



***Natural Healing with  
Innovative  
Versatile Wound Healing Products***

***From Nature to Science  
dedicated to excel***

**[www.sanomed-manufacturing.eu](http://www.sanomed-manufacturing.eu)**

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## 2. Introduction

The SanoMed Manufacturing BV company was founded in August 2006. In the years prior to its establishment Drs. Jan Vandeputte researched many topics regarding the properties of honey in wound healing. He was a researcher and tutor at many Universities. Several studies (in vitro, in vivo and literature) were conducted in relation to wound healing and dressing development. These studies resulted in publications (e.g. in the Lancet).

The research and publications lead to the company's unique and patented products and in 2007 the CE marking for the products was established. The company as for now is presence in several European countries and several countries outside the EU. Melladerm® Plus is the second generation honey based product and is rapidly taking over the older honey based products. Next to innovative honey based products, SanoMed manufacturing bv also have new concept products such as the SanoSkin® OXY, that is an old concept, but that will revolutionize the wound care market.

In this brochure the SanoMed Manufacturing bv product range is introduced. The brochure explains the advantages of the products and describes the products profiles. Many healthcare providers have benefited from using SanoSkin® products and those results are presented in the form of studies and case reports.

There are several abstracts incorporated on the use of honey and honey based products in wound care.

The website [www.sanomed-manufacturing.eu](http://www.sanomed-manufacturing.eu) can be consulted for the most up to date information about the company and the products.

## 3. Product range Honey products

Honey is well known to have significant antimicrobial activity against a wide range of wound pathogens; including methicillin-resistant Staphylococcus aureus (MRSA). Honey has also been used successfully in the management of infected wounds. The SanoSkin® product range can be combined with a honey product. Melladerm® is a hydro-active gel that utilize the therapeutic benefits of honey in a variety of easy to use presentations.

## 4. Melladerm® Plus, Wound Gel (use 1-2 days)

For the treatment of superficial (contaminated) chronic, oncologic and/or acute wounds. Melladerm® Plus is designed specifically with the patients with necrotic or slough wounds. Melladerm® Plus offers a more gentle approach than pure honey that is known to cause pain when applied to the wound. It contains 45% honey. The honey source of Melladerm® Plus is mainly Bulgaria. This is specially selected honey from a multiflower mountain region that has a naturally high glucose oxidase and Phenolic content.

During its processing into a wound gel this honey is not heated because this is known to destroy the honey healing properties. The Bulgarian honey is sterilized with a by SanoMed Manufacturing bv patented method (ozonation).

Melladerm® Plus can be used to fill the wound and then covered with SanoSkin® Net or Foam or other dressing. The gel is easy to apply and will not adhere to the wound. Melladerm® Plus provides a moist healing environment and has good debriding capabilities



Melladerm® comes in plastic tubes of 20 and 50 g

Product Code	Description	Contents	Contents over box
MD50	Melladerm Plus 50 gram	1 tube of 50 gram	14 x 1 tube
MD20	Melladerm Plus 20 gram	1 tube of 20 gram	70 x 1 tube



**Case:** Female patient (75 years old) with venous ulcer that was already present for 13 months and was treated with Betadine ointment (povidone jodium 10%) but did not heal. At 1 December 2007 the wound was treated with SanoSkin® Melladerm® Plus honey ointment. The next photograph is taken December 29, 2007 and the last picture is taken January 13, 2008. The Melladerm® Plus gel was covered with a SanoSkin® Foam dressing. The patient did not experience pain or discomfort and it took 2 months to completely heal this venous ulcer. Compression therapy was also part of the wound holistic treatment.



**Case:** A 70 year old man had an infected wound above his eye lid. The wound was filled daily with SanoSkin® Melladerm® Plus. The Melladerm® Plus was covered with SanoSkin® Foam and secured with light tape. It took 20 days to heal the wound completely.



**Case:** The Wound (mixed venous/arterial ulcer) was treated with Melladerm® Plus and SanoSkin® Foam for 50 days. The patient did not report pain or discomfort during the treatment. The wound existed for over 3 years and the patient was in bad condition, still the wound healed. Melladerm® Plus was applied daily.

Groep Backaert



Groep Backaert



Case: A 81 year old lady had a venous ulcer for over 3 years and was treated mainly with Hydrocolloids and Betadine ointment. The wound never healed. The doctor started a treatment with Melladerm® Plus and the wound quickly cleaned up and started to granulate. It took 8 weeks to reach the result shown in the picture. Compression therapy was also part of the treatment and a SanoSkin® Foam was used as secondary dressing.



## 5. SanoSkin®-OXY

The **SanoSkin® OXY** consists of vegetable ozonated olive oil, SanoSkin® OXY has a pH of 2 and provides a moist healing environment. SanoSkin®- OXY is a gentle gel that is able to create a moist wound healing environment. It will facilitate wound debridement and due to the low pH and oxidative environment it will act bacteriostatic (will stop growth of bacteria in wound). To cover the wound a Foam or non-adherent dressing can be used as a secondary dressing. Available as 30 gram tubes. The SanoSkin®-OXY is also an excellent product to treat acne, eczema, and fissures.

Product Code	Description	Contents	Contents over box
OX30	SanoSkin-OXY 30 gram	1 tube à 30 g	24 x1 tube



SanoSkin® Oxy comes in plastic tubes of 30 g

### LOWER LIMBS ULCERS. OZONATED OIL THERAPY STUDY

Performed in: "LOUIS PASTEUR" POLICLINIC & NATIONAL CENTRE FOR SCIENTIFIC RESEARCH. (France, 2000)

#### MATERIALS AND METHODS:

The sample was composed of 120 patients with lower limb ulcers (post traumatic or due to chronic venous insufficiency) of 1 to 4 centimeters diameter, at random distributed among two groups: Ozonated Oil group and Control Group. Ulcers were of recent origin or up to 3 years old, even some were suffered torpid evolution.

