

ABSTRACTS

ABSTRACTS 1ST INTERNATIONAL CONFERENCE ON THE MEDICINAL USES OF HONEY (FROM HIVE TO THERAPY)

26TH - 28TH AUGUST 2006

**GRAND RIVERVIEW HOTEL,
KOTA BHARU, KELANTAN, MALAYSIA**

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Honey and Medicine: Past, Present and Future

P C MOLAN

Professor of Biological Sciences and Director of the Honey Research Unit University of Waikato, Hamilton, New Zealand

Honey is one of the oldest medicines known, its recorded use going back more than 4 millennia. It was used to treat wounds and ulcers, sunburn, and infections of the eyes, throat and gut. These uses have continued into present-day folk medicine and are increasingly becoming part of modern professional medicine. Good results have been reported in modern medical literature on the use of honey in ophthalmology and gastroenterology. The use of honey as a wound dressing has always been part of professional medicine, but it was displaced from common usage by the advent of antibiotics. Now that antibiotic resistance in bacteria is becoming a major world-wide problem there is a rapidly increasing move towards using honey to clear infection in wounds, with no adverse effects on wound tissues. Additional to using honey's antibacterial activity, advantage is being taken of its other medically beneficial bioactivities: a rapid debriding action, a stimulatory effect on growth of tissues for wound repair, an anti-oxidant activity and an anti-inflammatory action, which minimises scarring. There is a large amount of evidence for its effectiveness that has been published in recent times-reports of animal model and clinical studies, case reports and randomised controlled trials showing that honey is more effective than modern pharmaceutical products in managing wounds. In cases where the long-forgotten ancient wisdom of using the best types of honey in formulations to keep it in place on a wound has been heeded, results obtained have been exceptionally good. Various wound-dressing materials manufactured from honey are now on the market in various countries as registered medical devices. At the research level, honey is currently showing potential to also be useful for minimising damage to skin and mucosal surfaces from radiotherapy, treating gingivitis, treating viral infections, and combating cancerous tumours. It is predicted that in the future it will be widely used prophylactically to prevent infection of patients with "superbugs" in hospitals, and will come into use as standard treatment for: leprosy; for all surgical wounds to prevent infection, prevent scarring, and speed healing; for burns, to prevent infection and prevent further damage to tissues caused by inflammation resulting from the thermal damage; to minimise burning from radiotherapy for cancer; to minimise effects on the gut of chemotherapy for cancer; and will be fully accepted by the medical profession as a legitimate modern medicine.

Standards for Quality Honey for Medicinal Uses

P C MOLAN

Professor of Biological Sciences and Director of the Honey Research Unit University of Waikato, Hamilton, New Zealand

Although honey produced for use as a food is commonly used medicinally, there are risks associated with this when it is used on open wounds and in ophthalmology. If honey is to become accepted as a modern medicine then these risks need to be avoided where possible, so standards need to be put in place for the production of honey for medicinal use. The risks are: infection resulting from microbial content; reaction to pyrogens from microbial content; allergic reaction to bee proteins or pollen in honey; formation of granulomas from non-biodegradable particles in honey; and to toxic substances in honey. Gamma-irradiation of honey will remove the risk of infection, but may not be fully effective if the microbial content is too high. Nor will it remove the risk to a reaction to bacterial endotoxins, which may be substantial if the microbial content is high. The bacterial content of honey can be kept low by maintaining high health in the hive and by clean handling of honey. Allergic reaction to bee proteins in honey cannot be avoided, but allergy to honey is commonly due to a reaction to pollen in the honey. With appropriate machinery, it is possible to filter out pollen from honey, but high temperatures should be avoided in processing as damage to bioactive components may result. High quality filtration will also remove foreign matter from honey. The avoidance of toxins in honey depends on the beekeeper: floral sources yielding toxic honey should be avoided when honey is destined for medicinal use, as should sources likely to be polluted with pesticides; measures should be taken to ensure that chemicals and antibiotics used in beekeeping cannot get into medicinal honey. Another important standard that needs to be put in place for the provision honey for medicinal use is for assurance that the honey has sufficient bioactivity to be therapeutically effective. The antibacterial potency of honey can vary as much as 100-fold. At present there are honey products on sale with quality-assured levels of antibacterial activity, and established assay protocols to measure this. Research is under way to establish assay protocols for other activities such as antioxidant activity, anti-inflammatory activity and stimulatory activity on growth of repair tissues.

Bees and Bee Products

ZAINAL ROMLY

Established Apitherapy Centre in Kelana Jaya, Selangor Malaysia.

