

# Evaluation of the therapeutic potential of some apicultural products with essential oils for cutaneous wounds in cats and dogs

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## Abstract

*Honey represents a valuable product, which has been widely used for its therapeutic benefits in various disease conditions. Moreover, honeydew honey has been scientifically recognised for its antioxidant, antimicrobial and wound healing properties and it is used clinically, as a topical treatment for wound infections. In addition to this, a plethora of studies have revealed that propolis, sea buckthorn essential oil and thyme essential oil are basic aids in the treatment of wounds and other skin conditions. The aim of the present research was to determine the clinical effectiveness of two natural dressings, based on honeydew honey, combined either with soft propolis extract and thyme essential oil, either with sea buckthorn essential oil, with the purpose of minimizing the antibioresistance phenomenon within the small animal clinics. Their therapeutic value has been evaluated in feline and canine distinct types of cutaneous wounds, by topical application. The honeydew honey, soft propolis extract and sea buckthorn essential oil were provided by "Apilife Sibiu" company, located in Romania, while the thyme essential oil was purchased from "Young Living" company. The products were applied on uncomplicated acute and complicated cutaneous wounds in dogs and cats. In the treatment of six patients with uncomplicated acute wounds, we found an increased efficacy of the dressing containing honeydew honey and sea buckthorn essential oil, while in the treatment of six patients with complicated cutaneous wounds, the dressing based on honeydew honey, soft propolis extract and thyme essential oil has proven to be highly effective. All in all, based on the results obtained in conjunction with other studies in the field, we recommend the implementation of apicultural products with addition of essential oils in the prevention and therapy of various forms of cutaneous wounds in animals.*

**Keywords:** honeydew honey, propolis, sea buckthorn oil, thyme oil, wounds.

## Introduction

Honey represents a traditional remedy for the treatment of different types of wounds and it has recently been rediscovered by the medical field, particularly for treating cases in which conventional therapeutic agents are failing or are considered immunosuppressive (Molan, 2011). A plethora of studies have highlighted the effectiveness of natural products such as honey, in quickly clearing wound infections (Molan, 2006; Majtan et al., 2014; Vica et al., 2014) and promoting the healing process (Lusby et al., 2005; Basualdo et al., 2007). Moreover, besides removing pathogens from wounds, honey also provides a moist environment for proper wound recovery (Abdel-Moein et al., 2012; Wang et al., 2012; Grego et al., 2016). Propolis has also been successfully used in wound management, due to its anti-inflammatory (Calderón-Montano et al., 2011), antioxidant (Valente et al., 2011), antimicrobial (Petrova et al., 2011; Kalogeropoulos et al., 2009) and antifungal activities (Dotta et al., 2011). Recent data underlined that dressings consisting of honeydew honey and propolis possess a synergistic effect and enhance tissue repair (Takzaree et al., 2016). In the last decades, the interest in essential oils for their use in multiple pathologies has increased, because they have been shown to possess antibacterial, antifungal, antiviral and antioxidant properties due to their biologically active compounds (Pranoto et al., 2005). In this

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regard, sea buckthorn (*Hippophae rhamnoides L.*) essential oil has been scientifically investigated and numerous pharmacological activities, such as anti-inflammatory, immune-modulatory and tissue regeneration have been reported. It has also been demonstrated that it has no cytotoxicity or side effects after oral administration (Chawla et al., 2007, Geetha et al., 2005, Gupta et al., 2008, Saggi et al., 2007). Regarding the thymus oil, derived from the herb *Thymus vulgaris*, several studies showed that it exerts strong antibacterial and antifungal properties and it also accelerates the healing process of wounds and burns (Braga et al., 2006). Moreover, thyme essential oil is rich in thymol and carvacrol, which yield considerable antioxidant properties (Sacchetti et al., 2005).

The present paperwork was designed to determine the clinical effectiveness of two apicultural dressings, based on honeydew honey, combined either with soft propolis extract and thyme essential oil, either with sea buckthorn essential oil, with the purpose of minimizing the antibioresistance phenomenon within the veterinary medical field.