#### Treatment:

The treatment for this study was recommended to patients for 30 days at home.

Control group: 60 patients, treated as:

- Venous repose.
- Hyposodic diet.
- Oral analgesics, if needed.
- Cures twice a day as follows:
  - Mechanical cleaning of the area with benzalconiuchloride
- Local application of antibiotics.

The first cure was performed by the physician to instruct the patient and/or the accompanying person how to repeat the subsequent at home.

Ozonated Oil Group: 60 patients, treated with the same procedures but with ozonated oil, instead of antibiotics.

Evaluation Criteria:

Evolution: as to the behaviour of patients signs and symptoms.

Healing: as to the cicatrisation of wounds. After the period of the study, in cases not healed, remission to hospital was considered.

RESULTS AND DISCUSSION:

Table I shows distribution of ulcers between groups according to ethiology. Most of them were of venous insufficiency origin, as usual, and their distribution was homogeneous. Also homogeneous were the distributions of sex and age between groups.

**TABLE I**

**LOWER LIMB ULCERS: PATIENTS DISTRIBUTION ACCORDING TO ETHIOLOGY.**

ETHIOLOGY	OZONE		CONTROL		TOTAL	
	Pats. N°	%	Pats. N°	%	Pats. N°	%
VENOUS INSUFIC.	54	(90)	53	(88)	107	(89)
POST-TRAUMATIC	6	(10)	7	(12)	13	(11)
<u>TOTAL</u>	<u>60</u>	<u>(50)</u>	<u>60</u>	<u>(50)</u>	<u>120</u>	<u>(100)</u>

In Table II, the evolution of signs and symptoms show that better results were achieved with ozonated oil at the end of the first half of the treatment period.

**TABLE II**

**LOWER LIMB ULCERS: SYMPTOMS & SIGNS DISAPPEARANCE**

Symptoms Disappnce.	OZONE GROUP				CONTROL GROUP			
	< 15 days		> 15 days		< 15 days		> 15 days	
	Pats.	(%)	Pats.	(%)	Pats.	(%)	Pats.	(%)
Inflammation	57	(95)	3	(5)	7	(12)	53	(88)
Fetidness	60	(100)	-	-	60	(100)	-	-
Pain	58	(97)	2	(3)	38	(63)	22	(37)

Clinically it was observed that fetidness, pain and itching disappeared from the first 24 hours on and inflammation from the third day on in most of this patients. Granulation tissue appeared around the 5<sup>th</sup> day, followed by the initiation of the ulcer diameter reduction.

On the other hand, in control group patients the evolution was significantly slower in all aspects. Inflammation and, in lesser extension, pain remained present in many patients for more than 15 days.

Regarding healing of ulcers, it was very remarkable the fact that most of patients with ozonated oil treatment (95 %) healed within the first 15 days (Table III) and the remaining three patients within the following 5 days. In control group instead, only a few patients healed in the first 15 days. Most of them healed from the day 16 to 20, and 8 patients did not heal up to the end of the 30 days period and had to be submitted for hospital treatment.

**TABLE III**

**LOWER LIMB ULCERS: HEALING PERIODS**

HEALING PERIOD	OZONE GROUP		CONTROL GROUP	
	Pats.	%	Pats.	%
≤ 15 days	57/60	(95)	7/60	(12)
16 - 20 days	3/60	(5)	45/60	(75)
21 - 30 days	-	-	-	-
No healing	-	-	8/60	(13)

All differences between groups were statistically significant, in favour of the higher effectivity of ozonated oil.

## **CONCLUSIONS:**

Ozone oil resulted much more effective than conventional treatments for healing of lower limb ulcers of venous or traumatic origin.

Patients symptoms disappeared faster and completely in those treated with ozonated oil, as compared with control group.

Lower limb ulcers in ozonated oil group healed within less than 15 days in 95% of patients, while in control group this was achieved in only 11,6% of patients.





**Case:** Female 73 years with skin tears was treated with SanoSkin®-OXY and was fully healed and closed after 50 days. Wound was covered with SanoSkin Foam and irrigated and cleaned with SanoSkin® Cleanser.



**Case:** Patient with necrotizing fasciitis treated during one month with SanoSkin® OXY. The wound is cleaned and ready for a skin graft.

## 6. Melloxy®

Melloxy® is a brand new patented formula that combines the benefits of honey and the OXY gel. A mixture of selected flower honeys (similar as in the Melladerm® Plus and ozonated vegetable olive oil (Similar as the OXY) has been proven to have excellent healing powers. The Melloxy® formula makes a soft ointment that is easy to apply. The 40% honey in the Melloxy® wound ointment has characteristics that help the wound to heal the presence of the ozonated oil help even more to maintain a moist healing environment.

A thin applied layer on regular gauze, Tulle or Foam is enough for optimal effect. Changing the dressing once a day or once every two days will suffice. The ointment will not adhere to the wound.



Product Code	Description	Contents	Contents over box
MO50	Melloxy 50 gram	1 tube of 50 g	14 x 1 tube
MO20	Melloxy 20 gram	1 tube of 20 gram	70 x 1 tube





**case:** A 74 year old female in very bad condition developed a difficult to heal open wound after abdominal surgery. The doctors decided to use Melloxy® and it took 2 months to fully heal the wound.

## 7. More than 4500 years of results

The use of honey for treating wounds is long established, it is believed that it was used for just this purpose 4500 years ago and continued to have a place in folk medicine. In more recent times with the development of sophisticated dressings and effective antibiotics, the value of honey for wound care was overshadowed. Pure bee honey, however, is not well suited for clinical use because its application is associated with pain and its high osmotic potential can lead to excessive fluid loss and subsequent evaporation, particularly when used to treat burns (this was already known by the Egyptians). Modern medical grade honey has been developed to overcome the limitations of pure honey by including an oily component which acts as a barrier to fluid loss, prevents desiccation and preserves a moist wound environment.

