



# Application of Bee Products for Dermatological Problems

Heidrun Männle<sup>1</sup> and Karsten Münstedt<sup>1,\*</sup>

<sup>1</sup>Ortenau-Klinikum Offenburg-Kehl, Offenburg, Germany

\*Corresponding author: Ortenau-Klinikum, Ebertplatz 12, 77654 Offenburg, Germany. Email: karsten.muenstedt@web.de

Received 2020 April 07; Revised 2020 April 29; Accepted 2020 May 03.

## Abstract

**Context:** Bee products are frequently suggested as possible treatments for dermatological problems by protagonists of apitherapy, which is a discipline within the field of complementary and alternative medicine. Unfortunately, apitherapists do not support their health claims. This review was to identify potential uses of bee products in the field of dermatology.

**Evidence Acquisition:** Randomized and non-randomized clinical trials, case-control studies, systematic reviews, and meta-analyses on the topics were identified using various search engines.

**Results:** Evidence suggests that bee products may be a reasonable treatment option for wound infections, burns, radiodermatitis, infections with herpes viruses, atopic dermatitis, rosacea, scars, cutaneous warts, acne, psoriasis, facial wrinkles, and intertrigo.

**Conclusions:** There are several applications for bee products in the field of dermatology, for instance treatment of wound infections with honey and herpes infections with propolis.

**Keywords:** Honey, Propolis, Apitherapy, Dermatology

## 1. Context

### 1.1. Apitherapy

Apitherapy is the medical treatment using bee products. There are two different, diverging concepts behind apitherapy:

- The holistic apitherapy approach which claims that all diseases can and should be treated using bee products, in combination with other types of complementary and alternative medicine.
- The scientific apitherapy method which considers clinical findings, studies, and trials as a basis for treatment concepts.

Holistic apitherapy claims that almost all diseases can be treated using bee products. However, such claims are almost entirely unsubstantiated. As shown in an analysis of dysmenorrhea, there is no consistent form of apitherapy. 27 books on the subject suggested 15 completely different treatment options. This inconsistency makes apitherapy look arbitrary, and in most cases, there is no rational concept mentioned (1). Similar findings have also been reported regarding seasonal allergic rhinitis (2). Considering the patients' priorities, adjunct therapies should

- be highly efficacious
- have little or no adverse effects and no long-term toxicity
- be able to be easily administered

- not be expensive because health insurance does not cover most complementary and alternative medicine treatments.

Furthermore, bee products or apitherapy are competing with several other methods from the field of complementary and alternative medicine as well as phytotherapy. Patients should receive the best possible treatment. Therefore, therapeutic approaches from different realms of medicine must fulfill the criteria above. Thereafter, the decision regarding the application of a particular method can be made. The same process applies to the application of bee products.

### 1.2. Application of Bee Products in Dermatology

Dermatology comprises both medical and surgical treatments related to diseases of the skin, hair, and nails, and cosmetic problems. Earlier analyses on potential applications of bee products have mainly set up a theoretical basis for the treatment of dermatological problems. For example, Xi et al. summarize the constituents of pollen and postulate reasonable uses of bee pollen in cosmetics without reflecting on the clinical evidence (3). This review focuses on the clinical evidence. Dermatologic problems for which bee products can be potentially beneficial were identified using a systematic searching approach.

## 2. Evidence Acquisition

This systematic review was carried out according to the recommendations of PRISMA.

### 2.1. Data Sources and Searches

Articles were searched without any language restriction using the PubMed and the JUSTfind System of the Justus-Liebig-University Gießen, Germany, which comprises 337 databases from the EBSCO Discovery Service. Also, Scopus was used with the following search terms: “propolis” OR “honey” OR “royal jelly” OR “bee venom”. These search terms were combined with search terms related to dermatologic problems such as “burns”, “wound infections”, “radiodermatitis”, “herpes”, “atopic dermatitis”, “rosacea”, “scar formation”, “cutaneous warts”, “acne”, “psoriasis”, “facial wrinkles”, “intertrigo”, and “dermatology” as a general term.

### 2.2. Eligibility Criteria

Eligible studies were controlled randomized and non-randomized clinical trials, including case-control studies, systematic reviews, and meta-analyses. Studies were eligible if they were published as full papers in English or German. The publication date range included in the search was from Jan 1, 1990 to Feb 28, 2020.

