

Use of Propolis chemical and Asian tiger mosquito bites - case report and review

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Abstract

Propolis is a substance of variable composition which incorporates resins derived from plants and beeswax. It varies depending on the geographic location and local flora such as plant and bee species. Propolis possesses several attributes such as immune enhancement, antimicrobial, antioxidant, analgesic as well as reported anti-tumour effects.^{1,2} Several research efforts have focused on studying the chemical composition of propolis.³⁻⁷ The diverse biological activity probably relates in part to the significant changes in extract constituents. Propolis has been popularized in the past as a natural remedy but significant possible pharmaceutical use is envisaged. This brief review details a case of how multiple annoying localized allergic skin reactions secondary to Asian tiger mosquito bites were soothed and resolved very rapidly with the application of Propolis.

Keywords

Propolis chemical, insect

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Case report

A young healthy 25 year old female sustained numerous mosquito bites during summer which were allegedly itching severely, were large in diameter and resolving very gradually compared to previous isolated mosquito bites. Five of the 12 lesions consisted of oval red elevations measuring over 1.5cms in diameter. Most lesions were situated on both lower limbs from mid-thigh downwards with a lesion on elbow of the left arm. Propolis was applied to 6 mosquito bites on the same subject yielding almost immediate symptomatic relief and visible reduction in swelling and redness of the skin lesions over first few hours when compared to a neighbouring lesion not treated with propolis. It reduced the lingering itching sensation and helped more rapid resolution of the inflammation in the skin affected by the mosquito bite. It was applied 1-2 times in the day over the affected site, not under occlusion which resulted in the need for the second application if it was wiped off the skin onto the clothing. The Asian Tiger Mosquito bite *Aedes albopictus*, a possible dengue fever and other exotic disease carrier was initially suspected in this individual. Although other arthropod bites were initially considered these were deemed to be not the case given the nature of the lesion and patient direct observation of the mosquito on the skin overlying the irritation in two instances, which immediately flew off when the limb was moved resulting in smaller lesions.

Three mosquitoes were killed in the household of the index case (South of Malta - Zabbar), the corpse of two of which revealed the black and white stripes characteristic of the Asian tiger mosquito. The neighbour of the index case claimed finding a swarm of such mosquitoes in his garden. The suspected insect bites treated were allegedly sustained over the same day and were the most symptomatic, however other lesions were present sustained over the preceding five days which showed relatively slow natural resolution compared to other mosquito species bites. The propolis formulation used consisted of a commercial preparation 'Bee Health TM Liquid Propolis HFMA'

consisting of 50% high potency propolis and mono propylene glycol. The patient used the substance again three times on such lesions with similar positive results on the lesions reported, as well as noting the fact the substance may be difficult to wash off clothing.

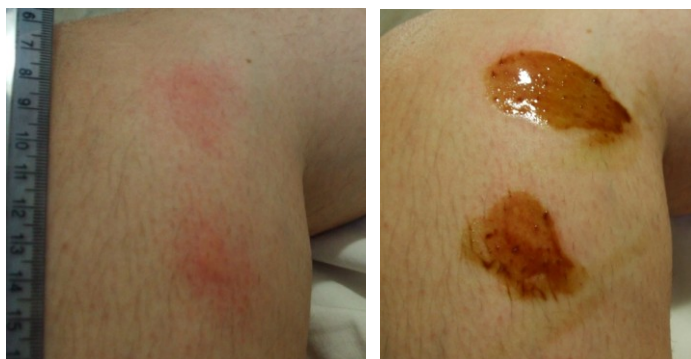


Figure 1: Two lower limb lesions before and with propolis applied



Figure 2: Lesions after 2 and 3 hours post treatment

Discussion

PubMed search yielded 996 articles with 'Propolis' in the title but only two titles resulted when this was combined with the abstract key word 'mosquito'. In one of these two, the word was used out of context and in the other article the main reference was to propolis and malaria.^{8,9} Checking the PubMed database one week after the initial search resulted in overall 1000 article retrieval for the key word 'Propolis' in the title.