Three important properties make SanoSkin® honey products so useful in professional wound care: due to the moist healing environment, speeds debridement, controls malodour and it encourages healing.

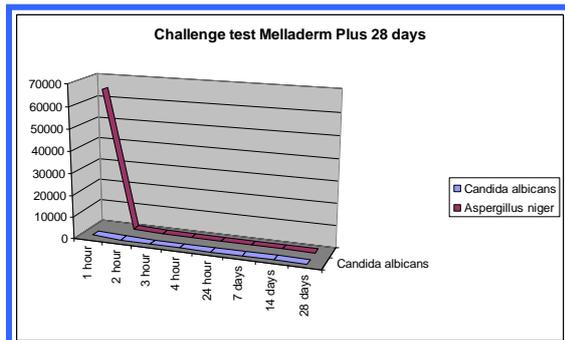
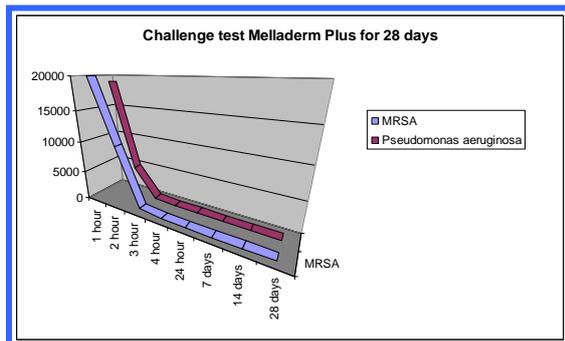
Today, the body of reliable evidence supporting a role for honey dressings continues to grow and there is a clearer understanding of the mechanisms of activity behind its positive effects which include accelerating debridement, controlling malodour and encouraging the healing process.

## 8. PET test

All test results show that the most common wound bacteria will be killed within 24 - 48hrs. Results *in vivo* corroborate with these test results and wounds will (after treatment) be free from most bacteria, including MRSA and VRE bacteria. Consequently most wounds heal faster. All honey products antibacterial properties are tested with a PET test. We show here only the results of Melladerm® Plus. A PET or challenge test is a European Pharmacopoeia test that is used to check the antibacterial activity of a topical preparation over a 28 day period (continuously). The ointment is inoculated with high amount of micro-organisms and then recultured at specific times. A log reduction of 3 is required in 7 days. As can be seen in the table hereunder the amount of St. Aureus starts at  $1,9 \times 10^6$  and falls quickly to  $0,4 \times 10^2$  which is a log reduction of 5 instantly and this effect is lasting for the duration of the PET test. This means that the Melladerm® Plus is killing micro-

organisms the moment the wound dressing is in contact with the moist wound and keeps killing bacteria over a long period. But we do not have enough evidence to support this for a type of wounds.

CFU (colony forming units)	1 hour	2 hour	3 hour	4 hour	24 hour	7 days	14 days	28 days
MRSA	20000	9900	400	40	30	0	0	0
Pseudomonas aeruginosa	19000	5000	260	30	20	0	0	0
Candida albicans	1050	300	30	10	0	0	0	0
Aspergillus niger	65000	1000	40	20	0	0	0	0



Tables show how quickly the different micro-organisms are killed and do not recover.

### - Safe usage without side effects

No side effects, no contra-indications, no restrictions are known related to usage of, Melladerm® Plus Sanoskin OXY and Melloxy® and the SanoSkin Cleanser.

No allergic reactions or delays in wound healing were reported till today. The products are safe, reliable and extensively tested.

### - Clinical effectiveness

Numerous studies have proven the efficacy of the SanoSkin® products. We have our products used in Asia, Africa, Middle East and Europe. The number of tubes used over the last 10 years exceed a million of each product.

### - Applicable for all types of wounds

SanoSkin® products can be used for a broad range of indications and all phases of wound healing. The ointment/gel can easily reach and clean deep wounds like pressure sores, ulcers and fistulae and can provide tissue healing. The dressings have been designed for the treatment of superficial wounds with little to high discharge.

### - Ease of use

Only a small dose of the ointment/gel is needed for effective treatment of superficial wounds. A thin layer, easily applied on gauze, is sufficient. Changing the dressing once a day or once every two days will be sufficient. Deeper wounds can easily be filled with honey gels. The dressings are easily applied and can be removed without damaging the surrounding tissue. In a lot of cases Foam is used to absorb excess exudate or simply to cover the wound.

#### **- Innovative and not "ME TOO"**

SanoSkin® OXY is new as a medical device, but ozonated oils are widely available on the market. By certifying this ozonated olive oil and having all the legally required test reports we are able to bring a safe product to the market.

#### **- TIMED concept**

SanoSkin® products are positioned in a TIMED concept way. TIME is the concept that has a world wide acceptance and since wound care practitioners are working and thinking following this concept it is imperative that dressings are positioned according to this new concept. The importance of debriding non viable tissue (**T**issue) is achieved by the Honey products. The need for controlling bacterial growth in the wound (**I**nfection) is secured by the hydrogels, the honey and the OXY products. The moisture balance (**M**oisture) is taken care of by the excellent absorbing capabilities of the hydrogel dressings and the Foam that are especially designed for moderate to excessive exudating wounds.

There is a new trend based on scientific evidence that not all wounds should not be disinfected. Cleaning the wound with a neutral saline solution is not only less cytotoxic but the mechanical effect that can be achieved by using an irrigation hand pump is leading to effective removal of loosely necrotic tissue and micro-organisms.

