



# Concentrated heat therapy for insect bites/stings – current data and practical considerations

## Study discussed:

The use of concentrated heat after insect bites/stings as an alternative to reduce swelling, pain, and pruritus: an open cohort-study at German beaches and bathing-lakes (Müller et al., 2011)

## Contents

- Principles behind local hyperthermia
- Heat transfer and mechanism of action
- Method of application and technology used
- Areas of application
- Study on insect bites and stings
- Discussion of the study results
- Expert recommendations for practice
- bite away®

## Principles behind local hyperthermia

Local hyperthermia is a promising, physical therapeutic approach. It involves brief application of concentrated heat to a highly localised area of skin. The temperature at the application site is approx. 51 °C. The short period of application means that there is usually no risk of damage to the skin. Application of concentrated heat for a few seconds is, however, sufficient to activate various physiological processes at the treatment site. As a practical consideration, it is important that the treatment site should be heated rapidly and evenly. This prevents damage to the skin and ensures that the temperatures achieved are effective. The study discussed here used a patented medical device, *bite away*®, to deliver this controlled heat transfer. Some practical experience has been gained in using the device for the treatment of local reactions to insect bites/stings. To illustrate the potential of local hyperthermia and its advantages over existing treatment options, an open label study was performed for the purpose of quantifying the effects of this treatment for this indication.

## Heat transfer and mechanism of action

Heat energy is transferred from the medical product by a process of thermal conduction. Thermal convection and radiation are negligible. The precise biological mechanism of action of this original treatment method has not yet been clarified, but is the subject of ongoing research. Previous findings and theories on the physiological effects of this treatment were discussed by a panel of experts at a workshop on concentrated heat therapy\*. These are as follows:

- Possible activation of mast cells: Histamine provocation tests with subsequent application of local hyperthermia suggest an effect on mast cells.
- Possible activation of TRPV1 receptors\*: These nerve receptors are activated at temperatures over 40 °C. There is a post-acute antipruritic, analgesic and vasodilatory effect.

\* June 5, 2013, MW Office GmbH; Prof. Dr. Ulrich Mrowietz, Prof. Dr. Johannes Wohlrab, Prof. Dr. Ulf Darsow, Dr. Gerrit Schlippe

- Possible induction of heat shock proteins: Some of these proteins are involved in antigen presentation and can activate various types of lymphocyte.
- Possible denaturation: Some pathogens and toxins are heat labile.

## Method of application and technology used

When activated, the patented *bite away*® medical device generates a temperature of approx. 51 °C, and maintains this temperature for 3 to 6 seconds, depending on the application. The device ensures controlled heating of the heating module by internally linking temperature and time controls (time-heat constant) and is regulated by a software-controlled microprocessor. Heat transfer is via a ceramic pad. Ceramic is resistant to disinfectants and abrasion during cleaning. To use the device, the contact surface is pressed gently onto the skin, before pressing the start button. An LED lights up once the device attains the treatment temperature and is extinguished when the device switches off automatically after 3 or 6 seconds.

## Areas of application

- Application of concentrated heat is an established treatment for insect bites/stings.
- The treatment addresses swelling, itching and pain symptoms, particularly in people with an increased local reaction.

\* transient receptor potential cation channel subfamily V member 1

# The use of concentrated heat after insect bites/stings as an alternative to reduce swelling, pain, and pruritus: an open cohort-study at German beaches and bathing-lakes

Christian Müller, Beatrice Großjohann, Lutz Fischer; *Clinical, Cosmetic and Investigational Dermatology* 2011;4 191–196

## Background

Swelling, pain and itching are considered the most common symptoms after suffering an insect bite or sting. Via their saliva, insects inject a substance which induces itching and pain into human skin. Currently, bites and stings are usually treated with home remedies, topical glucocorticoids or antihistamines. Physical therapy using concentrated heat represents an alternative approach.

## Objective

To investigate the efficacy of local hyperthermia against symptoms of swelling, pain and itching following insect bites and stings.