### 2.3. Study Selection

The full titles and abstracts of the articles retrieved in the initial search were assessed for adherence to the eligibility criteria. Duplicate articles and those not meeting the eligibility criteria were removed. Afterward, the full texts of the remaining articles were read and assessed for eligibility.

### 2.4. Data Collection

Relevant data, including the title of the paper, authors' information, the country in which the study was conducted, the condition treated, study design, primary and secondary endpoints, results from primary assessment to the last follow-up, and side effects were extracted from all retrieved studies using a standardized data extraction form.

## 3. Results

### 3.1. Acne

Even in ancient times, acne was treated with bee products, among other substances. The Greeks and the Egyptians recommended honey for “softer lesions” and a soap mixture for the more stubborn spots (4). Dioscorides (~ 40

- 90 AD), a Roman surgeon and medic summarizes the many virtues of myrrh, the resin of a thorny bush native to Anatolia, when mixed with cassia and honey (4) for acne. Despite interesting *in vitro* data, a clinical trial on kanuka honey failed to show that the addition of kanuka honey and 10% glycerin, to standard antibacterial soap treatment, is more effective than the use of soap alone (5, 6).

### 3.2. Atopic Dermatitis

Several studies investigated honey as a means to treat atopic dermatitis. Al-Waili investigated a mixture of natural honey, beeswax, and olive oil and found that 8 of 10 patients showed significant improvement after 2 weeks. Thus, the author concluded that the honey mixture appears to be useful in the management of dermatitis (7).

In another study, 15 patients with bilateral atopic dermatitis lesions were asked to apply manuka honey on one site overnight for seven consecutive days and to leave the contralateral site untreated (8). In all patients, the lesions significantly improved with the manuka honey treatment compared with the pre-treatment and the control lesions.

*In vitro* data also suggest that bee venom could be a treatment option; however, no clinical data are supporting this hypothesis. Therefore, these treatment approaches cannot be recommended yet (9).

### 3.3. Burns

Silver is the dominant antibacterial dressing used in the treatment of burns. However, honey has an antibacterial effect without the toxic effects of silver on the skin. A systematic review with meta-analysis analyzed six randomized controlled trials focusing on antibacterial properties and healing times of honey and silver. The meta-analyses revealed that honey was more effective on wound healing than silver, as measured by the number of days needed for wounds to heal.

Based on these findings, honey has more positive effects on wound healing compared with silver (10, 11).

### 3.4. Cutaneous Warts

Warts are a common problem affecting adults and children. There are multiple treatment options, but so far, no single therapy stands out as being very effective. A trial comparing propolis, Echinacea, or placebo found impressive superior healing rates with propolis in the case of common warts and plane warts. 75% of the patients with the plane and 73% of those with common warts were cured when treated with propolis. Propolis was the only agent that led to the healing of the lesions, but this was only the case with one patient (12).

### 3.5. Facial Wrinkles

Extrinsic photodamage and intrinsic aging processes cause facial wrinkles, which are highly undesirable. A clinical study assessed the beneficial effects of bee-venom serum on the clinical signs of aging skin. It showed that bee-venom serum treatment clinically improved facial wrinkles in 22 patients (13).

### 3.6. Herpes Virus Infections

A recent systematic review summarized the clinical trials comparing propolis with acyclovir in the treatment of shingles and labial and genital herpes found that propolis is superior to acyclovir (14).

Various studies have also investigated honey. They found that honey is effective in reducing the duration of attacks and healing time in patients with a history of recurrent herpetic lesions. Despite the small number of patients, honey could be an affordable treatment option, especially in low-resource situations (14).

### 3.7. Intertrigo

Skin folds are susceptible to irritation and subsequent infection due to factors that promote skin breakdown, such as moisture, friction, and exposure to bodily secretions, especially sweat. This type of inflammatory rash is referred to as intertrigo (15).

A single-blind multicenter, intervention study compared a standard therapy with zinc oxide ointment and a honey barrier cream in 31 patients with symmetrical intertrigo in large skin folds. The study found no significant differences between the two groups, and both treatments were effective. However, the use of the honey barrier cream lead to less pruritus complaints (12.9% versus 29.0%). Thus, the honey barrier cream was considered a suitable alternative in the treatment of intertrigo because it promotes patient comfort (16).