The humble honey bee is one of nature's most amazing and enduring creatures, having survived for hundreds of millions of years. It is the only insect that produces a whole range of superfoods that is sought after by all insects, animals and

mankind. It is important to remember that not all bees produce honey and therefore the focus of this study is the honey bee and its creations. Honey and other bee products have been revered and is common to all ages, cultures and civilizations and is mentioned in almost all religious books including the Torah, the Bible and especially the Holy Quran. The Prophet Muhammed (pbuh) has made numerous references to honey and its medicinal properties and modern science has confirmed both the special properties and its medicinal applications. Today there is a whole body of science and research dedicated to the development of bee products and its application to a whole range of ailments. The results are no less than outstanding. Every part of the hive including the wax itself has some form of medicinal properties and apitherapy which is the use of bee products in treating all kinds of ailments is expanding as more and more people discover the wonders of the bee. The bee hive is the most sterile environment in nature and the propolis that is created by the bee ensures its continued survival because it acts as a protection for the bees and ensures its continued survival. It is nature's most prolific pollinator and more than half of the world's food is pollinated by the bee. Without it we would face food shortages and a declining biodiversity. Honey itself is consumed by almost everyone and bee pollen is termed as nature's most complete food, providing a vital source of protein for the bee and its environment which includes almost all living creatures. Scientists today are experimenting with bees in ways never imagined or thought possible such as using bees to detect landmines, or using bee venom as an adjuvant to other medical therapies. The leading edge of research is being expanded as more scientists and doctors discover the many hidden secrets of the honeybee and its usefulness not just in pollination biology and agriculture but in modern medicine. The world is a much better place because of the honeybee and humankind has been enriched by the wonders of the creations of the bees. One wonders what it would be like if the bees were to become extinct and the thought is almost horrifying. In fact the demise of the bee will spell disaster to humankind and it is imperative that we do all we can to ensure the continued survival of the bees while enhancing the use and research of all the wonderful creations of the bees.

The Antioxidant Activities of Honey

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The role of free radicals such as superoxide radicals, hydroxyl radicals and others have been implicated in a number of diseases including cancer, cardiovascular diseases, cataracts, macular degeneration, impaired wound healing, gastrointestinal inflammatory diseases and many other inflammatory processes. The occurrences of human diseases, which are linked to oxidative stress, have led to the application of antioxidants to treat diseases. Small molecule dietary antioxidants such as vitamin C, vitamin E and carotenoids have generated particular interest as defenses against degenerative diseases. However, some studies have indicated that organic compounds such as flavonoids and phenolics are considerably more potent antioxidants. The use of honey in the treatment of chronic wounds, diabetic ulcers, cataracts and other eye ailments, peptic ulcers and gastric ailments have been well documented. The beneficial role of honey was partially attributed to its antibacterial activity. However, since some of these diseases have been recognized as being a consequence of free radicals damage, it seems that part of the therapeutic role of honey is due to its antioxidant activity. Our analysis on Malaysian honeys had revealed that in addition to C and E vitamins and catalase, the honeys also contain flavonoid and phenolic compounds. The antioxidant activities of these organic compounds were determined in terms of their anti radical power (ARP) as assessed by DPPH radical scavenging assay and their total antioxidant power (TAP), as measured by FRAP assay. A high correlation between the honey phenolics and the hydrogen peroxide level in honey is another new finding. It indicates that honey phenolics play a role in determining hydrogen peroxide level in honey. Our work also revealed that honey contains both aqueous and lipophilic antioxidants. Since honey possesses antioxidant activities, it thus justifies its use as a source of natural antioxidant as well.

Practical Application of Honey Dressing

M SUBRAHMANYAM

Professor and Head of Department of Surgery at Bharathi Bidyapeeth Deemed University Medical College and Hospital, Sangli, India.

The medicinal properties of honey have been known over the years. The Indian medicine 'Ayurveda' describes honey as the nectar of life and recommends its use in the treatment of various ailments. Honey has been used as an adjuvant for acceleration of wound healing in ulcers, infected wounds, bedsores, Fournier's gangrene and burns. In burns honey has been found to heal the burn wounds faster and quicker with less scarring by scientific studies. In minor burns, it is recommended to pour tap water immediately on the burns, as this reduces the temperature. Afterwards, honey can be applied on burns. Depending on the area, 15-30 ml of honey can be applied directly on to the burn wound or soaked in gauze before application. Occlusive or absorbent secondary dressings are applied to prevent honey from oozing out and the frequency of dressing changes depends on how rapidly the honey gets diluted by the exudates, which declines, as treatment progresses. In deep cavities gauze can be soaked and packing is done of the cavity. The dressing can be protected from ants by rapping it with a plastic cover.