## Method

- Prospective, open label cohort study in collaboration with the German Lifeguard Service at beaches and bathing lakes.
- 146 participants ranging in age from 2 to 81.
- Application of constant heat at approx. 51 °C for 3 or 6 seconds using the certified medical product *bite away*<sup>®</sup>.
- Participants' objective assessment of their symptoms was recorded prior to and 2, 5 or 10 minutes after application.
- A visual analogue scale (VAS) ranging from 0 (no symptoms) to 10 (maximum imaginable symptoms) was used.

## Results

- 64% of participants had suffered a wasp sting, 23% a mosquito bite and 5% a bee sting.
- 74% had swelling, 58% pain and 36% itching.
- There was a significant reduction in mean VAS score after treatment.
- After 10 minutes the swelling score decreased from 4 to 1 ([figure 1A](#)).
- After 2 minutes, the pain score fell from 6 to 2, after 5 minutes to 1 and after 10 minutes to 0 ([figure 1B](#)).
- The itching score fell from an initial 5 to 2 after 2 minutes and to 0 after 5 and 10 minutes ([figure 1C](#)).

## Summary

In this field study, local hyperthermia led to an effective reduction in the principal symptoms of insect bites and stings (swelling, pain and itching). After ten minutes, symptoms had generally subsided. Compared to conventional methods for treating itching and pain, *bite away*<sup>®</sup> appears to be the quickest-acting treatment option.

Summary based on the original study:

The use of concentrated heat after insect bites/stings as an alternative to reduce swelling, pain, and pruritus: an open cohort-study at German beaches and bathing-lakes

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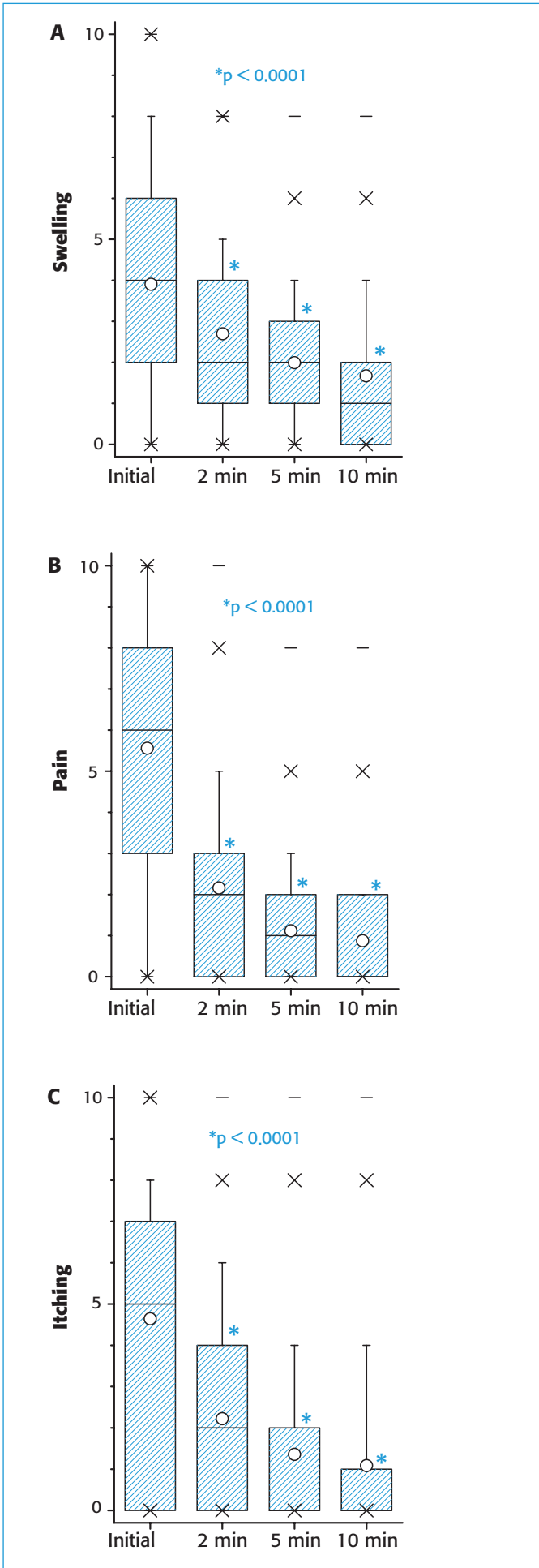


