

**Review Article**

# Wound Treatment with a Dressing Spray Based on St John's Wort Oil and Neem Oil: A Narrative Review

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Wound care represents a large component of the ever-increasing workload of healthcare professionals in the community, hospitals and care centres. The need for a cost-effective wound dressing that can be used on a variety of wounds and that meets multiple requirements e.g. acting anti-microbial, providing peri-wound protection and maceration control, preserving moisture balance and strengthening the skin's barrier function, is well recognised. Today, the plethora of wound dressings all fulfil some, though not all of these requirements. Choosing the correct dressing optimises the wound healing process and decreases healing time. Moreover, it can ease the busy work of health care professionals, lead to a more cost-effective care and improve patients' quality of life. This narrative review focusses on a plant-derived primary wound dressing spray based on St John's wort oil and Neem oil. Attention is paid to clinical efficacy, feasibility and user experiences. Overall, the results indicate that this wound spray is an effective treatment option in both acute and chronic wounds of various aetiologies. Application of the spray offers a promising non-invasive approach to support physiological wound healing processes in a very feasible way for both patients and professionals. Larger and more rigid longitudinal studies with a randomised controlled design are needed to confirm the efficacy of this innovative product.

**Keywords:** Plant-derived; Primary; Wound dressing; Spray; Acute and chronic; Wounds.**Introduction**

The process of wound healing in any type of tissue follows a predictable sequence of cellular and molecular events leading to the repair of injured tissue [1]. The healing process of acute wounds consists of four different consecutive phases (haemostasis, inflammation, proliferation/ migration and remodelling) [2]. However, certain wounds exhibit a failure in this sequential process of wound healing and are generally categorized as chronic or hard-to-heal wounds [3]. Wound chronicity is attributed to a

confluence of local wound related factors including prolonged inflammation, infection [4], impaired immune response, reduced cellular proliferation and migration, hindered extracellular and intracellular matrix synthesis, as well as compromised secretion of growth factors and perturbed cellular metabolism [5]. In addition, there are also host related factors (overall health status) which impact the wound healing process including age [6] (especially elevated age is a significant risk factor for delayed wound healing), nutritional status (especially malnutrition or specific nutritional shortages have a profound impact on wound healing), vascular insufficiency, hypoxia, comorbidities e.g. coronary heart disease and diabetes mellitus [7].

### **What is needed for optimal wound healing?**

Adequate and total wound care involves:

- Local wound management:
  - o cleanse and debride the wound
  - o cover and protect the wound
  - o monitor wound healing
- Supporting the host:
  - o identify and treat the cause of the wound
  - o optimize disease management
  - o optimize frail and compromised health status

The overall goal is to create a well-vascularized wound bed, free from non-viable tissue and excess exudate and with a low bacterial burden, that is optimal for the development of healthy granulation tissue and epithelializing towards closing wound edges.

Wound bed preparation is represented by the acronym TIME [8,9]:

- Tissue management: removing devitalized and necrotic tissue and its bacterial burden by adequate cleansing and debridement,
- Infection and inflammation control: antiseptic and antimicrobial cleaning [10],
- Moisture balance: promoting a warm and moist wound bed + control of excessive moisture; appropriate use of suitable wound dressing [11,12],
- Epithelial edge advancement: promoting well-advancing wound edges by adequate epithelialization [13].

### **What are important requirements of wound dressings?**

Wound dressings should meet the following requirements to ensure an optimal wound healing process during all phases: preserving a moist wound environment [11], prevention of dressing adherence [14], acting anti-microbial [15], providing peri-wound protection [16], maceration control [17,18] and strengthening the skin's barrier function [19,20].

Besides that, dressings that lead to a reduction in number of dressing changes, a reduction in the number of debridement episodes [21], a reduction in the number of wound cleansing episodes with antiseptic solutions [21], and which are easy-to-use and enable self-care (patient or family) are favourite.

### **Positioning of a novel wound dressing spray.**

Today, a large variety of hydrocolloid, hydrogel, alginate, polymeric and foam wound dressings exists of which all fulfil some, though not all requirements to support a good wound healing process in a feasible, cost-effective and patient/ professional friendly way.