### **Materials and methods**

Our research was conducted on 9 canine and 3 feline patients, that underwent different types of wounds namely, uncomplicated acute wounds and complicated wounds and hence, we implemented a novel therapy, based on two natural dressings, which consisted of honeydew honey and essential oils.

***Obtaining a dressing based on honey, soft propolis extract and thyme essential oil.*** It was followed the procedure implemented by the company Apilife Săliște, Sibiu County, based on the incorporation of soft propolis extract and thyme essential oil in fir honeydew honey (obtained in Romania). For this purpose, exclusively sterile, unprocessed and 100%  $\lambda$ -irradiated fir honeydew honey was used. The soft propolis extract was obtained from propolis tincture, after the evaporation of the alcohol and it was incorporated into the honey with a few drops of thyme essential oil. The two apicultural products were provided by Apilife Trading Company, while the thyme essential oil was obtained from Young Living Trading Company.

***Obtaining a dressing based on honey and sea buckthorn essential oil.*** The preparation of this dressing followed the procedure applied by the same company (Apilife). It was based on the incorporation of essential sea buckthorn oil in fir honeydew honey. It should be noted that only sterile, unprocessed and 100%  $\lambda$ -irradiated fir honeydew honey was used together with a few drops of sea buckthorn essential oil, which was procured from local trade. All the products that form this dressing were provided by Apilife company.

***Application of the experimental products in the skin wounds therapy in patients.*** The canine and feline patients treated with the above mentioned dressings were clients of the following veterinary clinics: Trivet, Napovet, Alvet and Biovet, located in Cluj-Napoca. Six cases with uncomplicated acute wounds and six cases with complicated wounds were observed at the clinical examination.

***Topical application of dressings and wounds inspection.*** The therapeutic protocol was differentiated, depending on the type of wound: in cases with uncomplicated wounds, a topical application/day was made with the product based on honeydew honey and sea buckthorn essential oil, and for complicated wounds there were made two applications per day, with the dressing consisting of honeydew honey, soft propolis extract and thyme essential oil. The therapy with the two products was extended until the full recovery of the wounds, even though there were cases that required a long period of therapy. The products were applied to wounds, previously cleaned with Ringer solution, in a thick layer that covered the entire area of the wound, by using a sterile spatula;

in order to keep the dressings on wounds and to prevent leakage, sterile gauze bandages were applied.

### Results and discussions

*Evolution of patients with uncomplicated acute skin wounds treated with the dressing based on honeydew honey and essential oil, one topical application/day.*

**Case 1:** Dog, Bichon Frise breed, 3 years old, female, unneutered. This patient presented a surgical site wound, following the ovariohysterectomy surgery, which was sutured under aseptic and antiseptic conditions. After the implemented therapy, we noticed a favorable evolution (Fig. 1).

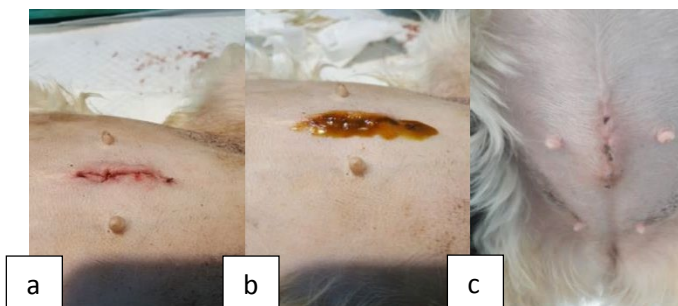


Fig. 1. Wound aspect-initially (a), during the application of the product (b) and final, at 7 days post-therapeutic (c)

**Case 2:** Cat, European breed, male, 6 years old, unneutered. The patient presented a scar wound in the parietal region of the head, about 2 cm, acquired after a fight with another cat. Following the established therapy, a positive development was showed (Fig. 2).