Honey in Indian Culture

M SUBRAHMANYAM

Professor and Head of Department of Surgery at Bharathi Bidyapeeth Deemed University Medical College and Hospital, Sangli, India.

Honey is a mixture of sugars prepared by honey bees from the natural sugar solutions called the nectar obtained from flowers or other secretions of plants. By addition of enzymes and evaporation of water in it, honey bees transform it into a sweet liquid. It was the sweetening agent known to the early man, and naturally found its way into traditions, rituals, customs and food of Indian households. It is the most complete natural food and ensures to get the daily dose of essential nutrients like, carbohydrates, minerals, amino acids, proteins and vitamins. Honey provides instantaneous replenishment of energy losses, being a rich source of carbohydrates and provide 3000 calories per kilogram and a table spoon of honey provides 100 calories. The medicinal properties of honey have been known over the years and honey has been used in the treatment of various ailments like diarrhoea, ulcers, burns etc. Honey is used as a nutritious food, recommended to be taken along with lemon juice and hot water early in the morning. Honey is a cheap and a valuable household self constituent useful both as nutritious food and a valuable medicine.

Role of Honey in the Management of Diabetic Foot

JENNIFER J EDDY MD

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Dr. Eddy will review the epidemiology and cost of diabetic ulcers, the natural history of this condition and the cost and effectiveness of standard treatment and of honey therapy. She will briefly discuss the current obstacles to wider use of topical honey for diabetic ulcers.

Honey and Diabetic Foot: Malaysian Experience

MOHD ISKANDAR MOHD AMIN

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Intrigue with the wonders of the nature's own resourceful product "Honey" and facing the ever challenging and complex management of "Diabetic Foot", we in HUSM embark in using honey in treating diabetic foot wound for more than 10 years. Being in Kelantan where diabetic foot incidence is relatively high, the rate of amputation is increasing, modern medicine effectiveness is questionable and expensive and patient are more inclined towards traditional form of treatment. We since early 1990's started using various methods of dressing material including papaya and honey. Honey seems to be more promising and to have scientific evidence of the effectiveness of the usage of honey in diabetic foot wound management. We did a controlled clinical trial comparing two types of dressing materials for diabetic foot ulcers using honey and povidone-iodine. Shukrimi et. al. has demonstrated in Wagner's II type of diabetic foot wound. Even though there is no significant difference in healing rate and achieving sterile wound for patient using honey and povidone as dressing material but there is added advantage of using honey as to reduction in pain during dressing change, faster reduction of oedema, less odor, cheaper and more acceptable to the patient. Now, honey is part of our regimen in treating Wagner's II diabetic wound and honey is provided by our hospital pharmacy for inpatient treatment. We are exploring and expanding the usage of honey as dressing material and possibility is infinite.

Therapeutic Effect of Dimocarpus Longan Lour Honey on Ichthyosis Patients

SIU-WAN IP

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Background : The Ichthyosis is a group of skin disorders of keratinisation in which the skin is extremely dry and scaly. Ichthyosis often invades joints and may cause human joints deformities because of severe skin infections. The objective of this study is to investigate the therapeutic effect of Dimocarpus Longan Lour. Honey on Ichthyosis patients. **Patients**

& Methods : Four Ichthyosis patients were selected in this study. Dimocarpus Longan Lour Honey 30ml was applied to the skin lesions every 12 hours. Also, Dimocarpus Longan Lour. Honey 20ml, per oral, every six hours for 16 weeks. **Main Results :** After 16 weeks of local application and oral administration of Dimocarpus Longan Lour. Honey, patients found that their skin lesions of Ichthyosis were greatly improved. **Conclusions :** Topical application and oral administration of Dimocarpus Longan Lour. Honey can provide a first line defense against wide spectrum of pathogens in Ichthyosis patients. The results of this study indicate Dimocarpus Longan Lour. Honey is an effective antimicrobial agent in preventing skin infections in Ichthyosis patients