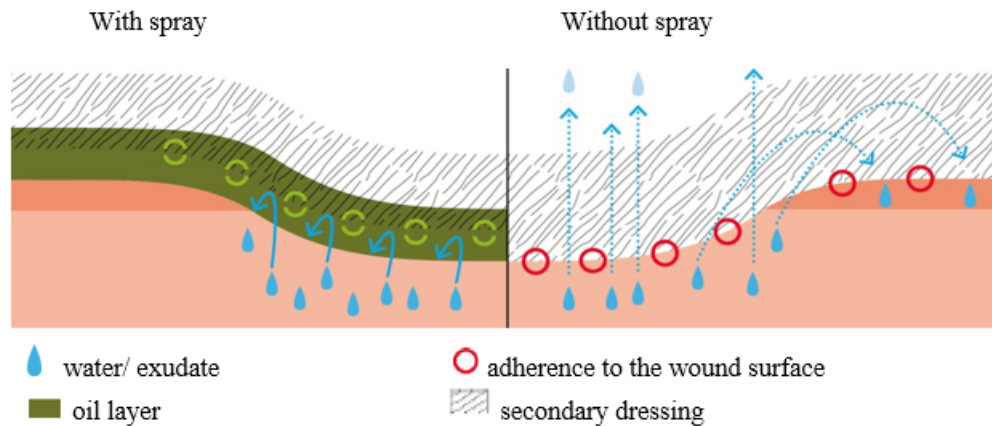
The novel treatment studied in this article involves the application of a wound dressing spray based on St John's wort oil and Neem oil [22]. The spray acts as a primary wound dressing and is applied from a distance of 5-10 cm directly onto the wound surface and peri-wound skin, after which it creates a thin layer of oil covering the wound bed and the surrounding skin.

The spray can be used for acute and chronic wounds and in all health care settings including the patients' home. Application can not only be done by wound care professionals but also by patients themselves and or their informal caregivers.

### **Mechanism of action.**

- o The spray creates a non-adherent wound coverage. The usage of non-adherent wound dressings supports wound healing since damage of the granulation tissue and regenerating epithelium during dressing change is prevented. This leads to improved epithelization and decrease of pain during dressing change.
- o The spray creates a continuous moist wound environment due to reduced water evaporation (barrier function). The thin oil film on the wound surface executes a barrier function, preventing water evaporation from the wound due to the hydrophobic nature of the oil. A moist environment is known to support wound healing by facilitating cell migration and diffusion of signalling molecules and nutrients into the wound area [11].
- o The spray exerts an antimicrobial effect based on a physical mode of action due to its high content of unsaturated fatty acids. Several publications have described antimicrobial effects of unsaturated fatty acids such as oleic and linoleic acid, which is caused by their surface activity [10,23].
- o The spray protects the skin area around the wound and supports a healthy skin barrier function due to the high content of unsaturated fatty acids [19].

The mechanism of the wound dressing spray is depicted in (Figure 1).



**Figure 1:** Primary effect of a wound dressing spray\* based on St John's wort oil and Neem oil. \*This wound dressing spray is currently available as WOUND. (<https://www.bap-medical.com/brands/wound/>).

**Aim of this study**

As this innovative wound dressing spray appears to meet most relevant requirements needed for an optimal wound healing process, we performed a narrative review to evaluate:

- the effects of this wound dressing spray on wound healing in acute and chronic wounds,
- its' feasibility for use in daily wound care practice,
- and patients' and professionals' satisfaction with the product.

**Methods**

**Search Strategy**

Potentially relevant articles were obtained by performing a broad systematic search in three electronic databases: PubMed, Web of Science and Google Scholar.

**Search Terms**

The following terms were combined with AND and OR:

“St John's wort oil” AND “Neem oil” AND “wound spray” AND “patients” AND “wounds” AND “2000/01/01” – “2024/12/31” AND “English” OR “German”.