Its properties in wound healing are widely acknowledged. The application of propolis or bee glue has been documented in Greek and Roman writings; Aristoteles in fact makes reference to its biology in 'Historia Animalium'. Its most widespread use was in surgery and wound treatment. This was one of the premises for initially trying out this remedy empirically in the first place. Propolis has been used in surgical wound healing.¹⁰⁻¹² It stimulates the keratinocytes and wound reepithelialisation with good penetrance.¹¹

Uncommonly Propolis may however cause contact dermatitis.¹³ Some authors also claim that it should not be

recommended for therapeutic use due to propensity for hypersensitivity reactions in some individuals and implication in certain cases of renal failure.¹⁴ Other recent studies were carried out on the rainbow trout subjected to long term propolis, demonstrating no adverse change in biochemistry.¹⁵ Other safety studies were also performed on mice.¹⁶

Propolis was more recently also rarely used by some as a natural remedy in mosquito bites.¹⁷⁻²¹ It may be applied to given affected areas of irritation secondary to the reaction to the mosquito's saliva. It is however much better known for a multitude of biological and pharmacological actions.²²

The pruritic weals of mosquito bites vary in stages from initial presentation. Non-sedating antihistamines such as cetirizine and ebastine may be effective.²³⁻²⁶ Hydrocortisone creams, calamine lotion and other anti-inflammatory medication and homeopathic substances may be useful.^{27,28} Studies comparing effectiveness of traditional treatments with novel emerging methods are scarce and little randomised data is available on propolis and mosquito bites in particular.^{21,26,27}

Numerous studies were carried out worldwide on different geographical locations of Propolis, some by collection of ethanolic extracts. This was done in an attempt to isolate compounds responsible for its biological action. Flavanones, terpenes and phenolic substances were commonly encountered. In a variety of studies components were analysed for example using spectral properties by gas chromatography-mass spectrometry as well as high-performance liquid chromatography-diode array detection-electrospray ionization-mass spectrometry.²⁹⁻³² This constituted an elucidation challenge in analytical chemistry. Basic spectrophotometric procedures were also suggested by some.³³ Composition worldwide varied considerably with detection of esters, aromatic acids, caffeic acid, cinnamyl compound derivatives, alcoholic hydrocarbons, prenylated and non-prenylated phenylpropanoids, anthracene derivatives and supportive nutrients amongst other compounds.³⁴ Flavonoids, the main bioactive species may inhibit lipid peroxidation as well as platelet aggregation and may influence the lipoxygenase and cyclo-oxygenase pathways.³⁵⁻³⁷ There is also concern that flavinoids may chelate heavy metals.⁹

Immuno-modulatory, anti-inflammatory, vasodilator, anti-allergic, anti-viral and anti-bacterial properties have been acclaimed. For example, amongst many other actions, Brazilian green Propolis contains bioactive species in prostate cancer and acts on the tumour necrosis factor-related apoptosis-inducing ligand (TRAIL)³⁸, Greek Propolis contains a diterpene, manool, which may arrest cancer cells in G2/M phase

during the cell cycle.³⁹

Although mosquito bites are extremely irritating they by far do not usually carry long term consequences apart from instances where they are vectors for disease. However studies on many more serious conditions have shown possible therapeutic benefit. Further studies are needed in complete profiling and characterization of chemical constituents and clinical trials on efficacy and safety profiling of individuals compounds in humans.