Honey in Chinese Culture

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Background : Honey has been used in traditional Chinese Medicine to treat many diseases for more than two thousands years. In Traditional Chinese Medication, honey is a combination used with bee venom, propolis, royal jelly, pollen and other herbal medications in medical treatment. In addition, the following diseases are good indications for using honey. I) Infectious Diseases: Bacterial Infections: A. Infections caused by gram-positive bacteria, e.g. Streptococcal infections-Pharyngitis, Enterococcal infections, Pneumococcal infections; Staphylococcus Aureus infections, B. Infections caused by gram-negative bacteria, e.g. Meningococcal infections- Meningococcal meningitis., Salmonellae infections-Typhoid fever, Salmonella Gastro-enteritis., Shigella infections-Shigella dysentery. II) Gastrointestinal Diseases: A. Gastritis, B. Peptic ulcer Disease, C. Celiac Disease, D. Antibiotic-Associated Colitis. E. Inflammatory Bowel Diseases. III) Allergic and Immunologic Disorders: A. Allergic Rhinitis B. Rheumatoid arthritis, C. Systemic Lupus Erythematosus(SLE), D. Ankylosing spondylitis, E. Multiple Sclerosis. IV) Traumatic wounds: traumatic and surgical wounds managements. **CONCLUSIONS.** Honey is widely used in traditional Chinese Medicine to treat a lot of infections diseases, autoimmune disorders and traumatic wounds. In addition, we believe honey will pay a more important role in the integrated medical treatment of many internal and surgical diseases in future.

Role Of Honey In The Management Of Radiation Mucositis

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Radiation therapy is an important modality of management for head and neck cancers. While irradiating the tumors inside head and neck anatomy, a significant extent of the oral and pharyngeal mucosa get therapeutic doses leading to mucositis. Mucositis is a condition characterized by damage to the epithelium of the oropharyngeal cavity and gastrointestinal tract from radiation or chemotherapy. One of the reasons that epithelial cells are more susceptible to cytotoxic effects of radiation and chemotherapy is because of their relatively high rate of turn over of cells compared to other organs. Radiotherapy or chemotherapy further deplete stem cells of the basal epithelium resulting in a reduction of epithelial cells, release cytokines which increase local vascularity and cause inflammation. Mucositis can lead to secondary infection, ulceration, and pain leading to malnutrition. Severe mucositis can result in hospitalization and delay in scheduling treatment, compromising therapeutic efficacy. In many instances, patients used to discontinue effective radiotherapy treatment. Though radiation induced mucositis is a very common side effect of radiotherapy, there is no established guidelines of management. Treatments like antibiotic lozenges, topical sucralfate, aspirin mucilage, local laser treatment, GM-CSF, keratin growth factors have been applied with varying response rate in research set up. Honey results primarily from the transformation and concentration of nectars from flowers by two processes: interaction with the upper digestive tract secretion of the honeybee and concentration by the water loss (>80%) in beehives. It is a golden yellow viscous fluid containing sugar and many useful compounds. Earlier basic laboratory and animal studies has shown to be epithelial regenerative, anti-bacterial and nutritional properties. Earlier literature evidences reported usefulness of honey in the management of burn and post surgical wound. In a randomized comparative study conducted at University Science Malaysia for the first time showed a significant reduction of severe (RTOG grade III-IV) radiation induced mucositis among head and neck cancer patient's undergone fractionated radiotherapy. In addition to prevention of severe mucositis, we observed positive gain in the body weight. Currently we are conducting a multicenter double blind randomized trial on the application of pure natural honey in the management of mucositis induced by concurrent chemoradiotherapy in nasopharyngeal cancers. Honey being a natural agent available worldwide may found to be a useful and cost effective treatment in radiation mucositis.

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Honey and Reproductive Hormones

Honey is used traditionally for the treatment of various diseases and for maintenance of health including reproductive health. In the Malay community, honey is frequently taken together with egg yolk especially during the confinement period and is also being used to overcome subfertility problems for both sexes. Honey could also be consumed as it is and can also be taken in combination with coffee or herbal preparations to enhance vitality and to improve sexual performance. Studies have shown that honey significantly increased the sperm count in rat and bonnet monkey. However, no research findings have demonstrated a positive effect of honey on circulating gonadotrophins or testosterone in man or animals. We have evaluated the effect of Malaysian honey (Tualang honey) on male rats' hormonal profiles and spermatogenesis and its effects on estradiol, progesterone, testosterone, and gonadotrophins in ovariectomised rats, an animal model for post menopausal state. Positive findings were noted on the spermatogenesis. Vaginal wall epithelium and muscles thicknesses were significantly increased in honey treated ovariectomised rats. The findings on the hormonal profiles of both studies will be presented and discussed.