Articles were eligible for inclusion if they met the following inclusion criteria:

1. written in English or German
2. clinical trial (RCT or CT) or case study or review or expert opinion/ clinical expertise
3. treatment of acute and/ or chronic wounds

4. with a dressing spray based on St John's wort oil and Neem oil
5. describing the effect of both plant preparations as a primary wound dressing
6. describing the feasibility for daily wound care practice
7. describing patients' and/ or professionals' satisfaction about the wound spray
8. describing cost effectiveness of the application of the spray in the treatment of acute and/ or chronic wounds
9. no age nor health restrictions for patients

In the first phase, all potentially relevant articles were reviewed based on title by JN and JS. In the second phase, abstract assessment of the initially retrieved articles was performed by JN and JS and articles not meeting the inclusion criteria were excluded. In the third phase, full text assessment was done by JN and JS of all articles included after the second phase. Finally, after full text analysis combined with searching the reference lists of the included articles for relevant additional articles, the final article selection for this narrative review was achieved by both assessors.

**Search results**

The combined search in PubMed, Web of Science and Google Scholar yielded 264 potentially relevant articles. Based on the title, 249 articles were excluded because they had another outcome than wound healing, did not contain St John's wort oil together with Neem oil in the form of a spray as primary wound dressing, or were not treatment studies. Additionally, 3 articles were excluded because they did not involve human studies. Twelve full text publications remained for review. Thereafter, 4 reviews were excluded because 1 did not meet the inclusion criteria and 3 revealed duplicates of

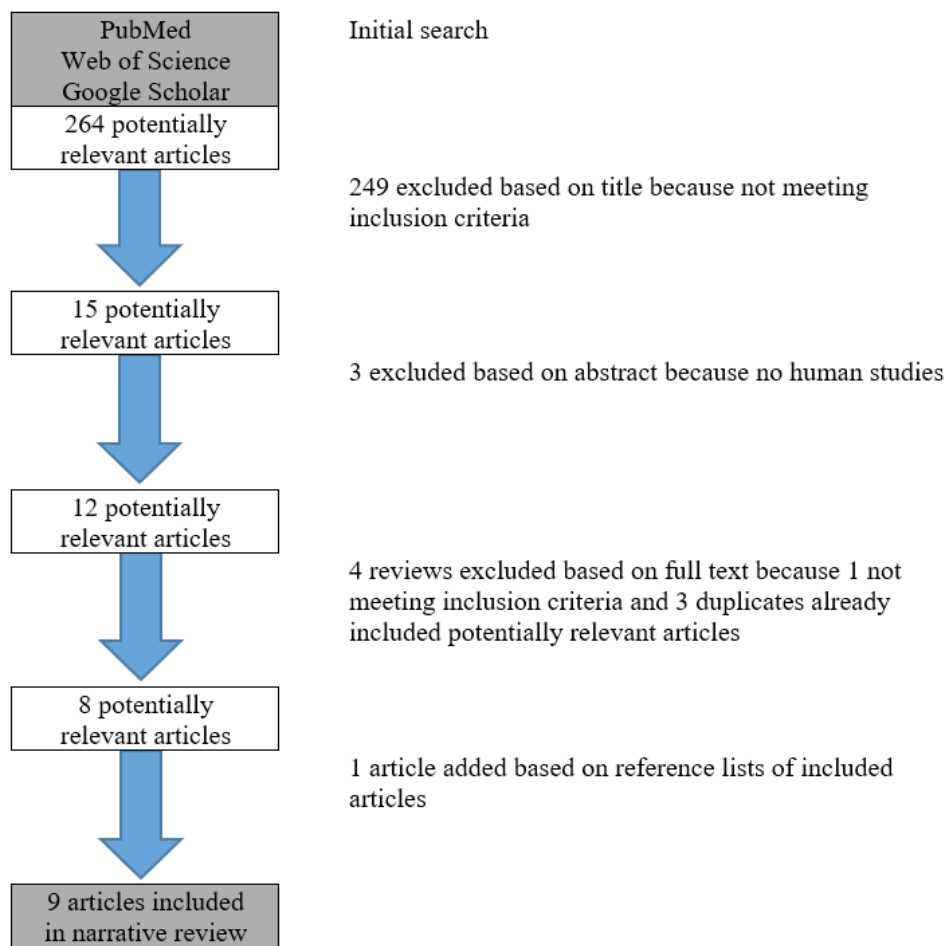
already included potentially relevant articles. After searching the reference lists of the 8 remaining articles, 1 relevant article was added. Finally, 9 articles were included in this narrative review. The flow chart of the selection process is depicted in (Figure 2).

