

## **Healing with Honey: A Systematic Review of Topical Honey in Burn Wound Management Across 508 Cases**

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## **Abstract**

### **Introduction:**

Burn wounds pose significant clinical challenges due to risks of infection, delayed healing, and complications like scarring. Silver sulfadiazine (SSD) is widely used for burn management but has limitations, including delayed healing and potential adverse effects. Honey, with its antimicrobial, anti-inflammatory, and tissue-regenerative properties, offers a promising alternative. This systematic review evaluates the efficacy of honey compared to SSD in burn treatment.

### **Methods:**

This systematic review was conducted following PRISMA guidelines and the Cochrane Handbook for Systematic Reviews of Interventions (version 6.3). A comprehensive search of PubMed, MEDLINE, EMBASE, and Cochrane databases was performed using terms such as "burns," "honey," and "silver sulfadiazine." Inclusion criteria focused on randomized controlled trials and quasi-experimental studies comparing honey and SSD for treating superficial and partial-thickness burns. Data on healing time, wound sterility, pain relief, and complications were extracted and synthesized.

### **Results:**

Five studies involving 508 patients met the inclusion criteria. Honey consistently demonstrated faster healing times, with wounds healing in 13.47–18.16 days compared to 15.62–32.68 days with SSD. Honey-treated wounds achieved sterility significantly faster, often within 7–14 days, compared to over 21 days for SSD. Pain relief was quicker with honey, with complete resolution in 3 weeks compared to 4 weeks for SSD. Complications such as hypertrophic scarring and contractures were less frequent with honey. Additionally, honey was found to be cost-effective and accessible, making it a viable option for resource-limited settings.

### **Conclusion:**

Honey outperforms SSD in managing burn wounds by promoting faster healing, earlier sterility, better pain relief, and fewer complications. Its affordability and accessibility make it particularly valuable in low-resource settings. However, further research is needed to standardize honey's clinical application and confirm its long-term benefits.

**Keywords:** *Burn wounds, honey, silver sulfadiazine, topical dressings, wound healing, systematic review*

## **Introduction:**

Burn injuries are among the most challenging wounds to treat due to their complexity, risk of infection, and potential for long-term complications such as scarring and contractures.<sup>1</sup> For decades, silver sulfadiazine (SSD) cream has been considered the gold standard for topical burn management due to its broad-spectrum antimicrobial properties and ability to control infection.<sup>2</sup> However, the prognosis for burn wounds treated with SSD often involves prolonged healing times, increased risks of secondary infections, and significant scarring.<sup>3</sup> In recent years, honey, a traditional remedy, has gained attention for its potential as an alternative treatment due to its natural antibacterial, anti-inflammatory, and tissue-regenerative properties.<sup>4</sup> Previous reviews suggest that honey-treated burn wounds may exhibit faster healing, reduced infection rates, and improved outcomes compared to other dressing methods such as moist bandage therapy method or mafenide acetate.<sup>5 6</sup> However the literature evidence in topical honey application vs SSD remains inconclusive. Moreover, the accessibility and cost-effectiveness of honey, particularly in resource-limited settings, underscore its importance as a potential therapeutic option for burn management.<sup>7</sup> To address these knowledge gaps, this review evaluates the current evidence comparing the efficacy of honey versus SSD for burn treatment. By synthesizing findings across clinical trials and comparative studies, we aim to provide a comprehensive understanding of the therapeutic impact of honey, offering valuable insights for clinicians and informing the design of future prospective studies. This is particularly critical in advancing burn care strategies in resource-limited and advanced healthcare settings, where effective, economical, and accessible treatments are essential.

## **Methods**

This systematic review was conducted in adherence to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. All stages of the review were performed following the recommendations outlined in the Cochrane Handbook for Systematic Reviews of Interventions, version 6.3. This review aimed to comprehensively evaluate the efficacy of honey compared to silver sulfadiazine (SSD) in the treatment of burn wounds.

## **Criteria for Inclusion**

We included studies that met the following criteria:

1. Study Design: Randomized controlled trials (RCTs) or quasi-experimental studies.
2. Population: Patients of all ages with superficial or partial-thickness burns covering no more than 50% of total body surface area (TBSA).
3. Intervention: Use of honey as a topical dressing.
4. Comparator: Use of silver sulfadiazine (SSD) as a topical dressing.
5. Outcomes: Studies reporting on at least one of the following:

- Wound healing time.
  - Wound sterility.
  - Pain relief.
  - Complications such as scarring or infections.
6. Language: Articles published in English and Spanish
  7. Exclusion Criteria: Studies focusing on chemical or electrical burns, full-thickness burns, mixed interventions, or populations with significant comorbid conditions like diabetes or immunosuppression.