Honey In The Malay Tradition

SYARIFAH ANISAH SYED AGIL BARAKHBAH

The Founder and Managing Director of Nona Roguy Group of Companies

Honey is a prized delicacy to the Malays. The Malays traditionally do not farm the bees like in other community. The Malays believe that honey from wild bees is a genuine natural energizer, especially honey which drop from the comb known as madu dara (virgin honey). There are four types of bees known to the Malays. They are the Tualang, Jungle, Cerung or Cerang bees and the Kelulut bees. All the bees except Kelulut have poisonous sting but the Jungle bee's sting can cause death. Jungle and Cerung bees have a darker honey compared to Tualang honey. Kelulut bees are the smallest bees and are more of a 'house bee'. The Malays considered these small bees have more medicinal powers. For centuries honey is known to be the enemy of diseases. It is used as anti-ageing, it is able to give pleasure and enhance libido, enhancing immune system, kills bacteria, use in the treatment of bronchial catarrh, sore throat, coughs and colds. There is a special Malay recipe for treatment of asthma using egg, lime juice and honey. Honey is also restorative after serious illness. It is used in the preparation of the famous Traditional Malay herbal remedy ubat periuk. In addition honey is said to soothe pain, acts as antiseptic, hastens healing and is effective in curing burns, carbuncle, boils and diabetic wound. It is done by mixing honey with kapur sireh or selected herbal plants. Honey comb is known to cure diabetic wound. The Malays believe that the darker the honey the better as it is said to contain practically all minerals which help in maintaining hemoglobin. Kelulut honey is well known for its antiageing activities and in combination with honey comb is effective for treatment of tumors.

UTHMAN EL-MUHAMMADY

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Honey In Quran And Hadith

The paper presents data from the Qur'an and the Prophetic Traditions concerning honey and its uses as cure for some diseases as practiced during that period. Discussion will be focused on the actual cases involved and the views of religious scholars, classical and contemporary, concerning the subject in what is termed as 'al-tibb al-nabawi'. Some considerations will also be given, in a summary, as to the symbolical significance of honey in sacred literature. Indications of the medical benefits of honey will be given based on the views of medical experts, for the sake of comparative study of the subject.

Oral Session 1

Comparison of Gymnosperms and Angiosperms Plants on Quality and Quantity of Propolis

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INTRODUCTION

Propolis is a natural antibiotic, gathered by bees from gum of various plants. Propolis is available for purchase as an

ingredient in capsule form, lip balm, skin cream, tincture and toothpaste. Bees use it to fill cracks, smooth over the interior of the nest, strengthen comb attachments and cover and embalm intruders in the hive that are too large to carry out.

OBJECTIVES

The aim of this study was to compare effects of two kinds of plant sources (gymnosperms and angiosperms) on quantity and quality of propolis.

MATERIALS AND METHODS

Two areas with poplar (angiosperms) and cypress (gymnosperms) plantations were selected in Khojir and Telo respectively, located near Tehran, Iran. These two areas were about 20 km away from each others. Ten honeybee colonies were placed in each area for 2.5 months in autumn 2003 and 3 months in spring 2004. The fiber method was used to collect the propolis. The produced propolis from the colonies was weighed at two-week intervals. The propolis samples were analyzed by GC-MS and the antimicrobial activity of the samples was tested against *Staphylococcus aureus*.

RESULTS

The highest amounts of propolis in Khojir and Telo were 11.63g and 8.79g per hive per two weeks, respectively. The amount of propolis produced in Khojir was significantly higher than that in Telo ($p < 0.01$). It may indicate that the presence of poplars near the hives could be effective in increasing propolis production. The antibacterial activity of the Khojir propolis samples against *Staphylococcus aureus* was stronger (MIC - 31.25 mg/ml) than that of the Telo propolis samples (MIC - 62.5 mg /ml).

CONCLUSIONS

The results of our study, GC-MS analyzes and antibacterial activity of propolis, indicated that the gymnosperms plants (poplar) are very important for propolis production.

Effect of Indian Honeys on Various Clinical Isolates

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INTRODUCTION & BACKGROUND

In Ayurveda, honey is considered as the nectar of life. It is a sweet natural liquid gathered by honeybees from nectar or other secretions of plants, which they transform by addition of enzymes and evaporation of water. Many extensive studies on different types of honeys have been carried out in various parts of the world and have reported its medicinal uses and properties. Manuka honey from New Zealand is one of the most extensively studied honeys for its medicinal uses and antibacterial activity. In India, use of honey in medicine has been known since ancient times, but very few documented research reports are available. Indian honeys are classified according to their floral source, type of honeybee, season and location. However, little account has been taken of the very large variation that exists in the antibacterial potency of these different types of honeys.

OBJECTIVES, MATERIALS & METHODS

Hence, in the present study a total 400 clinical isolates of four types of bacterial spp. (*E. coli*, *S. aureus*, *P. aeruginosa* and *Klebsiella spp.*) were obtained from various clinical samples from Dept. of Microbiology, T. N. M. C & B. Y. L. Nair Ch. Hosp., Mumbai, Maharashtra, India during the period of Feb. 2005 to Jan. 2006. These clinical isolates were further grouped according to their sensitivity patterns to standard antibiotics. The in vitro antibacterial effect of six Indian honeys was then tested against these 400 clinical isolates along with standard ATCC strains of *E. coli*, *S. aureus* and *P. aeruginosa*. All Indian honey samples were compared with Manuka honey-UMF-16 from New Zealand for their physicochemical properties, enzyme levels and antibacterial activity.