The SanoSkin® Cleanser is the answer to this new trend.

Each SanoSkin® product has a specific function to enhance the healing of the wound that can be positioned into the TIMED concept.

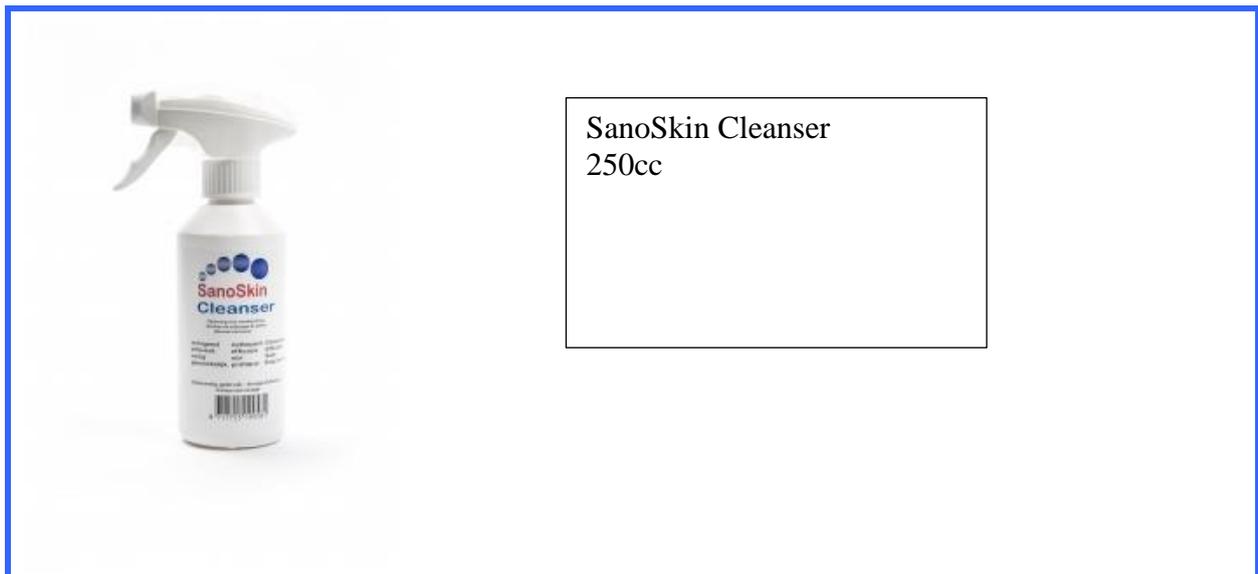
## 9. Product range Skin care products

### SanoSkin® Cleanser

SanoSkin®-Cleanser is a solution to clean wounds. "Practitioners continue to use antiseptics in wounds because of tradition – This tradition must stop !!!" (Dow G. Infection in chronic wounds. In: Krasner DL, Rodeheaver GT, Sibbald RG, eds Chronic Wound Care: A clinical Source Book for Healthcare Professionals. 3th ed. Wayne, Pa: HMP Communications, 2001:343-356.)

Modern wound treatment recommend a cleansing solution based on physiologic saline mixed with mild detergents (non cytotoxic levels) that effectively remove proteins and fat. The presence of glycerine in the cleaning solution makes it a gentle soft solution and the chlorhexidine preserves the solution for several years from microbiological contamination. The SanoSkin® Cleanser formula is being used for over 10 years with great satisfaction. Its easy nozzle spray system makes it possible to adjust the cleaning power (output of the cleaning stream) so even hard to clean wounds can be cleaned. The bottle contains 250 cc.

Product Code	Description	Contents	Contents over box
SC250	SanoSkin-Cleanser	bottle 250 cc	36 x 1 bottle



With the wound cleanser it is possible to remove the necrotic tissue and consequently the microbiological contamination. A physical removal is usually removing 95% of the bacteria.

## 10. What are the advantages of SanoSKin® products?

### - Innovative and Safe

All SanoSkin® products are designed with the purpose to be new and at least a good than the existing products. This is a an ongoing process and is only possible trough constant research for new products and therapies.

All products are also extensively tested for possible allergies or incompatibilities.

SanoSkin® products are widely tested in vivo and in vitro before coming to the market.

### - Cost-effective

The Ointment / Gel are cost-effective due to the small dose needed for effective treatment and it can be used in every phase of wound healing. The dressings can stay up to 2-5 days on the wound. Therefore the SanoSkin® products help saving on expensive dressing changes and due to their efficacy they can help to prevent expensive surgical procedures (e.g. surgical debridement).

### - Can be combined with all types of wound dressings

The honey gels and the SanoSkin® OXY combines well with all wound dressings, such as gauzes or non-woven compresses, band-aids, foam bandages and alginates and therefore fits easily in any wound protocol.

Using the ointment and OXY gel in combination with other dressings, will make sure those dressings will not adhere to the wound. It is recommended to use the honey products in combination with Foam for optimal results in treating necrotic, sloughy and deep cavity wounds. Fissures, eczema, acne and even herpes zoster blisters can be treated with SanoSkin® OXY.

All these products can be combined with light therapy. After cleansing the wound, one minute light therapy/day will do and then the appropriate ointment or gel can be applied in the wound and covered by a foam or hydrogel sheet.

This makes the SanoSkin® range complete. Even for skin care we do have the best product.

### - A full range of products

The SanoSkin® product line is all you need to perform good clinical practice wound care. We offer a full range of products so almost all wounds can be treated with one or more of the SanoSkin® products.

From cleansing to skin care, from absorbing to debriding, ...



SanoSkin®, Melladerm®, and Melloxy® are registered trademarks.