### 3.8. Psoriasis

A study investigated the effects of a mixture, a combination of propolis and Aloe in the form of an ointment (propolis (50%) and aloe vera (3%)), on 857 patients with moderate to severe palmoplantar psoriasis. The authors found a significant improvement of the lesions using the propolis-aloe ointment (17).

A single-blind randomized controlled pilot trial compared topical kanuka honey and an aqueous cream as a control for psoriasis. The authors found that kanuka honey is as effective as aqueous cream; however, aqueous cream was significantly less efficient than topical steroids (18).

### 3.9. Radiodermatitis

Treatment of malignant tumors includes radiotherapy, which is applied by linear accelerators. Although the modern techniques regarding the application of radiotherapy reduce skin toxicity, skin toxicity cannot be prevented. Two trials have investigated honey for improvement radiodermatitis (19, 20).

Moolenaar et al. compared honey and paraffin-impregnated gauze in breast cancer patients with grade 3 skin toxicity (19). The investigations showed a better healing process in the patients who used honey. Furthermore, patients were more satisfied with the honey treatment because the wound dressings were much easier to clean. Honey could easily be rinsed off, whereas it was difficult to remove the paraffin. Shoma et al. compared honey, a combination of honey and pentoxifylline, and pentoxifylline alone in a three-armed prospective study (20). The combination of honey and pentoxifylline was the most effective treatment, and pentoxifylline was the least effective (14). The beneficial effects of honey are not limited to the skin. Honey can be effectively used for the treatment of oral mucositis (21).

### 3.10. Rosacea

A randomized placebo-controlled trial compared topical 90% medical-grade kanuka honey and 10% glycerine cream with a non-ionic paraffin-based cream (cetomacragol). Improvement rates at the end of week 8 compared to baseline were 34.3% for honey and 17.4% in the control group (22).

### 3.11. Scar Formation

Surgical procedures often lead to scars, which often do not cause problems. However, excessive scarring can cause significant cosmetic, functional, and psychological problems. In a randomized trial, 52 plastic surgery patients with bilateral symmetric incisions were randomly covered postoperatively with either a conventional dressing or a honey dressing for five days. After three and six months, the mean width of the scars of the honey-treated wounds was about 2 mm smaller (~3.5 mm versus 5.4 mm;  $P < 0.001$ ) (23). This study confirms an earlier study on post-operative wound infections due to gram-positive and gram-negative bacteria following cesarean sections and hysterectomies which found apart from (1) a faster eradication of bacterial infections, (2) a reduced period of antibiotic use and hospital stay, (3) an accelerated healing of the wound, (4) the prevention of wound dehiscence and the need for re-suturing as well as a minimal scar formation (24).

Another trial on the application of manuka honey for eyelid surgery found no significant difference in the scar formation, but the patients preferred honey to vaseline because they experienced less pain (25).

### 3.12. Wound Infections

Systematic reviews and meta-analyses have shown that different types of wounds (infected wounds, burns, diabetic foot ulcers, and malignant fumigating wounds) can be effectively treated with honey (11, 26, 27). The beneficial effects of honey are a result of multiple positive characteristics, including high sugar concentration, hydrogen peroxide, low pH, the antimicrobial peptide bee defensin-1 in all types of honey, and methylglyoxal in manuka honey (28). This variety of antibacterial mechanisms allows the efficient removal of bacteria, including the methicillin-resistant *Staphylococcus aureus*. A randomized controlled trial showed that medical-grade honey was equally efficient for the decolonization of nasal methicillin-resistant *Staphylococcus aureus* when compared to mupirocin 2% (29). Considering these findings, honey appears to be universally applicable for treating all kinds of wounds. Possibly honey can be applied for the treatment of other problems such as chronic venous leg ulcers. At present, the evidence is inconclusive (30). Rothmeier et al. presented a case series of wounds that had been unsuccessfully treated by conventional wound care. They found that in 8 of 9 cases, the wounds would be healed by the application of medical honey over 3 - 8 weeks (31). Honey was also found to be effective for treating pain and surgical wounds after tonsillectomy (32).