## Results

The 9 included studies in this review were published between 2012 and 2024. They were conducted in different care settings: University Hospital (N=3), Hospital (N=5) and Long-Term Care (N=1). All studies evaluated a plant-derived primary wound

dressing spray, based on St John's wort oil and Neem oil, in the treatment of acute wounds, chronic wounds or both.

Eight out of 9 studies are case series studies of which 7 retrospective and 1 prospective. The 9th study is a single-blinded RCT. The study characteristics (type, (N), settings, wound types and participants' age), study aims as reported, and outcomes are summarized in (Table 1), organized by first author and year of publication.



**Figure 2:** Flow chart of the selection process of the specific literature search.

<b>1st Author/ Publication year</b>	<b>Study type (N) Setting/ Wound type</b>	<b>Participants' age</b>	<b>Study aims as reported</b>	<b>Outcomes</b>
Laüchli, S. [22] 2012	Case report (N=105) University Hospital/ Acute and chronic wounds	Average age 70 +/- 16 y	To present clinicians' and wound experts' clinical experience with a novel primary wound dressing*.	Decreased time to healing, Impressive induction of granulation, Maceration-reducing effect, Pain-reducing effect, No adverse events.
Laüchli, S. [24] 2012	Retrospective analysis (N=9) University Hospital/ Scalp wounds with exposed bone	Mean age 81.2 +/- 8.5 y	To evaluate the efficacy of a primary wound dressing*.	Complete healing, Rapid induction of granulation tissue, Easy to use, No adverse events.
Mainetti, S. [25] 2013	Retrospective evaluation (N=9) Hospital/ Burn wounds	Mean age 8.17 +/- 3.35 y	To observe the efficacy of a primary wound dressing*.	Rapid induction of granulation tissue, Strong pain relief within 1 <sup>st</sup> week. No adverse events.
Laüchli, S. [26] 2014	Retrospective review (N=15) University Hospital/ Acute wounds	Mean age 76.87 +/- 10.3 y	To evaluate efficacy and cost-effectiveness of a primary wound dressing* in scalp wounds with exposed bone.	Rapid formation of granulation tissue, No adverse events, Substantial decrease in mean costs.
Lenz, A. [27] 2015	Retrospective analysis (N=21) Hospital/ Acute wounds	Mean age 26 +/- 5.6 y	To evaluate the effectiveness of a primary wound dressing* in healing pilonidal sinus wounds.	The application of ONE led to complete healing by secondary intention in all wounds, Dressing change was easy and without pain, No adverse events.
Elliott, S. [28] 2019	Clinical focus on a primary wound dressing. Hospitals/ Acute and chronic wounds	NA	This article looks at the important properties of wound care products, investigates the need to release nurse time and describes how patients can engage in effective self-care using a primary wound dressing*.	Maceration-reducing effect, Pain-reducing effect and skin barrier function, Reduced number of debridements and dressing changes, Effective treatment strategy, Decreased time to healing, Support for self-care.
Weber, C. [29] 2021	Retrospective report (N=15) Hospital/ Acute and chronic wounds	Mean age 64.8 (38-90 y)	To evaluate the efficacy of a primary wound dressing* from the clinicians' perspective.	40 % complete healing, 60 % reduced WSA, Pain reduction, No adverse events, Easy to use, dressing change without pain.

Arena, M. [30] 2022	RCT, single blinded (N=99) Hospital/ Acute wounds	Mean age 59.5 +/- 11.2	To evaluate the clinical effect of a primary wound dressing* in dehisced surgical wounds with critical colonization/ infection versus silver-based dressings.	Overall BWAT° evaluation regarding inflammatory signs demonstrated similar outcomes between the groups. However, a statistically significant pain reduction was demonstrated in the experimental group (p<0.0001, 95% CI: 2.918-4.8819). No adverse events.
van Leen, M. [31] 2024	Prospective case study (N=4) Long Term Care/ Acute and chronic wounds	Average age 91.75 +/- 4.7 y	To evaluate the effects of a primary wound dressing* on healing acute and complex wounds, its’ feasibility of application and patient’s satisfaction with the product.	Complete healing in all wounds. No adverse events. Feasibility of use and satisfaction with the product both scored 4.5 out of 5.0.
<p>*The reported primary wound dressing is a spray based on St John’s wort oil and Neem oil, currently available as WOUND. (<a href="https://www.bap-medical.com/brands/wound/">https://www.bap-medical.com/brands/wound/</a>)</p> <p>○ Bates-Jensen Wound Assessment Tool</p>				