## 11. ABSTRACTS

### Honey for Wounds, Ulcers, and Skin Graft Preservation

Lancet 1993, vol 341: March 20, 756-757, Postmes T, Boogaard vdA, Hazen M. For 4.000 years the wound healing properties of honey have been cleansing, absorption of oedema, antimicrobial activity, deodorisation, promotion of granulation, tissue formation, and epithelialisation and improvement of nutrition. Like any other natural product, the composition of honey may contain contaminations. Exposing patients to this type of honey is unacceptable because of an additional risk of infection. Honey intended for medical use should be sterile and free of residues, which might make the clinical use of honey more acceptable.

[All honeys used in Melladerm®, Melladerm® Plus and Melloxy® are medical grade and *clean* honey ]

### The sterilization of honey with cobalt 60 gamma radiation: a study of honey spiked with spores of *Clostridium botulinum* and *Bacillus subtilis*.

Experientia, Basel, 1995; 986-989. Postmes T, Boogaard vd A, Hazen M, Department of Internal Medicine and Department of Medical Microbiology, Academic Hospital Maastricht (NL). Unprocessed honey is a recognized wound healing remedy. However, to make clinical use of honey acceptable, it should be sterile. To find the lowest dose of irradiation needed for sterilization, six batches of honey (a-f ) were gamma irradiated. with 6, 12, 18, 22 and 25 kGy Cobalt-60. All batches spiked with approximately 10 (6) spores from *Cl.Botulinum* or *B. subtilis* proved to be sterile after irradiation with a dose of 25 kGy.

[ We are now aware that this article did not study the effects of the irradiation on the properties of the honey and that ointments made with irradiated honey are rapidly ageing and produce gas which leads to and explosive waste of the ointment when the tubes are opened.]

### The Treatment of Burns and other Wounds with Honey

IBRA/Eds. Munn&Jones 2001. Postmes T. Burns that are treated with honey heal more rapidly and effectively in a patient-friendly way, without infection complications and with little pain and relatively little scarring. Honey treatment of burns is certainly cost effective because it shortens the duration of treatment by 25% and it certainly reduces the duration of hospitalization.

### Topical application of honey in treatment of burns.

Br J Surg 1991; 78(4):497-498. Subrahmanyam M.

Honey was compared with silver sulfadiazine-impregnated gauze (Flamazine) for efficacy as a dressing for superficial burn injury in a prospective randomised controlled trial that was carried out with a total of 104 patients. In the 52 patients treated with honey, 91% of the wounds were rendered sterile within 7 days. In the 52 patients treated with silver sulfadiazine, 7% showed control of infection within 7 days. Healthy granulation tissue was observed earlier in patients treated with honey (means 7.4 versus 13.4 days). The time taken for healing was significantly shorter with the honey treated group ( $p < 0.001$ ): of the wounds treated with honey 87% healed within 15 days compared with 10% of those treated with silver sulfadiazine. Better relief of pain, less exudation, less irritation of the wound, and a lower incidence of hypertrophic scar and post-burn contracture were noted with the honey treatment. The honey treatment also gave acceleration of epithelialisation at 6- 9 days, a chemical debridement effect and removal of offensive smell.

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### Healing of an MRSA-colonized, hydroxyurea-induced leg ulcer with honey.

J Dermatol Treat 2001 March;12(1):33-/Natarajan S, Williamson D, Grey J, Harding KG, Cooper RA. Wound Healing Research Unit, University of Wales College of Medicine, Heath Park, Cardiff, UK.

**BACKGROUND:** With the everincreasing emergence of antibiotic-resistant pathogens, in particular methicillin-resistant *Staphylococcus aureus* (MRSA) in leg ulcers, a means of reducing the bacterial bioburden of such ulcers, other than by the use of either topical or systemic antibiotics, is urgently required. **METHODS:** We report the case of an immunosuppressed patient who developed a hydroxyurea-induced leg ulcer with subclinical MRSA infection which was subsequently treated with topical application of manuka honey, without cessation of hydroxyurea or cyclosporin.

**RESULTS:** MRSA was eradicated from the ulcer and rapid healing was successfully achieved.

**CONCLUSION:** Honey is recognized to have anti-bacterial properties, and can also promote effective wound healing. A traditional therapy, therefore, appears to have enormous potential in solving new problems.

### Re-introducing Honey in the Management of Wounds and Ulcers - Theory and Practice.

Ostomy Wound Manage 2002 Nov; 48(11):8-40/Molan PC. Department of Biological Sciences, University of Waikato, Hamilton, New Zealand.

Dressing wounds with honey, a standard practice in past times, went out of fashion when antibiotics came into use. Because antibiotic-resistant bacteria have become a widespread clinical problem, a renaissance in honey use has occurred. Laboratory studies and clinical trials have shown that honey is an effective broad-spectrum antibacterial agent that has no adverse effects on wound tissues. As well as having an antibacterial action, honey

also provides rapid autolytic debridement, deodorizes wounds, and stimulates the growth of wound tissues to hasten healing and start the healing process in dormant wounds. Its anti-inflammatory activity rapidly reduces pain, oedema, and exudate and minimizes hypertrophic scarring. It also provides a moist healing environment for wound tissues with no risk of maceration of surrounding skin and completely prevents adherence of dressings to the wound bed so no pain or tissue damage is associated with dressing changes. Using appropriate dressing practice overcomes potential messiness and handling problems.

### The efficacy of honey in inhibiting strains of *Pseudomonas aeruginosa* from infected burns.

J Burn Care Rehabil 2002 Nov-Dec; 3(6):366-70/ Cooper RA, Halas E, Molan PC. Centre for Biomedical Sciences, School of Applied Sciences, University of Wales Institute, Cardiff, UK.

Because there is no ideal therapy for burns infected with *Pseudomonas aeruginosa*, there is sufficient need to investigate the efficacy of alternative anti-pseudomonal interventions.