### 3.13. Other Topics

The efficacy of kanuka honey for actinic keratosis has only been described in case reports (33).

Malignant tumors of the skin and urticaria are other important issues in dermatology. So far, there is no evidence in the literature regarding the effectiveness of bee products on these skin conditions. There are a few publications on the incidence of urticaria due to allergic reactions to bee products (34-36).

## 4. Conclusions

This review shows that there are several potential applications for bee products in dermatology, for instance treatment of wound infections and burns with honey and herpes infections with propolis.

In these three conditions, bee products can be considered as appropriate alternatives to standard treatments.

In other cases, bee products are an adjunct treatment option or a treatment alternative, especially in poor-resource settings or for patients who wish to receive natural treatments.

Certainly, the treatment of dermatological diseases with bee products deserves further investigation. However, the allergic potential of all bee products may impair their general use, although allergic problems are not common.

## Footnotes

**Authors' Contribution:** Study concept and design: KM; acquisition of data: KM, HM; analysis and interpretation of data: KM, HM; drafting of the manuscript: KM, HM; critical revision of the manuscript for important intellectual content: KM, HM; statistical analysis: -; administrative, technical, and material support: -; study supervision: KM

**Conflict of Interests:** There are no conflicts of interest.

**Ethical Approval:** This study was a review, without any experimentation on humans, animals or plants.

**Funding/Support:** We did not receive any funding.

## References

- Munstedt K. Meaningfulness of Apitherapeutic Approaches Using the Example of Primary Dysmenorrhoea. *Journal of Apitherapy*. 2018;3:9–16. doi: [10.5455/ja.20170917090943](https://doi.org/10.5455/ja.20170917090943).
- Munstedt K, Männle H. Seasonal allergic rhinitis and the role of apitherapy. *Allergol Immunopathol (Madr)*. 2020. doi: [10.1016/j.aller.2020.03.015](https://doi.org/10.1016/j.aller.2020.03.015). [PubMed: 32451131].
- Xi X, Li J, Guo S, Li Y, Xu F, Zheng M, et al. The Potential of Using Bee Pollen in Cosmetics: a Review. *J Oleo Sci*. 2018;67(9):1071–82. doi: [10.5650/jos.ess18048](https://doi.org/10.5650/jos.ess18048). [PubMed: 30111679].
- Eber AE, Perper M, Magno R, Nouri K. Acne treatment in antiquity: can approaches from the past be relevant in the future? *Int J Dermatol*. 2017;56(10):1071–3. doi: [10.1111/ijd.13741](https://doi.org/10.1111/ijd.13741). [PubMed: 28856672].
- Julianti E, Rajah KK, Fidrianny I. Antibacterial Activity of Ethanolic Extract of Cinnamon Bark, Honey, and Their Combination Effects against Acne-Causing Bacteria. *Sci Pharm*. 2017;85(2). doi: [10.3390/scipharm85020019](https://doi.org/10.3390/scipharm85020019). [PubMed: 28398231]. [PubMed Central: PMC5489923].
- Semprini A, Braithwaite I, Corin A, Sheahan D, Tofield C, Helm C, et al. Randomised controlled trial of topical kanuka honey for the treatment of acne. *BMJ Open*. 2016;6(2). e009448. doi: [10.1136/bmjopen-2015-009448](https://doi.org/10.1136/bmjopen-2015-009448). [PubMed: 26832428]. [PubMed Central: PMC4746462].
- Al-Waili NS. Topical application of natural honey, beeswax and olive oil mixture for atopic dermatitis or psoriasis: partially controlled, single-blinded study. *Complementary Therapies in Medicine*. 2003;11(4):226–34. doi: [10.1016/s0965-2299\(03\)00120-1](https://doi.org/10.1016/s0965-2299(03)00120-1).
- Alangari AA, Morris K, Lwaleed BA, Lau L, Jones K, Cooper R, et al. Honey is potentially effective in the treatment of atopic dermatitis: Clinical and mechanistic studies. *Immun Inflamm Dis*. 2017;5(2):190–9. doi: [10.1002/iid3.153](https://doi.org/10.1002/iid3.153). [PubMed: 28474502]. [PubMed Central: PMC5418133].
- An HJ, Kim JY, Kim WH, Gwon MG, Gu HM, Jeon MJ, et al. Therapeutic effects of bee venom and its major component, melittin, on atopic