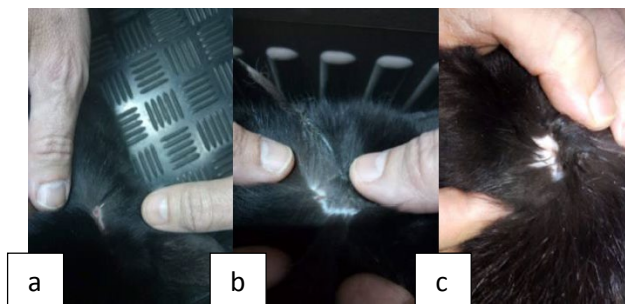


Fig. 2. Wound aspect-initially (a), at 20 hours post-therapeutic (b) and final, at 3 days post-therapeutic (c)

**Case 3:** Dog, Metis, 2 years old, male. This patient presented a surgical site wound in the scrotal region, following the orhydoctomy surgery, sutured under aseptic and antiseptic conditions. Following the implemented therapy, a good outcome was reported (Fig. 3).

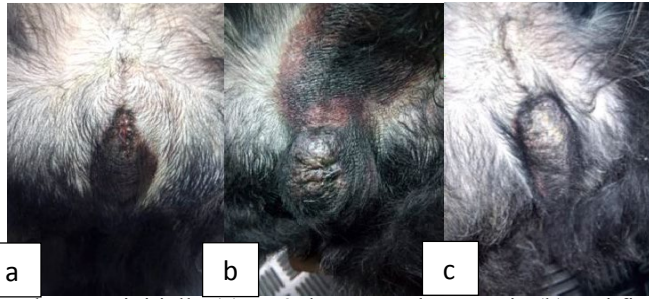


Fig. 3. Wound aspect-initially (a), at 2 days post-therapeutic (b) and final, at 6 days post-therapeutic (c)

**Case 4:** Cat, 6 years old, female, European breed, neutered. The patient suffered a laceration wound, in the right thoracic region, sutured under aseptic and antiseptic conditions. Following the established therapy, we observed a complete cure of the injured area (Fig. 4).

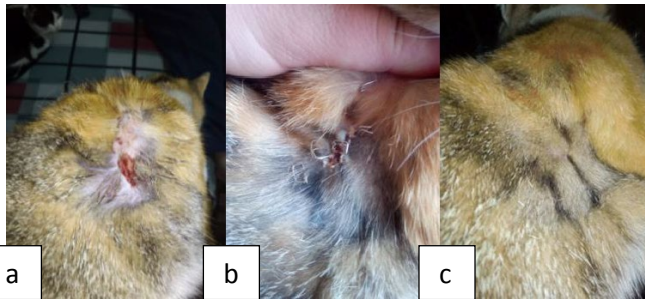


Fig. 4. Wound aspect-initially (a), at 3 days post-therapeutic (b) and final, at 6 days post-therapeutic (c)

**Case 5:** Dog, Metis, 3 years old, female. This patient presented a surgical site wound, following the ovariohysterectomy surgery, which was sutured under aseptic and antiseptic conditions. The implemented therapy led to the complete healing of the wound (Fig. 5).



Fig. 5. Wound aspect-initially (a), at 4 days post-therapeutic (b) and final, at 9 days post-therapeutic (c)

**Case 6:** Dog, Bichon Havanais breed, 4 years old, male, unneutered. The patient presented a puncture wound located in the abdominal region. Following the established therapy, a favorable evolution of the wound was observed (Fig. 6).

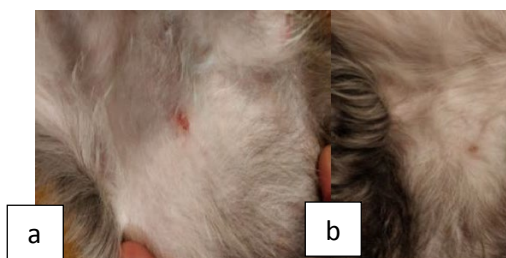


Fig. 6. Wound aspect-initially (a) and final, at 3 days post-therapeutic (b)

*Evolution of patients with complicated skin wounds treated with the product based on honeydew honey, soft propolis extract and thyme essential oil, twice/day.* The treatment of this type of wounds was implemented only in patients whose anamnesis indicated the absence of endocrine or metabolic diseases.