Honey is an ancient wound remedy for which there is modern evidence of efficacy in the treatment of burn wounds, but limited evidence for the effectiveness of its antibacterial activity against *Pseudomonas*. We tested the sensitivity of 17 strains of *P. aeruginosa* isolated from infected burns to two honeys with different types of antibacterial activity, a pasture honey and a Manuka honey, both with median levels of activity. All strains showed similar sensitivity to honey with minimum inhibitory concentrations below 10% (vol/vol); both honeys maintained bactericidal activity when diluted more than 10-fold. Honey with proven antibacterial activity has the potential to be an effective treatment option for burns infected or at risk of infection with *P. aeruginosa*.

[This study shows that good wound healing can be achieved with other

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honey also and not only with Manuka honey that has been over hyped because of pure marketing reasons.]

### **The sensitivity to honey of Grampositive cocci of clinical significance isolated from wounds.**

J Appl Microbiol 2002Nov; 93(5): 857- 863 / Cooper RA, Molan PC, Harding KG. Centre for Biomedical Sciences, School of Applied Sciences, University of Wales Institute Cardiff, Llandaff Campus, Cardiff, Wales.

**AIMS:** To determine the sensitivity to honey of Gram-positive cocci of clinical significance in wounds and demonstrate that inhibition is not exclusively due to osmotic effects.

**METHODS AND RESULTS:** Eighteen strains of methicillin-resistant *Staphylococcus aureus* (MRSA) and seven strains of vancomycin-sensitive enterococci (VRE) were isolated from infected wounds and 0 strains of vancomycin-resistant enterococci were isolated from hospital environmental surfaces. Using an agar incorporation technique to determine the minimum inhibitory concentration (MIC), their sensitivity to two natural honeys of median levels of antibacterial activity was established and compared with an artificial honey solution. For all of the strains tested, the MIC values against manuka and pasture honey were below 10% (v/v), but concentrations of artificial honey at least three times higher were required to achieve equivalent inhibition in vitro. Comparison of the MIC values of antibiotic-sensitive strains with their respective antibiotic-resistant strains demonstrated no marked differences in their susceptibilities to honey.

**CONCLUSIONS:** The inhibition of bacteria by honey is not exclusively due to osmolarity. For the Gram-positive cocci tested, antibiotic sensitive and -resistant strains showed similar sensitivity to honey.

**SIGNIFICANCE AND IMPACT OF THE STUDY:** A possible role for honey in the

treatment of wounds colonized by antibiotic-resistant bacteria is indicated.

### **Local application of honey for treatment of neonatal postoperative wound infection.**

Acta Paediatr 1998 April; 87(4): 429-32/Vardi A, Barzilay Z, Linder N, Cohen HA, Paret G, Barzilay A. Paediatric Intensive Care Unit, Chaim Sheba Medical Centre, Tel Hashomer, Israel.

Honey has been described in ancient and modern medicine as being effective in the healing of various infected wounds. In this report we present our experience in nine infants with large, open, infected wounds that failed to heal with conventional treatment. Conventional treatment was defined as having failed if after > or = 14 d of intravenous antibiotic and cleaning the wound with chlorhexidine 0.05% W/V in aqueous solution and fusidic acid ointment the wound was still open, oozing pus, and swab cultures were positive. All infants showed marked clinical improvement after 5 d of treatment with topical application of 5-10 ml of fresh unprocessed honey twice daily. The wounds were closed, clean and sterile in all infants after 21 d of honey application. There were no adverse reactions to the treatment. We conclude that honey is useful in the treatment of post-surgical wounds that are infected and do not respond to conventional systemic and local antibiotic treatment.

### **Antibacterial activity of honey against strains of *Staphylococcus aureus* from infected wounds.**

J R Soc Med 1999 June; 92(6): 83-5/ Cooper RA, Molan PC, Harding KG. School of Biomedical Sciences, University of Wales Institute, Cardiff, UK.

The antibacterial action of honey in infected wounds does not depend wholly on its high osmolarity. We tested the sensitivity of 58 strains of coagulase-positive *Staphylococcus aureus*, isolated from infected wounds, to a pasture

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honey and a manuka honey. There was little variation between the isolates in their sensitivity to honey: minimum inhibitory concentrations were all between and 3% (v/v) for the Manuka honey and between 3 and 4% for the pasture honey. Thus, these honeys would prevent growth of *S. aureus* if diluted by body fluids a further seven-fold to fourteen-fold beyond the point where their osmolarity ceased to be completely inhibitory. The antibacterial action of the pasture honey relied on release of hydrogen peroxide, which in vivo might be reduced by catalase activity in tissues or blood. The action of Manuka honey stems partly from a phytochemical component, so this type of honey might be more effective in vivo. Comparative clinical trials with standardized honeys are needed.

### **Honey has potential as a dressing for wounds infected with MRSA.**

The second Australian Wound Management Association Conference, Brisbane, Australia, 18-21 March, 1998. Molan, Brett.

Honey provides a moist healing environment yet prevents bacterial growth even when wounds are heavily infected. It is a very effective means of quickly rendering heavily infected wounds sterile, without the side effects of antibiotics, and it is effective against antibiotic resistant strains of bacteria.

### **Protective covering of surgical wounds with honey impedes Tumor Implantation.**

Arch Surgery, vol 135, December 2000. Ismail Hamzaoglu et al. Departments of Surgery, Pathology and Medical Biology, University of Istanbul, Turkey.

Tumor implantation (TI) development at the surgical wound following cancer surgery is still an unresolved concern. Trocar site recurrence (TSR), which is likely a form of TI, has become one of the most controversial topics and, with the widespread acceptance of laparoscopic surgery, has caused renewed interest in questions about IT.