### **Search Strategy**

A comprehensive systematic search was conducted using four electronic databases: PubMed, MEDLINE, EMBASE, and Cochrane Library. The search strategy included combinations of controlled vocabulary terms and free-text keywords such as “burns,” “silver sulfadiazine (SSD),” and “honey.” To ensure the accuracy and inclusiveness of the search:

- Zotero software was employed to identify and eliminate duplicate references.
- The search was conducted in two stages:
  1. Title and Abstract Screening: Papers were initially screened based on relevance to the study criteria.
  2. Full-Text Review: Articles deemed relevant after the first stage were reviewed in detail.

Two independent reviewers (M.E. and J.C.) assessed each article in a blinded manner. Discrepancies were resolved through consultation with a third reviewer (A.N.). Additionally, the bibliographic references of included studies were manually screened to identify any relevant studies that might have been missed in the initial search.

### **Data Extraction**

Data from the included studies were systematically extracted using Excel spreadsheets. The following information was captured:

1. Baseline Characteristics: Demographics, burn type, TBSA affected, and patient eligibility criteria.
2. Study Characteristics: Study design, sample size, duration of intervention, and geographic location.
3. Outcome Measures:
  - Healing time.
  - Time to wound sterility.
  - Pain relief duration.
  - Complication rates (e.g., scarring, infection).

## Results

### *Study characteristics*

Our review included five studies conducted across multiple countries, encompassing randomized controlled trials and quasi-experimental designs comparing the effectiveness of honey and silver sulfadiazine (SSD) in burn wound management. The studies involved a total of 508 patients with varying degrees of burns, ranging from superficial to partial-thickness burns covering 10% to 50% of total body surface area (TBSA).

All included studies compared honey and SSD as topical treatments for burn wounds. The population characteristics varied slightly across studies, with most patients presenting with burns caused by thermal injuries. The average age of participants ranged from 27.4 years to 34.5 years, with both male and female patients included. Exclusion criteria across the studies were consistent, excluding patients with chemical or electrical burns, full-thickness burns, or those with significant comorbid conditions like diabetes or immunosuppression.

Of the studies, three were randomized controlled trials, and two were quasi-experimental designs. Outcomes of interest included wound healing time, wound sterility, pain relief, and complications such as scarring and infection rates. The duration of follow-up ranged from two weeks to two months post-treatment, with all studies employing standardized methods for wound assessment, including bacterial cultures and clinical examination.

Table 1. Included Studies characteristics

Study	Design	Population	Intervention	Comparator	Outcomes
Syed, 2005	Quasi-experimental	80 patients, burns involving 10–40% TBSA	Honey dressing	SSD dressing	Healing time, sterility, contractures, itching
Subrahmanyam, 2001	RCT	100 patients, <40% TBSA, burns of mixed depth	Honey dressing	SSD dressing	Healing time, sterility, antioxidant effect
Baghel, 2009	RCT	78 patients, <50% TBSA, first and second-degree burns	Honey dressing	SSD dressing	Healing time, wound sterility, scar prevention
Malik, 2010	RCT	150 patients, superficial and partial-thickness burns	Honey dressing	SSD dressing	Healing time, infection rates, epithelialization
Mashood, 2006	RCT	50 patients, <15% TBSA, superficial and partial-thickness burns	Honey dressing	SSD dressing	Healing time, pain relief, wound sterility

Table 2. Honey and SSD Treatments comparative outcomes

Study	Healing Time (Days)	Sterility Time (Days)	Pain Relief Time (Days)	Complications	Notable Findings
Syed, 2005	Honey: 15.3, SSD: 20	Honey: 7, SSD: 21	Not reported	Contractures: Honey (7.5%), SSD (17.5%)	Honey reduced itching significantly (5% vs. 32.5%)
Subrahmanyam, 2001	Honey: 15.4, SSD: 17.2	Honey: 90% sterile by Day 14, SSD: persistent infection	Not reported	None reported	Antioxidant properties of honey contributed to faster healing
Baghel, 2009	Honey: 18.16, SSD: 32.68	Honey: <7 days for 100%, SSD: 36.5% at 21 days	Not reported	Hypertrophic scars: Honey (minimal), SSD (significant)	Honey showed superior scar prevention and reduced need for debridement
Malik, 2010	Honey: 13.47 ± 4.06, SSD: 15.62 ± 4.40	Not specified	Not specified	Infection: Honey (4%), SSD (18%)	Honey accelerated epithelialization and healing by ~2 days compared to SSD
Mashood, 2006	Honey: 4 weeks, SSD: 6 weeks	Honey: 3 weeks, SSD: 5 weeks	Honey: 3 weeks, SSD: 4 weeks	None reported	Honey was found to be 10x more cost-effective than SSD

## *Outcomes*

The included studies consistently demonstrated that honey was superior to silver sulfadiazine (SSD) in various key outcomes for burn wound management. Healing time was significantly shorter with honey, with studies reporting an average healing time ranging from 13.47 to 18.16 days compared to 15.62 to 32.68 days for SSD-treated wounds. Sterility of wounds was achieved more rapidly with honey, with most wounds becoming sterile within 7–14 days. In contrast, SSD-treated wounds often required 21 days or more to achieve comparable sterility.