**Case 7:** Dog, male, 4 years, Metis, unneutered. The patient was taken to the Alvet veterinary clinic, presenting a deep wound produced by laceration in the right axillary region. The results obtained from the applied therapy indicated a complete recovery of the damaged area (Fig. 7).

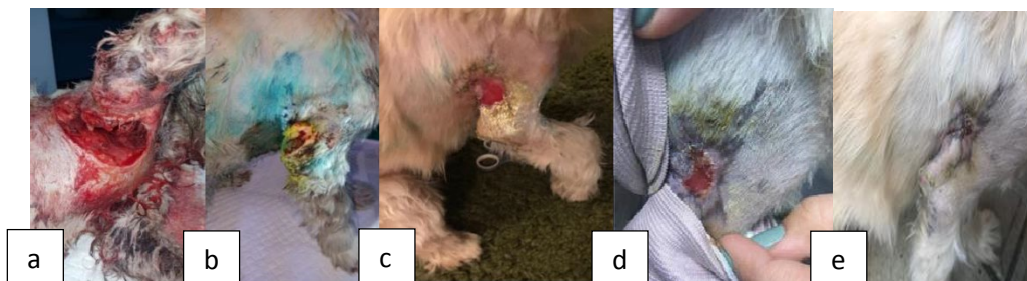


Fig. 7. Wound aspect - initially (a), at 5 days post-therapeutic (b), at 10 days post-therapeutic (c), at 12 days post-therapeutic (d) and final, at 14 days post-therapeutic (e)

**Case 8:** Dog, female, 3 years, Metis, unneutered. The patient was taken to the Trivet veterinary clinic and according to the clinical examination, it presented a deep abrasion and laceration wound, produced by the continuous pressure on the neck of a collar attached too tightly. The wound was sutured respecting the conditions of asepsis and antiseptics. The results obtained after the implemented therapy indicated a positive outcome of the injured area (Fig. 8).

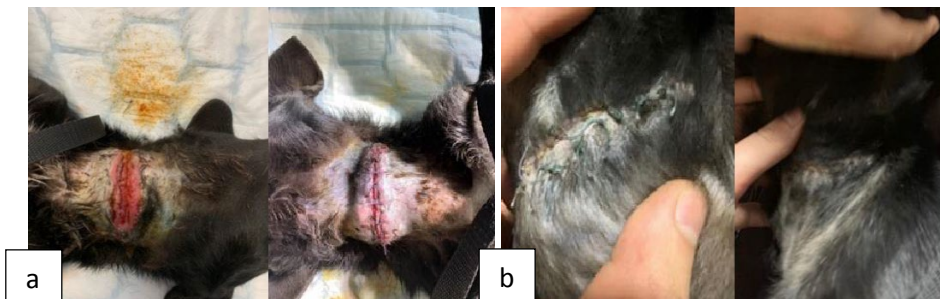


Fig. 8. Wound aspect-initially (a) and final, at 10 days post-therapeutic (b)

**Case 9:** Dog, male, 4 years, Metis, unneutered. The patient was brought to the Napovet veterinary clinic, presenting a deep abrasion and laceration wound, following a continuous pressure on the neck of a collar attached too tightly. It is worth mentioning that the wound was not sutured before the topical application of the dressing. The results from the implemented therapy revealed a full recovery of the wound (Fig. 9).



Fig. 9. Wound aspect-initially (a), at 4 days post-therapeutic (b) and final, at 20 days post-therapeutic (c)

**Case 10:** Dog, Yorkshire Terrier breed, 8 years old, female, unneutered. The patient was taken to the Alvet veterinary clinic, presenting a severe open wound in the abdominal region, following the involuntary opening of the suture performed after the total mastectomy surgery. The established therapy led to the complete wound healing (Fig. 10).