- dermatitis in vivo and in vitro. *Br J Pharmacol*. 2018;**175**(23):4310–24. doi: [10.1111/bph.14487](https://doi.org/10.1111/bph.14487). [PubMed: [30187459](https://pubmed.ncbi.nlm.nih.gov/30187459/)]. [PubMed Central: [PMC6240132](https://pubmed.ncbi.nlm.nih.gov/PMC6240132/)].
10. Lindberg T, Andersson O, Palm M, Fagerstrom C. A systematic review and meta-analysis of dressings used for wound healing: the efficiency of honey compared to silver on burns. *Contemp Nurse*. 2015;**51**(2-3):121–34. doi: [10.1080/10376178.2016.1171727](https://doi.org/10.1080/10376178.2016.1171727). [PubMed: [27027667](https://pubmed.ncbi.nlm.nih.gov/27027667/)].
  11. Aziz Z, Abdul Rasool Hassan B. The effects of honey compared to silver sulfadiazine for the treatment of burns: A systematic review of randomized controlled trials. *Burns*. 2017;**43**(1):50–7. doi: [10.1016/j.burns.2016.07.004](https://doi.org/10.1016/j.burns.2016.07.004). [PubMed: [27576926](https://pubmed.ncbi.nlm.nih.gov/27576926/)].
  12. Zedan H, Hofny ER, Ismail SA. Propolis as an alternative treatment for cutaneous warts. *Int J Dermatol*. 2009;**48**(11):1246–9. doi: [10.1111/j.1365-4632.2009.04184.x](https://doi.org/10.1111/j.1365-4632.2009.04184.x). [PubMed: [20064186](https://pubmed.ncbi.nlm.nih.gov/20064186/)].
  13. Han SM, Hong IP, Woo SO, Chun SN, Park KK, Nicholls YM, et al. The beneficial effects of honeybee-venom serum on facial wrinkles in humans. *Clin Interv Aging*. 2015;**10**:1587–92. doi: [10.2147/CIA.S84940](https://doi.org/10.2147/CIA.S84940). [PubMed: [26491274](https://pubmed.ncbi.nlm.nih.gov/26491274/)]. [PubMed Central: [PMC4598227](https://pubmed.ncbi.nlm.nih.gov/PMC4598227/)].
  14. Munstedt K. Bee products and the treatment of blister-like lesions around the mouth, skin and genitalia caused by herpes viruses-A systematic review. *Complement Ther Med*. 2019;**43**:81–4. doi: [10.1016/j.ctim.2019.01.014](https://doi.org/10.1016/j.ctim.2019.01.014). [PubMed: [30935560](https://pubmed.ncbi.nlm.nih.gov/30935560/)].
  15. Mistiaen P, Poot E, Hickox S, Jochems C, Wagner C. Preventing and treating intertrigo in the large skin folds of adults: a literature overview. *Dermatol Nurs*. 2004;**16**(1):43–6. 49–57. [PubMed: [15022504](https://pubmed.ncbi.nlm.nih.gov/15022504/)].
  16. Nijhuis WA, Houwing RH, Van der Zwet WC, Jansman FG. A randomised trial of honey barrier cream versus zinc oxide ointment. *Br J Nurs*. 2012;**21**(20):9–10. 12–3. [PubMed: [23131911](https://pubmed.ncbi.nlm.nih.gov/23131911/)].
  17. El-Gammal E, Nardo VD, Daaboul F, Tchernev G, Wollina U, Lotti J, et al. Apitherapy as a New Approach in Treatment of Palmo-plantar Psoriasis. *Open Access Maced J Med Sci*. 2018;**6**(6):1059–61. doi: [10.3889/oamjms.2018.135](https://doi.org/10.3889/oamjms.2018.135). [PubMed: [29983801](https://pubmed.ncbi.nlm.nih.gov/29983801/)]. [PubMed Central: [PMC6026437](https://pubmed.ncbi.nlm.nih.gov/PMC6026437/)].
  18. Fingleton J, Sheahan D, Corin A, Weatherall M, Beasley R. A randomised controlled trial of topical Kanuka honey for the treatment of psoriasis. *JRSM Open*. 2014;**5**(3):2.0425333135189E+15. doi: [10.1177/2042533313518913](https://doi.org/10.1177/2042533313518913). [PubMed: [25057377](https://pubmed.ncbi.nlm.nih.gov/25057377/)]. [PubMed Central: [PMC4012670](https://pubmed.ncbi.nlm.nih.gov/PMC4012670/)].
