence summaries are consistent with methodology published in

Munn Z, Lockwood C, Moola S. The development and use of evidence summaries for point of care information systems: A streamlined rapid review approach, *Worldviews Evid Based Nurs*. 2015;12(3):131-8.

Methods are provided in detail in resources published by the Joanna Briggs Institute as cited in this evidence summary. WHAM evidence summaries undergo peer-review by an international review panel. More information on the website: <http://WHAMwounds.com>

WHAM evidence summaries provide a summary of the best available evidence on specific topics and make suggestions that can be used to inform clinical practice. Evidence contained within this summary should be evaluated by appropriately trained professionals with expertise in wound prevention and management, and the evidence should be considered in the context of the individual, the professional, the clinical setting and other relevant clinical information.

PUBLICATION

This evidence summary has been published in:

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