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Antibacterial activity of medical grade Indian honey

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Abstract

Aim: Honey has emerged as a new agent in wound care due to its antimicrobial and anti inflammatory properties. The aim of this study was to check the antibacterial activity of Indian honey (medical grade).

Methods and materials: A fresh gamma sterilized Indian honey of Apis dorsata species was obtained from Amit Jain's centre of Apitherapy and was tested against ATCC strains of *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* and *Escherichia coli* in-vitro using agar well diffusion method.

Result: Medical grade Indian honey was effective in inhibiting all the 4 microbes that commonly infect diabetic wounds.

Conclusion: Indian honey is a very effective agent against gram positive and gram negative bacteria and its antibacterial property is retained even after sterilization with gamma irradiation.

Keywords: wounds, honey, bacteria

Introduction

Wounds pose a significant problem worldwide and are a challenge to clinicians [1]. The wound can be acute or chronic [2]. Wounds are considered to be chronic if the healing does not progress normally [3]. It is stated that even in a developed country like United States, there are around 4.5 million people who have chronic wounds [4].

Diabetic foot ulcers are one of the commonest wounds seen worldwide and it is believed that a diabetic patient carries 25% risk of having a foot ulcer in his lifetime [5]. Infected ulcers cause major morbidity and mortality [6]. They can lead to social and economic problems [6]. It is estimated that treatment of a single diabetic foot ulcer in western country costs around US $ 50,000 [3].

Chronic wound pose problems as they harbor microbial communities that have bacteria as biofilms [1]. Biofilms are responsible for delayed wound healing and are present in up to 60% in chronic wounds [2]. Many bacteria are resistant to systemic antibiotics leading to multidrug resistant infections [2].

Honey has recently gained importance in view of its antimicrobial and anti-inflammatory properties. Honey is effective against many gram positive and gram negative organisms [7].

We conducted this study to assess the efficacy of medical grade Indian honey against four most common bacteria's known to infect diabetic foot ulcers.

Methods and Materials

Fresh medical grade Indian honey was obtained from Amit Jain's Centre of Apitherapy at Amit Jain's Institute of Diabetic Foot and Wound Care, Brindhavvan Areion hospital, Bengaluru, India. The Amit Jain's Centre of Apitherapy is a dedicated wing which deals with acquisition, storage, sterilization and use of honey on different types of wounds. The honey used in this study was from Apis Dorsata bee which is an Indian rock bee. We sterilized this honey with 15KGy gamma irradiation, in order to be used as medical grade honey on wounds.

Around 20 ml of this medical grade Indian honey was sent to Department of Microbiology of Rajarajeswari Medical College to assess its in-vitro antibacterial efficacy, by Agar well diffusion method. ATCC 25923 *Staphylococcus aureus*, ATCC 25922 *E.coli*, ATCC 27853 *Pseudomonas aeruginosa* and ATCC 13883 *Klebsiella pneumoniae* species were used to perform the test. Trypticase soy Agar was prepared by adding 100µl of ATCC strain to the autoclaved media broth. The plates were allowed to solidify. Then a well was punched in the centre of agar and 100µl of honey was added to it. The plate was incubated at 37^0 C for 24 hours. The plates were then checked for any antimicrobial activity of honey by measuring any zone of inhibition towards the ATCC strains.

Results

The medical grade Indian honey of Apis Dorsata species was found to be effective against *Staphylococcus*, *Pseudomonas*, *Escherichia coli* and *Klebsiella* species. The zone of inhibition ranged from 16-22mm (Figure 1).

Fig 1: Showing zone of inhibition in E.Coli.

Discussion

Honey has been used for thousands of years by different civilization and it was a popular ancient remedy for treating wounds [8, 9]. It is believed to have antibacterial, antiviral, anti-inflammatory and antioxidant properties [10]. It has gained immense popularity over past few years in view of emerging multidrug resistant organisms that are recalcitrant to antimicrobial therapy [11]. Diabetic foot wounds are common in clinical practice and are polymicrobial in nature [5, 12, 13].

The common microorganisms affecting diabetic foot are *E. coli, Proteus, Pseudomonas, Staphylococcus Aureus, Enterococcus, Klebsiella,* etc apart from anaerobes like *B. fragilis* and *Peptococcus* and fungal infections [5, 12, 13]. These bacteria reside in biofilms and are 500 times less susceptible to antimicrobials [14]. Anti-biofilm properties of honey have been demonstrated in literature [15]. The antibiotic susceptible and resistant strains are inhibited by honey in vitro [15].The antimicrobial activity of honey is due to its low pH, osmotic effect and also due to production of hydrogen peroxide [16].

A study by Uruvu *et al* showed honey to be effective against bacterial strains *Of Pseudomonas, E. Coli and Staphylococcus* [17]. In our study too, we found Indian honey to be effective against these organisms and *Klebsiella* species as well.

Many clinicians are reluctant to use unsterile products on open wounds [18]. Hence, honey needs to be gamma irradiated before use on wounds and such honey is known as medical grade honey [15]. We also sterilize our Indian honey with 15KGy gamma irradiation (Cobalt 60 gamma chamber- 5000) prior to use on wounds [19].

Conclusion

Honey is an effective agent that can be used in treatment of infected wounds. Our study has shown that medical grade Indian honey, obtained from Apis dorsata, has significant antibacterial activity covering both gram positive and gram negative bacteria. This in-vitro study done also showed that the antimicrobial activity of Indian honey is unaffected with 15KGy gamma irradiation.

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