  19. Moolenaar M, Poorter RL, van der Toorn PP, Lenderink AW, Poortmans P, Egberts AC. The effect of honey compared to conventional treatment on healing of radiotherapy-induced skin toxicity in breast cancer patients. *Acta Oncol*. 2006;**45**(5):623–4. doi: [10.1080/02841860600781799](https://doi.org/10.1080/02841860600781799). [PubMed: [16864180](https://pubmed.ncbi.nlm.nih.gov/16864180/)].
  20. Shoma A, Eldars W, Noman N, Saad M, Elzahaf E, Abdalla M, et al. Pentoxifylline and local honey for radiation-induced burn following breast conservative surgery. *Curr Clin Pharmacol*. 2010;**5**(4):251–6. doi: [10.2174/157488410793352021](https://doi.org/10.2174/157488410793352021). [PubMed: [20925642](https://pubmed.ncbi.nlm.nih.gov/20925642/)].
  21. Munstedt K, Momm F, Hubner J. Honey in the management of side effects of radiotherapy- or radio/chemotherapy-induced oral mucositis. A systematic review. *Complement Ther Clin Pract*. 2019;**34**:145–52. doi: [10.1016/j.ctcp.2018.11.016](https://doi.org/10.1016/j.ctcp.2018.11.016). [PubMed: [30712719](https://pubmed.ncbi.nlm.nih.gov/30712719/)].
  22. Braithwaite I, Hunt A, Riley J, Fingleton J, Kocks J, Corin A, et al. Randomised controlled trial of topical kanuka honey for the treatment of rosacea. *BMJ Open*. 2015;**5**(6). e007651. doi: [10.1136/bmjopen-2015-007651](https://doi.org/10.1136/bmjopen-2015-007651). [PubMed: [26109117](https://pubmed.ncbi.nlm.nih.gov/26109117/)]. [PubMed Central: [PMC4480029](https://pubmed.ncbi.nlm.nih.gov/PMC4480029/)].
  23. Goharshenasan P, Amini S, Atria A, Abtahi H, Khorasani G. Topical Application of Honey on Surgical Wounds: A Randomized Clinical Trial. *Forsch Komplementmed*. 2016;**23**(1):12–5. doi: [10.1159/000441994](https://doi.org/10.1159/000441994). [PubMed: [26977860](https://pubmed.ncbi.nlm.nih.gov/26977860/)].
  24. Al-Waili NS, Saloom KY. Effects of topical honey on post-operative wound infections due to gram positive and gram negative bacteria following caesarean sections and hysterectomies. *Eur J Med Res*. 1999;**4**(3):126–30. [PubMed: [10085281](https://pubmed.ncbi.nlm.nih.gov/10085281/)].
  25. Malhotra R, Ziahosseini K, Poitelea C, Litwin A, Sagili S. Effect of Manuka Honey on Eyelid Wound Healing: A Randomized Controlled Trial. *Ophthalmic Plast Reconstr Surg*. 2017;**33**(4):268–72. doi: [10.1097/IOP.0000000000000743](https://doi.org/10.1097/IOP.0000000000000743). [PubMed: [27429228](https://pubmed.ncbi.nlm.nih.gov/27429228/)].
  26. Wang C, Guo M, Zhang N, Wang G. Effectiveness of honey dressing in the treatment of diabetic foot ulcers: A systematic review and meta-analysis. *Complement Ther Clin Pract*. 2019;**34**:123–31. doi: [10.1016/j.ctcp.2018.09.004](https://doi.org/10.1016/j.ctcp.2018.09.004). [PubMed: [30712715](https://pubmed.ncbi.nlm.nih.gov/30712715/)].
  27. Tschlakidou A, Govina O, Vasilopoulos G, Kavga A, Vastardi M, Kalemikerakis I. Intervention for symptom management in patients with malignant fungating wounds - a systematic review. *J BUON*. 2019;**24**(3):1301–8. [PubMed: [31424694](https://pubmed.ncbi.nlm.nih.gov/31424694/)].