References

- Sawaya AC, Cunha IB, Marcucci MC. Analytical methods applied to diverse types of Brazilian propolis. *Chem Cent J*. 2011 Jun 1;5(1):27.
- Barbaric M, Miskovic K, Bojic M, Loncar MB, Smolcic-Bubalo A, Debeljak Z, et al. Chemical composition of the ethanolic propolis extracts and its effect on HeLa cells. *J Ethnopharmacol*. 2011 Jun 1;135(3):772-8.
- Zhang CP, Zheng HQ, Hu FL. Extraction, partial characterization, and storage stability of beta-glucosidase from propolis. *J Food Sci*. 2011 Jan-Feb;76(1):C75-9.
- Trusheva B, Popova M, Koendhori EB, Tsvetkova I, Naydenski C, Bankova V. Indonesian propolis: chemical composition, biological activity and botanical origin. *Nat Prod Res*. 2011 Mar;25(6):606-13.
- Aliboni A, D'Andrea A, Massanisso P. Propolis specimens from different locations of central Italy: chemical profiling and gas chromatography-mass spectrometry (GC-MS) quantitative analysis of the allergenic esters benzyl cinnamate and benzyl salicylate. *J Agric Food Chem*. 2011 Jan 12;59(1):282-8.
- Lotti C, Campo Fernandez M, Piccinelli AL, Cuesta-Rubio O, Marquez Hernandez I, Rastrelli L. Chemical constituents of red Mexican propolis. *J Agric Food Chem*. 2010 Feb 24;58(4):2209-13.
- Campo Fernandez M, Cuesta-Rubio O, Rosado Perez A, Montes De Oca Porto R, Marquez Hernandez I, Piccinelli AL, et al. GC-MS determination of isoflavonoids in seven red Cuban propolis samples. *J Agric Food Chem*. 2008 Nov 12;56(21):9927-32.
- Gama GB. [Propolis and malaria]. *Rev Soc Bras Med Trop*. 1993 Jul-Sep;26(3):193.
- Sales A, Alvarez A, Areal MR, Maldonado L, Marchisio P, Rodriguez M, et al. The effect of different propolis harvest methods on its lead contents determined by ET AAS and UV-vis-S. *J Hazard Mater*. 2006 Oct 11;137(3):1352-6.
- Damyantiev R, Hekimov K, Savova E, Agopian R. The treatment of suppurative surgical wounds with propolis. *Folia Med (Plovdiv)*. 1982;24(2):24-7.
- Sehn E, Hernandez L, Franco SL, Goncalves CC, Baesso ML. Dynamics of reepithelialisation and penetration rate of a bee propolis formulation during cutaneous wounds healing. *Anal Chim Acta*. 2009 Mar 2;635(1):115-20.
- Fedorov VD, Dul'tsev Iu V, Martynova TI, Korneva TK, Pestovskaia GN. [Use of propolis in the treatment of perineal and anal wounds]. *Khirurgiia (Mosk)*. 1975 Dec(12):44-8.
- Tumova L, Pasavova D. [Allergic contact dermatitis caused by propolis]. *Ceska Slov Farm*. 2000 Nov;49(6):285-7.
- Propolis: hypersensitivity reactions. *Prescrire Int*. 2010 Aug;19(108):170.
- Beyraghdar Kashkooli O, Ebrahimi Dorcheh E, Mahboobi-Soofiani N, Samie A. Long-term effects of propolis on serum biochemical parameters of rainbow trout (*Oncorhynchus mykiss*). *Ecotoxicol Environ Saf*. 2011 Mar;74(3):315-8.
- Araujo MJ, Mattar NS, Reis AS, Serra IC, Fialho EM, Assuncao AK, et al. Pharmacognostic and acute toxicological evaluation of *Scaptotrigona aff. postica* propolis extract in pre-clinical assays. *Nat Prod Res*. 2011 Jan 1:1-10.
- Castaldo S, Capasso F. Propolis, an old remedy used in modern medicine. *Fitoterapia*. 2002 Nov;73 Suppl 1:S1-6.
- Golder W. [Propolis. The bee glue as presented by the Graeco-Roman literature]. *Wurzburg Medizinhist Mitt*. 2004;23:133-45.
- Tsarev NI, Petrik EV, Aleksandrova VI. [Use of propolis in the treatment of local suppurative infection]. *Vestn Khir Im I I Grek*. 1985 May;134(5):119-22.
- Home Remedies for Mosquito Bites. 2011; Available from: <http://beepropolis.org/home-remedies-for-mosquito-bites>.