Physiological and chemical properties of honey might prevent Tumor Implantation when applied locally.

Honey could be used on trocar wounds of patients with malignant disease to prevent Trocar Site Recurrence (TSR). It also may prevent infection with its bactericidal effects.

Wound healing also may even be enhanced with topical application of honey. Honey may also provide benefit in conventional oncological surgery where TI is predictable. Preventive covering of surgical wounds with honey seems to be a harmless procedure and may constitute at least a partial barrier that might overcome Tumor cell invasion.

### **The use of honey as an antiseptic in managing Pseudomonas infection.**

J Wound Care 1999 April; 8(4):161-4/Cooper R, Molan P. School of Biomedical Sciences, University of Wales Institute, Cardiff, UK.

A laboratory study was undertaken to extend existing knowledge about the effectiveness of the antibacterial properties of honey against pseudomonas. To date, sensitivity testing has used non-standardised honeys, which may vary greatly in their antibacterial potency. Pure cultures of *Pseudomonas* spp, isolated from swabs from 20 infected wounds, were inoculated on the surface of nutrient agar plates containing various concentrations of honey in the medium. Two types of honey were used, a Manuka honey and a pasture honey, each selected to have antibacterial activity close to the median for each type. The minimum inhibitory concentration of the Manuka honey for the 0 isolates ranged from 5.5-8.7% (v/v) (mean 6.9% (v/v), standard deviation 1.3). The minimum inhibitory concentration of the pasture honey for the 0 isolates ranged from 5.8-9.0% (v/v) (mean 7.1% (v/v), standard deviation 1.0). Honeys with an average level of antibacterial activity could be expected to be effective in preventing the growth of pseudomonas on the surface of a wound even if the honey were diluted more than tenfold by exudation from the wound.

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### **Addition of antioxidants and polyethylene glycol 4000 enhances the healing property of honey in burns.**

Subrahmanyam N. Department of Surgery, Dr. Vaishampayan Memorial Medical College, India.

A prospective study was carried out in two groups of randomly allocated 84 patients with partial-thickness burns to compare the effect of honey alone with that of honey

fortified with antioxidants (vitamin C and vitamin E) and polyethylene glycol. Burns treated with honey plus antioxidants and PEG, healed earlier than those treated with honey alone. In this study the addition of antioxidants and PEG accelerated the healing properties of honey in burns. In patients treated with honey alone, healthy granulation tissue appeared in the majority of cases after about one week: wounds healed by day 10 in 20 patients and by day 15 in another 12 patients. Thus 32 patients (76,1%) achieved wound healing by day 15. In patients treated with honey PEG/C/E, granulation appeared by day 4 in the majority of the cases, with wounds healing within 9 days. The time taken for wound healing differed significantly between the two groups. Allergy or other side-effects were not observed in any patient in either group.

### **The evidence for honey promoting wound healing. A brief review of the use of honey as a clinical dressing.**

Molan, P. C. Primary Intention (The Australian Journal of Wound Management) 6(4) 148-158 (1998). The clinical observations recorded are that infection is rapidly cleared, inflammation, swelling and pain are quickly reduced, odour is reduced, sloughing of necrotic tissue is induced, granulation and epithelialisation are hastened, and healing occurs rapidly with minimal scarring.

### **The effect of gamma-irradiation on the antibacterial activity of**

### **honey.**

J Pharm Pharmacol 1996; 48:1206-1209. Molan PC, Allen KL. The sterilization of honey with cobalt

60 gamma radiation: a study of honey spiked with Clostridium botulinum and Bacillus subtilis. Experientia (Basel) 1995; 51:986-989.

Postmes T, van den Bogaard AE, Hazen M.

Honey sometimes contains spores of clostridia, which poses a small risk of wound botulism. This objection can be overcome by the use of honey that has been treated by gamma-irradiation, which kills clostridial spores in honey without loss of any of the antibacterial activity.

[SanoSkin honey products are sterilized by ozonation and not gamma-irradiated]

### **Inflammation.**

Ryan GB, Majno G. Kalamazoo, Michigan: Upjohn, 1977:80.

It provides a supply of glucose for leucocytes, essential for the 'respiratory burst' that produces hydrogen peroxide, the dominant component of the antibacterial activity of macrophages. The acidity of honey (typically below pH 4) may also assist in the antibacterial action of macrophages, as an acid pH inside the vacuole is involved in killing ingested bacteria.

### **Potential of honey in the treatment of wounds and burns.**

Am J Clin Dermatol 2001;(1): 13-9/ Molan PC. Honey Research Unit, University of Waikato, Hamilton, New Zealand.

There has been a renaissance in recent times in the use of honey, an ancient and traditional wound dressing, for the treatment of wounds, burns, and skin ulcers. In the past decade there have been many reports of case studies, experiments using animal models, and randomized controlled clinical trials that provide a large body of very convincing evidence for its effectiveness, and biomedical research that explains how honey produces such good results. As a

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dressing on wounds, honey provides a moist healing environment, rapidly clears infection, deodorizes, and reduces inflammation, oedema, and exudation. Also, it increases the rate of healing by stimulation of angiogenesis, granulation, and epithelialization, making skin grafting unnecessary and giving excellent cosmetic results.

### **The use of honey in wound management.**

Nurs Stand 2000 Nov 9- Dec 5;15 (11):63-8/Dunford C, Cooper R, Molan P, White R. Salisbury District Hospital.

Honey has been used as a wound treatment for more than 2000 years. Greater scientific understanding of how it works, particularly as an antibacterial agent, has led practitioners to reconsider the therapeutic value of honey. Once honey is commercially available as a regulated product in the UK, practitioners will have access to an effective, alternative wound treatment. Specific, sterilised honeys intended for wound care will provide a safe natural product to manage colonised or infected wounds that would otherwise remain unresponsive to treatment.