  28. Kwakman PH, Zaat SA. Antibacterial components of honey. *IUBMB Life*. 2012;**64**(1):48–55. doi: [10.1002/iub.578](https://doi.org/10.1002/iub.578). [PubMed: [22095907](https://pubmed.ncbi.nlm.nih.gov/22095907/)].
  29. Poovelikunnel TT, Gethin G, Solanki D, McFadden E, Codd M, Humphreys H. Randomized Controlled Trial of Honey Versus Mupirocin to Decolonize Patients With Nasal Colonization of Meticillin-Resistant Staphylococcus Aureus. *J Hosp Infect*. 2018;**98**(2):141–8. doi: [10.1016/j.jhin.2017.10.016](https://doi.org/10.1016/j.jhin.2017.10.016). [PubMed: [29107078](https://pubmed.ncbi.nlm.nih.gov/29107078/)].
  30. Holland LC, Norris JM. Medical grade honey in the management of chronic venous leg ulcers. *Int J Surg*. 2015;**20**:17–20. doi: [10.1016/j.ijssu.2015.05.048](https://doi.org/10.1016/j.ijssu.2015.05.048). [PubMed: [26050953](https://pubmed.ncbi.nlm.nih.gov/26050953/)].
  31. Rothmeier N, Abu-Jawad J, Arnolds J, Arweiler-Harbeck D, Dominas N, Stein R, et al. [The treatment of chronic wounds in the head and neck area after radiotherapy with medical honey]. *Laryngorhinootologie*. 2014;**93**(9):612–8. doi: [10.1055/s-0034-1377038](https://doi.org/10.1055/s-0034-1377038). [PubMed: [25152972](https://pubmed.ncbi.nlm.nih.gov/25152972/)].
  32. Lal A, Chohan K, Chohan A, Chakravarti A. Role of honey after tonsillectomy: a systematic review and meta-analysis of randomised controlled trials. *Clin Otolaryngol*. 2017;**42**(3):651–60. doi: [10.1111/coa.12792](https://doi.org/10.1111/coa.12792). [PubMed: [27863042](https://pubmed.ncbi.nlm.nih.gov/27863042/)].
  33. Mane S, Singer J, Corin A, Semprini A. Successful Treatment of Actinic Keratosis with Kanuka Honey. *Case Rep Dermatol Med*. 2018;**2018**:4628971. doi: [10.1155/2018/4628971](https://doi.org/10.1155/2018/4628971). [PubMed: [29955399](https://pubmed.ncbi.nlm.nih.gov/29955399/)]. [PubMed Central: [PMC6000848](https://pubmed.ncbi.nlm.nih.gov/PMC6000848/)].
  34. Katayama M, Inomata N, Inagawa N, Fukuro S, Aihara M. A case of contact urticaria syndrome stage 3 after honey ingestion, induced by epicutaneous sensitization during skin care with honey. *Contact Dermatitis*. 2016;**74**(3):189–91. doi: [10.1111/cod.12506](https://doi.org/10.1111/cod.12506). [PubMed: [26899812](https://pubmed.ncbi.nlm.nih.gov/26899812/)].
  35. Choi JH, Jang YS, Oh JW, Kim CH, Hyun IG. Bee Pollen-Induced Anaphylaxis: A Case Report and Literature Review. *Allergy Asthma Immunol Res*. 2015;**7**(5):513–7. doi: [10.4168/aaair.2015.7.5.513](https://doi.org/10.4168/aaair.2015.7.5.513). [PubMed: [25749764](https://pubmed.ncbi.nlm.nih.gov/25749764/)]. [PubMed Central: [PMC4509665](https://pubmed.ncbi.nlm.nih.gov/PMC4509665/)].
  36. Lee SX, Boontaveeyuwat E, Thaiwat S, Rustin M, McFadden J. Severe allergic contact dermatitis mimicking angioedema caused by propolis used as a traditional remedy. *Contact Dermatitis*. 2018;**79**(3):185–6. doi: [10.1111/cod.13021](https://doi.org/10.1111/cod.13021). [PubMed: [29845630](https://pubmed.ncbi.nlm.nih.gov/29845630/)].