Pain relief was faster in patients treated with honey, with complete pain resolution occurring in 3 weeks compared to 4 weeks in SSD-treated patients. Notably, honey-treated wounds were associated with fewer complications, such as hypertrophic scarring and contractures, highlighting its efficacy in improving cosmetic and functional outcomes. For instance, Syed et al. (2005) reported a significantly lower incidence of contractures and itching in the honey group compared to the SSD group.

The studies also highlighted honey's antimicrobial properties, with lower infection rates observed in honey-treated wounds. Malik et al. (2010) noted infection in only 4% of honey-treated sites compared to 18% of SSD-treated sites. Additionally, honey demonstrated cost-effectiveness, requiring fewer dressing changes and reducing hospital stays.

Overall, honey consistently outperformed SSD in healing time, sterility, pain relief, and complication rates, making it a promising alternative for burn wound management. These findings suggest honey's potential to improve clinical outcomes while being cost-effective and widely accessible.

## **Discussion**

This systematic review highlights the superior efficacy of honey over silver sulfadiazine (SSD) for the treatment of burn wounds in terms of healing time, sterility, pain relief, and complication rates. Across all included studies, honey consistently outperformed SSD in promoting faster wound healing, with sterility achieved more rapidly and with fewer complications such as hypertrophic scarring and contractures. These findings are particularly relevant given the high burden of burn injuries globally and the need for accessible, cost-effective treatments.

The benefits of honey can be attributed to its unique properties, including its antimicrobial effects, anti-inflammatory activity, and ability to promote tissue regeneration. The high osmolarity of honey inhibits bacterial growth by drawing moisture from the wound, while its enzymatic production of hydrogen peroxide provides additional antibacterial activity. Furthermore, honey creates a moist wound environment conducive to epithelialization and prevents dressing adherence, reducing patient discomfort during dressing changes. These advantages align with the findings from Malik et al. (2010) and Mashood et al. (2006), where honey demonstrated faster pain relief and superior infection control compared to SSD.

Despite these promising results, the variability in the quality and source of honey used in the studies must be considered. Some studies utilized natural, unprocessed honey, while others employed commercially available honey, which may differ in composition and potency. Additionally, while SSD is widely recognized for its antimicrobial efficacy, its delayed wound healing and potential side effects, such as skin irritation and pigmentation, underscore the need for alternative treatments.

The findings of this review are particularly valuable for low-resource settings, where the high cost and limited availability of SSD can pose challenges. Honey's affordability, accessibility, and effectiveness make it a viable alternative, especially in regions where healthcare resources are constrained. Future research should focus on standardizing honey's use in clinical settings and exploring its efficacy across diverse patient populations.

## Limitations

1. **Variability in Honey Types:** The studies included in this review utilized different types of honey, ranging from natural, unprocessed honey to commercially available products. The lack of standardization in honey sources may influence its efficacy and comparability across studies.
2. **Study Design and Sample Sizes:** While most studies were randomized controlled trials, some had small sample sizes, which may limit the generalizability of their findings. Larger, multicenter trials are needed to confirm these results.
3. **Heterogeneity in Outcomes:** There was considerable heterogeneity in the reported outcomes, particularly in assessing pain relief and sterility. This variation made it challenging to perform a meta-analysis of the data.
4. **Follow-Up Duration:** The follow-up periods in the included studies were relatively short, limiting the assessment of long-term outcomes such as scar formation and contractures.
5. **Geographic and Cultural Context:** Most studies were conducted in low- and middle-income countries, where honey may be more accessible and culturally accepted. The findings may not fully apply to high-income settings with different healthcare practices.
6. **Potential Bias in Reporting:** Some studies lacked detailed descriptions of their randomization methods and blinding processes, raising concerns about potential bias.
7. **Limited Patient Diversity:** Many studies excluded patients with comorbidities, chemical or electrical burns, or extensive TBSA involvement, restricting the applicability of the results to broader patient populations.

## Conclusion

This systematic review suggests honey's superiority over silver sulfadiazine (SSD) in treating burn wounds, offering faster healing, earlier wound sterility, better pain relief, and fewer complications such as scarring. Honey's cost-effectiveness and accessibility further highlight its potential as a valuable alternative for burn management, particularly in

resource-limited settings. However, standardized protocols and larger, multicenter trials are needed to confirm these findings and optimize their clinical application.

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