RESULTS & CONCLUSIONS

It was found that Indian unifloral honey samples were more or less at par with Manuka honey. Detailed results will be presented.

Antimicrobial Properties of 'Kelulut' (Trigona Spp) Honey

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INTRODUCTION

The natural healing power of honey has been well documented. Most accounts on honey involve honey produced by the common honeybee (*Apis spp.*). Honey produced by stingless bee (*Trigona spp.*), commonly known as 'Kelulut' in Malaysia, is also known to have medicinal values. 'Kelulut' honey is widely used and consumed by the aborigines and is believed to have better performance than honeybee honey.

OBJECTIVES

It is claimed that 'Kelulut' honey is more effective than the common honeybee honey as a remedy for many diseases. The current study attempts to evaluate this hypothesis.

MATERIALS AND METHODS

The 'Kelulut' was tested against several strains of pathogenic bacteria and fungi, which cause common and major infections in humans. For antibacterial evaluation, disk diffusion method was adapted against six strains of bacteria, *Streptococcus* group A; *Staphylococcus aureus*, *Salmonella typhi*, *Shigella sonnei*, *Escherichia coli* and *Pseudomonas aeruginosa* using different dilutions of honey. The MIC of the honey was determined. Well diffusion assay method was implemented for antifungal screening test. The honey was tested against four pure isolates of fungi; *Candida albicans*, *Candida tropicalis*, *Aspergillus fumigatus* and *Cryptococcus neoformans*.

RESULTS

The results showed that all the bacterial strains tested were sensitive to the 'Kelulut' honey. Neat honey produced the best antibacterial activity when compared to dilute one. The clear zone produced by neat honey against *Salmonella typhi*, *Shigella sonnei*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Streptococcus* group A, were 30mm, 28mm, 26mm, 23mm and 24mm respectively. The MIC value for the bacteria tested was between 8.5 mg/ml to 70 mg/ml. However, no antifungal activity was detected against the four species of fungi used.

CONCLUSIONS

The study proves the potential of 'Kelulut' honey as a wide spectrum antibacterial agent especially against the pathogens tested. Although the honey did not show antifungal activity against the fungi tested, evaluation should be made using other types of fungi to explore the potential of 'Kelulut' honey.

The Effect of Manuka Honey on the Structure of Bacteria

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BACKGROUND

Although Manuka honey has been shown to be bactericidal for bacteria, the mechanism of inhibition has not been elucidated.

METHODS

Using cultures of *Staphylococcus aureus* and *Pseudomonas aeruginosa* the MIC and MBC values of Manuka honey were established. Using concentrations of Manuka honey two or three times higher than MICs, cultures were incubated with and without honey for 4 or 8 hours and examined using electron microscopy.

RESULTS

Both scanning and transmission electron microscopy were used. Structural changes in *Staphylococcus aureus* were distinct from those observed in *Pseudomonas aeruginosa*.

CONCLUSIONS

This suggests that Manuka honey has different target sites in these two bacteria.

Effect of Hydrogen Peroxide on Antibacterial Activities of Canadian Honey

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BACKGROUND

Honey becomes increasingly recognized as a preventive medicinal agent, promoting health and well-being. In order to endorse the therapeutic aspect of honey, quality control criteria are required to measure honey efficacy and relate it to honey specific biomarkers.

AIM

The aim of this study was to determine whether hydrogen peroxide could serve as a biomarker for antibacterial activity of Canadian honeys.

METHODS

A total of 42 honey samples originating from different plant sources were analyzed using a broth microdilution assay against two bacterial strains: *E. coli* (ATCC 14948) and *B. subtilis* (ATCC 6633). The dose-response relationship between antibacterial activity and honey concentration for each bacterial strain were analyzed and MIC90 and MIC50 values were established. Each honey sample was further investigated for the production of hydrogen peroxide using the hydrogen peroxide/ peroxidase assay and the results were compared with levels of antibacterial activities of honey, expressed as MIC90.

MAIN RESULTS

The majority of honeys demonstrated moderate to high antibacterial activity with MIC90 ranging from 25% to 6.25% v/v. MIC90 and MIC50 values revealed that Canadian honeys exhibit a selective growth inhibitory activity against gram-negative *E. coli*. The endogenous formation of H₂O₂ varied among honey samples and ranged from 0.92 μ M to 10.3 μ M. The comparison of the total H₂O₂ concentrations with honeys' antibacterial activities expressed as MIC90 values showed no correlation between these two factors (linear correlation for *E. coli*: $r = 0.15$, $p = 0.66$ n.s. and *B. subtilis*: $r = 0.039$, $p = 0.91$ n.s.).