- Gama DGB. A Própolis e a Dengue. 2007; Available from: <http://pt.shvoong.com/medicine-and-health/1803077-pr%C3%B3polis-dengue/>.
- Sforcin JM, Bankova V. Propolis: is there a potential for the development of new drugs? *J Ethnopharmacol*. 2011 Jan 27;133(2):253-60.
- Reunala T, Brummer-Korvenkontio H, Lappalainen P, Rasanen L, Palosuo T. Immunology and treatment of mosquito bites. *Clin Exp Allergy*. 1990 Nov;20 Suppl 4:19-24.
- Reunala T, Brummer-Korvenkontio H, Palosuo T. Are we really allergic to mosquito bites? *Ann Med*. 1994 Aug;26(4):301-6.
- Reunala T, Lappalainen P, Brummer-Korvenkontio H, Coulie P, Palosuo T. Cutaneous reactivity to mosquito bites: effect of cetirizine and development of anti-mosquito antibodies. *Clin Exp Allergy*. 1991 Sep;21(5):617-22.
- Karppinen A, Kautiainen H, Petman L, Burri P, Reunala T. Comparison of cetirizine, ebastine and loratadine in the treatment of immediate mosquito-bite allergy. *Allergy*. 2002 Jun;57(6):534-7.
- Hill N, Stam C, Tuinder S, van Haselen RA. A placebo controlled clinical trial investigating the efficacy of a homeopathic after-bite gel in reducing mosquito bite induced erythema. *Eur J Clin Pharmacol*. 1995;49(1-2):103-8.
- Zhai H, Packman EW, Maibach HI. Effectiveness of ammonium solution in relieving type I mosquito bite symptoms: a double-blind, placebo-controlled study. *Acta Derm Venereol*. 1998 Jul;78(4):297-8.
- Righi AA, Alves TR, Negri G, Marques LM, Breyer H, Salatino A. Brazilian red propolis: unreported substances, antioxidant and antimicrobial activities. *J Sci Food Agric*. 2011 May 17.
- Piccinelli AL, Lotti C, Campone L, Cuesta-Rubio O, Campo Fernandez M, Rastrelli L. Cuban and brazilian red propolis: botanical origin and comparative analysis by high-performance liquid chromatography-photodiode array detection/electrospray ionization tandem mass spectrometry. *J Agric Food Chem*. 2011 Jun 22;59(12):6484-91.
- Sawaya AC, Abdelnur PV, Eberlin MN, Kumazawa S, Ahn MR, Bang KS, et al. Fingerprinting of propolis by easy ambient sonic-spray ionization mass spectrometry. *Talanta*. 2010 Apr 15;81(1-2):100-8.
- Popova MP, Graikou K, Chinou I, Bankova VS. GC-MS profiling of diterpene compounds in Mediterranean propolis from Greece. *J Agric Food Chem*. 2010 Mar 10;58(5):3167-76.
- Popova M, Chen CN, Chen PY, Huang CY, Bankova V. A validated spectrophotometric method for quantification of prenylated flavanones in pacific propolis from Taiwan. *Phytochem Anal*. 2010 Mar;21(2):186-91.
- Sahinler N, Kaftanoglu O. Natural product propolis: chemical composition. *Nat Prod Res*. 2005 Feb;19(2):183-8.
- Mirzoeva OK, Calder PC. The effect of propolis and its components on eicosanoid production during the inflammatory response. *Prostaglandins Leukot Essent Fatty Acids*. 1996 Dec;55(6):441-9.
- Viuda-Martos M, Ruiz-Navajas Y, Fernandez-Lopez J, Perez-Alvarez JA. Functional properties of honey, propolis, and royal jelly. *J Food Sci*. 2008 Nov;73(9):R117-24.

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37. Volpert R, Elstner EF. Interactions of different extracts of propolis with leukocytes and leukocytic enzymes. *Arzneimittelforschung*. 1996 Jan;46(1):47-51.
38. Szliszka E, Zydowicz G, Janoszka B, Dobosz C, Kowalczyk-Ziomek G, Krol W. Ethanolic extract of Brazilian green propolis sensitizes prostate cancer cells to TRAIL-induced apoptosis. *Int J Oncol*. 2011 Apr;38(4):941-53.
39. Pratsinis H, Kletsas D, Melliou E, Chinou I. Antiproliferative activity of Greek propolis. *J Med Food*. 2010 Apr;13(2):286-90.