**Table 1:** Study characteristics and outcomes.

Although this innovative wound dressing spray may be used as a stand-alone dressing, in 8 out of the 9 included studies, a simple secondary dressing (non-woven gauze or absorbent dressing) without any active compound was additionally applied. The choice of the secondary dressing was based on the amount of wound exudate present. The outcomes in the study of Mainetti and Carnevali (2013), who didn’t use a secondary dressing, were in line with the findings of the other included studies.

In most studies, the induction of granulation tissue formation was impressive, resulting in progressive filling up of even deep wounds and finally in re-epithelialization.

Seven studies also found a remarkable pain reduction effect with the spray treatment and this effect was particularly found in patients with (deep) burns [25].

Overall, no serious adverse events were reported.

The feasibility of application of the spray was generally rated as high and user-friendly.

### Discussion

The wound spray in this study, consisting of a mixture of Neem and Hypericum oil acts as a primary wound dressing for use in acute or chronic wounds [22,24-31]. The oil layer on the wound surface prevents adherence of the secondary dressing to the wound bed and reduces water evaporation from the wound, thereby creating a moist wound environment. Both effects are known to support wound healing [11].

The spray can be reapplied without removal of the previous application, which is an advantage over traditional dressings that always must be removed and replaced, with a risk of damaging the underlying restoring tissue and provocation of pain or infection upon removal [32].

The clinical efficacy of this plant-derived primary wound dressing spray is supported by the data in this review. In all studies, application of the spray led to a decreased healing time, adequate induction of granulation tissue, a reduction of maceration and a pain-reducing effect. These effects may be explained by the antimicrobial activity of unsaturated fatty acids contained in the spray [10,23], the balanced moist environment obtained by the semi-occlusive layer the oil creates [11] and the fact that the oil prevents secondary dressings from adhering to the wound [32].

These effects may imply a significant improvement of the quality of life for the affected patients.

No adverse events associated with the epicutaneous administration of Neem oil or Hypericum oil were observed supporting the safety of this spray. Only van Leen (2024) mentioned in his study a negative comment of the nursing staff being an unpleasant smell for a short time after spraying.

The feasibility of application of the spray was rated as high and user-friendly by care providers applying the therapy both at patients’ homes and local community health centers. Moreover, there are indications that this spray may be more cost-effective

[33]. Using the spray enables family members to perform dressing changes simply and safely themselves after instruction, indicating the potential for significant savings, also compared to using advanced methods such as negative pressure wound therapy (NPWT) or skin substitutes such as skin grafts [26].

There are some limitations of this review. The most important limitation is lacking high standards of scientific evidence. Overall, 8 out of 9 studies were case series studies with a small number of patients (average N= 27, ranging from 4 to 105), mostly recruited from a single center, with in general (7 out of 8 studies) data analyzed retrospectively and indirectly compared with published data. Only 1 case study was a prospective one but with only 4 cases. The included RCT was single-blinded. Therefore, the results, despite pointing in the same direction and being uniformly positive, must be interpreted with caution.

The COVID-19 pandemic led to more wounds with complex pathologies being treated at home and in local community health centers. Innovative and easy-to-use treatment solutions were urgently needed to support community nurses during wound healing efforts at patients' homes [34].

Nowadays, this is also very important as the demand for nursing time increases while the nursing workforce is under high pressure and declining. Therefore, it is vital to find products that are efficient, easy-to-use and accepted by patients and carers with equivalent or improved healing rates. This review indicates that this plant-derived primary wound dressing spray might help to free nursing time by reducing the frequency of nurse-led dressing changes and enabling self-management.

## Conclusion

Overall, this narrative review indicates that this wound spray consisting of a mixture of Neem oil and Hypericum oil may be a promising non-touch treatment option in both acute and chronic wounds of various etiologies. Larger and more rigid longitudinal studies with a randomized controlled design are needed to confirm the efficacy of this innovative product.

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**Ethical Considerations:** Not applicable.

**Conflict of interest:** All authors declare no conflict of interest.

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