### **Why do some cavity wounds treated with honey or sugar paste heal without scarring?**

J. Topham, MPhil, BPharm, MRPharmS, Journal of Wound Care, vol 11, no , February 2002.

Saccharides at the wound surface encourage the production of hyaluronic acid from glucose, simultaneously suppressing the formation of fibroforming collagens. The sugar preparations at the wound bed create an environment that enables woundhealing proteoglycans to exert their effects without producing excessive quantities of collagens. The saccharide attachments to the nascent collagen may result in branching of the triplestranded helical structure of collagens. This will produce the meshlike scaffold structure of collagen type IV. Vitamin C is important for the prevention of scars when sugar or honey are applied to wounds.

### **Honey and contemporary wound care: an overview.**

Cutting KF. Ostomy Wound Manage. 2007 Nov;53(11):49-54.

A growing body of research and empirical evidence have supported the re-discovery of medicinal grade honey as a wound management agent. Pre-clinical study results suggest that honey has therapeutic benefit; clinical study results have shown that honey effectively addresses exudate, inflammation, devitalized tissue, and infection. Honey-containing dressings and gels have been developed to facilitate the application of medicinal-grade honey to the wound. Clinical studies to compare the safety and effectiveness of these products to other moisture-retentive dressings and treatment modalities are warranted.

### **Effect of medical honey on wounds colonised or infected with MRSA.**

**Blaser G, Santos K, Bode U, Vetter H, Simon A.J** Wound Care. 2007 Sep;16(8):325-8.

Full healing was achieved in seven consecutive patients whose wounds were either infected or colonised with methicillin-resistant Staphylococcus aureus. Antiseptics and antibiotics had previously failed to eradicate the clinical signs of infection.

### **The therapeutic use of honey.**

Bell SG. Neonatal Netw. 2007 Jul-Aug;26(4):247-51.

Honey has been shown to have antibacterial activity against a variety of species of bacteria in vitro. Although the evidence regarding the use of honey for wound treatment in neonates and infants is interesting, it is not strong. The sample sizes in the cited clinical studies are small; there were no comparison groups and no randomization. It appears that honey may be safe and useful in treating difficult-to-heal infected wounds, but double-blinded randomized controlled clinical trials with sufficient power are needed to determine the

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efficacy of honey in both initial wound management and secondary treatment of infected and poorly healing wounds. A comparison of different types of honey would be an important component of these trials. Currently, there is not enough evidence to recommend one type of honey over another type; however, honey and wound care experts do recommend honey for wound care, not for consumption.

### **A different and safe method of split thickness skin graft fixation: medical honey application.**

Emsen IM. Burns. 2007 Sep;33(6):782-7. Epub 2007 Jun 29.

Honey has been used for medicinal purposes since ancient times. Its antibacterial effects have been established during the past few decades. Still, modern medical practitioners hesitate to apply honey for local treatment of wounds. This may be because of the expected messiness of such local application. Hence, if honey is to be used for medicinal purposes, it has to meet certain criteria. The authors evaluated its use for the split thickness skin graft fixation because of its adhesive and other beneficial effects in 11 patients. No complications such as graft loss, infection, and graft rejection were seen. Based on these results, the authors advised honey as a new agent for split thickness skin graft fixation. In recent years there has been a renewed interest in honey wound management. There are a range of regulated wound care products that contain honey available on the Drug Tariff. This article addresses key issues associated with the use of honey, outlining how it may be best used, in which methods of split thickness skin graft fixations it may be used, and what clinical outcomes may be anticipated. For this reason, 11 patients who underwent different diagnosis were included in this study. In all the patients same medical honey was used for the fixation of the skin graft. No graft loss was seen during both the first dressing and the last view of the

grafted areas. As a result, it has been shown that honey is also a very effective agent for split thickness skin graft fixations. Because it is a natural agent, it can be easily used in all skin graft operation for the fixation of the split thickness skin grafts.

### **Manuka honey dressing: An effective treatment for chronic wound infections.**

Visavadia BG, Honeysett J, Danford MH. Br J Oral Maxillofac Surg. 2008 Jan;46(1):55-56. Epub 2006 Nov 20.

The battle against methicillin-resistant Staphylococcus aureus (MRSA) wound infection is becoming more difficult as drug resistance is widespread and the incidence of MRSA in the community increases. Manuka honey dressing has long been available as a non-antibiotic treatment in the management of chronic wound infections. We have been using honey-impregnated dressings successfully in our wound care clinic and on the maxillofacial ward for over a year.

### **Honey: a potent agent for wound healing?**

Lusby PE, Coombes A, Wilkinson JM. J Wound Ostomy Continence Nurs. 2002 Nov;29(6):295-300 Comment in: J Wound Ostomy Continence Nurs. 2002 Nov;29(6):273-4.

Although honey has been used as a traditional remedy for burns and wounds, the potential for its inclusion in mainstream medical care is not well recognized. Many studies have demonstrated that honey has antibacterial activity in vitro, and a small number of clinical case studies have shown that application of honey to severely infected cutaneous wounds is capable of clearing infection from the wound and improving tissue healing. The physicochemical properties (eg, osmotic effects and pH) of honey also aid in its antibacterial actions. Research has also indicated that honey may possess anti-inflammatory activity and stimulate immune responses within a wound. The overall effect is to reduce infection and to enhance wound healing in burns, ulcers,

and other cutaneous wounds. It is also known that honeys derived from particular floral sources in Australia and New Zealand (*Leptospermum* spp) have enhanced antibacterial activity, and these honeys have been approved for marketing as therapeutic honeys (Medihoney and Active Manuka honey). This review

outlines what is known about the medical properties of honey and indicates the potential for honey to be incorporated into the management of a large number of wound types.

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