CONCLUSIONS

These data indicate that all Canadian honeys exhibited antibacterial activity, with higher selectivity against *E. coli* than *B. subtilis*, and that these antibacterial activities were not correlated with hydrogen peroxide production in honeys. Hydrogen peroxide levels in honey, therefore, are not predictive of the honeys' antibacterial activity.

Honey as a Supplement to Fetal Bovine Serum in Cell Culture - A Pilot Study

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OBJECTIVE

The aim of this study is to assess the efficacy of honey (Tualang) when used as a supplement to fetal bovine serum (FBS) in cell culture and to determine its effect on the expression of tumour suppressor gene.

METHODS

The human osteoblast cell line CRL 1543 (ATCC) was used in this study. Honey was used at different concentrations as a supplement to fetal bovine serum in the cell cultures. The cytotoxicity was assessed by two different techniques; the MTT assay and the chromosomal assay. For the MTT assay, the absorbance values were analyzed using an Elisa reader at 570 nm and for the chromosomal assay, the cytotoxicity was assessed by calculating the mitotic index values. The gene expression was evaluated using RT-PCR techniques at different cell cultures harvest timings.

RESULTS

In the MTT assay, the percentage of cell viability was best observed at the concentrations of 0.0195% Honey + 10% FBS (105.3%), 0.0012% Honey + 2% FBS (78.4%) and 0.0049% Honey + 5% FBS (71.4%). Mean mitotic index values 1.75 ± 0.05 , 2.05 ± 0.05 and 2.3 ± 0.10 per cent were observed for the 3 different concentrations 0.0195% Honey + 10% FBS, 0.0049% Honey + 5% FBS and 0.0012% Honey + 2% FBS respectively.

CONCLUSIONS

The MTT assay shows that FBS cannot be completely replaced by honey in cell culture. The chromosomal analyses indicate that there is enhanced cell proliferation corresponding to the decrease in the concentrations of honey and FBS.

Influence of Honey on the Suppression of Human Low Density Lipoprotein (LDL) Peroxidation (In -vitro)

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The antioxidant activity of four honey samples from different floral sources (Acacia, Coriander, Sider and Palm) were evaluated with three different assays; DPPH free radical scavenging assay, superoxide anion generated in xanthine - xanthine oxidase (XOD) system and low density lipoprotein (LDL) peroxidation assay. The dark Palm and Sider honeys had the highest antioxidant activity in the DPPH assay. But all the honey samples exhibited more or less the same highly significant antioxidant activity within the concentration of 1mg honey / 1 ml in XOD system and LDL peroxidation assays.

The data support the concept that honey is bioavailable and it can increase the antioxidant activity in-vitro. It can be speculated that as honey dramatically slowed the rate of LDL peroxidation, it might be able to protect human LDL from oxidative stress. The chemical composition of these samples was investigated by GC/MS and HPLC analysis, 11 compounds being new to honey. The GC/MS revealed the presence of 90 compounds, mainly aliphatic acids (37 compounds), which represent 54.73, 8.72, 22.87 and 64.10 % for Acacia, Coriander, Sider and Palm honeys respectively. In HPLC analysis, 19 flavonoids were identified. Coriander and Sider honeys were characterized by the presence of large amounts of flavonoids.

Medicinal Properties of Honey from Northern Pakistan

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BACKGROUND

In Pakistan, honey is obtained from European and Oriental bee colonies foraged on variety of flora such as *Acacia modesta*, *Ziziphus spp.*, *Plectanthrus spp.*, *Citrus spp.* etc. Due to the richness in bee flora there is a great diversity in honey types. Honey produced from each plant species and from each geographical area has its own colour, flavour, and medicinal properties.

METHODS

We have made biochemical and pharmacological analyses of different unifloral and multifloral honeys produced in the plains and Himalayan regions of Punjab and North-Western provinces of Pakistan.

RESULTS

Honey samples showed antibacterial, antiplatelet and antinociceptive activities. Preliminary in vitro experiments described honey as an inhibitor of protein glycation. These observations pointed to the potential of honey and its constituents in conditions such as gastroenteritis, analgesia and inflammation.

Oral Session 2

Combined Intravaginal Bee Honey and Royal Jelly versus Intrauterine Insemination for Asthenozoospermia

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BACKGROUND & OBJECTIVE

Artificial insemination by husband (h-IUI) is a simple treatment method for infertility reasoned by asthenozoospermia. However, the pregnancy rates are poor. Artificial insemination donor (AID) is absolutely unacceptable in our society. The purpose of this work was to evaluate another simple method for "sperm enhancement" that entailed the midcyclic intravaginal use of bee honey and royal jelly by the wives, as compared to h-IUI.