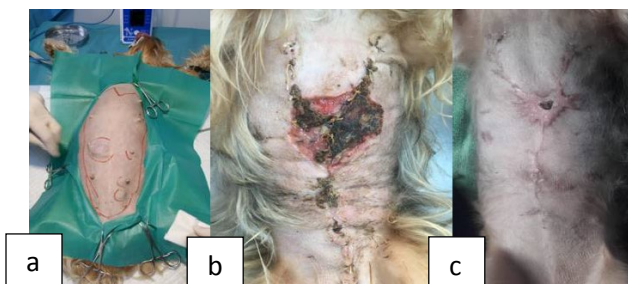


Fig. 10. Wound aspect-preoperatively (a), initially (b) and final, at 12 days post-therapeutic (c)

**Case 11:** Dog, Metis Bichon breed, 12 years old, female, neutered. The patient was brought to the Biovet veterinary clinic, presenting multiple bite wounds. The results obtained after the applied therapy indicated a positive cure of the damaged area (Fig. 11).



Fig. 11. Wound aspect-initially (a), at 7 days post-therapeutic (b), at 11 days post-therapeutic (c) and at 14 days post-therapeutic (d)

**Case 12:** Cat, European breed, 1 year, female, unneutered. The patient was taken to the Biovet veterinary clinic, presenting an abrasion wound, with unfavorable evolution towards abscess and skin necrosis. The results obtained from the implemented therapy revealed a favorable evolution of the affected area (Fig. 12).



Fig.12. Wound aspect-initially (a), at 7 days post-therapeutic (b), at 11 days post-therapeutic (c) and final, at 20 days post-therapeutic (d)

We assess that the success of our therapeutic formulas could be associated with the valuable components that we have incorporated in the two dressings, honeydew honey being an assortment of superior healing capacity in cutaneous wounds. In this context, we must point out that honeydew honey compared to other assortments, including Manuka honey, can generate higher amounts of hydrogen peroxide, one of the main antibacterial components (Vandamme et al., 2013). Moreover, once the exudate is removed, honey stimulates the process of granulation, epithelization and angiogenesis, which helps accelerate the healing process (Cooper, 2016). In addition, due to the osmotic properties of honey resulting from the high level of simple sugars (80%), it possesses the ability to debride necrotic tissues which serve as a primary source for bacterial infection and associated inflammatory complications (Jull et al., 2015).

Regarding the essential thyme oil, there is also evidence to suggest that it increases collagen deposition, angiogenesis and keratinocyte migration, thus facilitating the healing process of wounds (Woollard et al., 2007). Another study aimed investigating the property and the impact of essential thyme oil on nitrogen monoxide, a very important mediator of burn injuries. Researchers performed experimental burns on anesthetized mice, compared them with the control group and found out that nitrogen monoxide was produced in excess in burns, and after treating burns with essential thyme oil, they observed that it not only reduced production, but also facilitated faster healing (Dursun et al., 2003). Regarding the healing action of sea buckthorn oil in skin wound therapy, it has been discovered that the lesions contract more quickly after application and epithelization occurs in a shorter time (Gupta et al., 2005). Numerous studies have shown that propolis may be an ally in the treatment of diabetic wounds, increasing the rate of healing and epithelialization of wounds, compared to conventional treatment strategies (Henshaw et al., 2014; Oryan et al., 2018).

### **Conclusions**

The results of this clinical trial could be summed up to the healing process of the entire batch of treated patients, supporting the use of apicultural products with essential oils in the treatment of skin wounds in animals. We also ascertain that after applying the dressings consisting of apicultural products and essential oils on dogs and cats wounds, we recorded an increased level of tolerance, expressed by the absence of any type of local or general side effects. Based on the results obtained and their corroboration with other research in the field, we firmly recommend the

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use of apitherapeutic products with the addition of essential oils, such as the dressings we had tested, in the prevention and therapy of various forms of skin wounds in animals.

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