Figure 1: Reduction in swelling, pain and itching measured using a visual analogue scale two, five and ten minutes after treatment with bite away®.

## Discussion of the study results

In keeping with practical experience, previous studies on local hyperthermia have indicated high efficacy against the principal symptoms of insect bites and stings.\* At the temperatures used, permanent changes/damage to skin or denaturation of skin proteins would be expected to require minutes or hours of exposure and cannot occur with the short hyperthermia application times used here. This is in keeping with the high level of tolerability observed in this study. Treatment options for the indications investigated were previously limited. There was an unmet need for a rapid, effective, well-tolerated treatment for insect bites and stings. *bite away*<sup>®</sup> offers a means of effectively and permanently relieving itching and pain after insect bites and stings. Observational studies showed that pain, swelling and itching subsided after just a few minutes. People for whom treatment with antihistamines is potentially contraindicated may also benefit from non-drug based treatment with concentrated heat.

### Expert recommendations for practice

When using *bite away*<sup>®</sup>, to maximise the efficiency of heat transfer to the skin, care needs to be taken to ensure good skin contact. Due to its poor thermal conductance, a thin layer of air between the heating surface and the area being treated may affect energy transfer. The effect is likely to be limited to the treatment site only. The device should therefore be placed precisely on the affected area of skin. The earlier the device is used, the more effective it is in treating symptoms, but later use also generally provides some therapeutic benefit. Its portability means that the device can always be carried to allow immediate use. People with sensitivities, pregnant women, children and people with allergies gain particular benefit from this non-pharmacological therapy.

## *bite away*<sup>®</sup>

Heat in excess of 42 °C activates the thermal/capsaicin receptor TRPV1. Pain receptors also carry the TRPV1 protein. Consequently, as well as being activated by mechanical pain stimuli such as bites and stings, they are also activated by high temperatures or capsaicin. Capsaicin has long been used as a topical analgesic. By activating TRPV1, capsaicin initially triggers a painful burning sensation followed by hypersensitivity, which is primarily the result of neurogenic inflammation. This is then followed by the neurons becoming insensitive to heat, capsaicin, and other stimuli (Szallasi A, Blumberg PM., Vanilloid [Capsaicin] receptors and mechanisms. *Pharmacol Rev.* 1999; 51:159–212). Since TRPV1 is also activated by heat, heat application using *bite away*<sup>®</sup> may trigger the same processes in nerves as capsaicin, resulting in desensitisation of the neurons and relief of swelling, itching and pain. Mechanical stimuli, such as bites and stings or heat and cold, can cause cells to become so stressed that they die off. This causes these cells to release stress proteins such as HMGB1 and heat shock proteins. In conjunction with proteins from the insect saliva, these proteins then enable the immune system to initiate a response to the stimulus. The objective of such an immune response may include, for example, removing dead tissue and damaged cells. This immune response may also prevent insect bite/sting symptoms, such as swelling, pain and itching.

\* Schlippe G et al. Dovepress Clinical, Cosmetic and Investigational Dermatology 2013;6: 163–166 and Wohlrab et al. 2013



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## Brief profile of Dr. Schlippe

Dr. Gerrit Schlippe is a medical dermatology specialist and lead author of the study on genital herpes. She is responsible for research, validation and publications in the skin physiology/ medical test methodologies field at Dermatest, a dermatology research company.



## Sources & links

Insect bites/stings study:  
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3257884/>

User information for non-specialist users:  
[www.stichheiler.de](http://www.stichheiler.de)

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