MATERIAL & METHODS

Ninety-nine women with periods of infertility of more than three years, and in whom the sole reason for the infertility was asthenozoospermia, were studied. They were randomly assigned to use either pericoital intravaginal bee honey and royal jelly on cycle days 8 to 21 (group I), or h-IUI (group II) for three cycles. 5 ml crude Egyptian New Valley honey and half gram royal jelly were applied, using a special piston-like applicator. Application was either pre- or post-coital according to the personal preference. After a washout period of 2 months, women who did not conceive, were crossed over to the alternate protocol for another 3 cycles.

RESULTS

Five-hundred fifty three cycles were completed, 283 for group I, and 270 for group II. The pregnancy rates per cycle were 8.1 % for group I (23 pregnancies), and 2.6 % (7 pregnancies) for group II; a statistically significant difference

CONCLUSION

Combined pericoital intravaginal use of bee honey and royal jelly is a more effective, simpler, and less expensive therapy for infertility due to asthenozoospermia than h-IUI.

The Comparison of Topical Honey and Povidone Iodine for Dressing of Diabetic Foot ulcers

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BACKGROUND

Honey has been used in clinical practice for centuries. Its role as a dressing material that promotes wound healing has been observed in the treatment of a wide range of serious long standing ulcers and wounds. Honey debrided wounds rapidly, replacing slough with granulation tissue. It also promoted rapid epithelization, and absorption of oedema from around the ulcer margin. Diabetic foot ulcers have different characteristics since they are associated with polymicrobial infection, neuropathy and ischemia. The challenge in the treatment of diabetic foot ulcers is to find a dressing material that is able to overcome the unique features of diabetic foot ulcers.

OBJECTIVE

The aim of the study was to look at the efficacy of honey as a dressing material in diabetic foot ulcer (Wagner's stage 2), as compared to povidone followed by normal saline.

RESULTS

In the povidone group, all wounds infected with *Streptococcus spp.*, *Staphylococcus spp.*, *Acinobactor*, *Proteus* and *E.coli* became sterilized after treatment. However, wound infected with *Pseudomonas*, mixed organisms or enterococcus had persistent positive swab culture at the end of the study. In the honey group all wounds infected with *Streptococcus spp.* and *Staphylococcus spp.* became sterilized after treatment. However, wounds infected with mixed organisms, *Bacteroides* or enterococcus had persistent positive swab culture at the end of the study. The duration of wound healing in the povidone group was 9 to 36 days with a mean of 15.4 days. Whereas, in the honey group, it took 7 to 26 days with a mean of 14.4 days. The difference was not statistically significant ($p > 0.05$). However, honey had better effect in terms of reducing pain when changing the dressing, reduced the oedema faster and also suppressed the bad odour of the wound faster than povidone. There were no local or systemic complications in both groups. The overall cost of the dressing using honey was cheaper than povidone.

CONCLUSION

Honey dressing was shown to have results comparable to povidone for the treatment of diabetic foot ulcer in terms of sterility of the wound and the duration of wound healing.

Treatment of Infected Perineal and Episiotomy Wounds by Local Bee Honey Application

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OBJECTIVE

The aim of the study was to evaluate the therapeutic efficacy of topical honey as wound dressing in cases of perineal infections following gynaecologic surgeries and episiotomies.

SUBJECTS AND METHODS

Sixty one patients having either post-perineal repair or post-episiotomy wound infections were recruited and allocated into two groups. Group I (31 cases) received 12-hourly crude honey applications, and Group II (30 cases) had local antiseptics. Both groups received systemic antibiotics.

RESULTS

Group I showed: a) faster wound healing, b) shorter hospital stay, c) less need for secondary sutures, and, d) faster bacteriologic cure.

CONCLUSION

Honey is a very effective and inexpensive treatment for perineal wound sepsis.

Effect of Topical Honey Application Along with Intralesional Injection of Glucantime on Cutaneous Leishmaniasis Treatment

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INTRODUCTION

Leishmaniasis is an endemic disease in Iran. Although many treatments have been suggested for this disease, there hasn't been an effective and safe treatment yet. Regarding the healing effect of honey on the chronic ulcers and its reported efficacy on the cutaneous leishmaniasis, we performed a study to evaluate better the antiinflammatory effect of honey in cutaneous leishmaniasis and its final Scar.

METHOD

In a clinical trial study 100 patients were selected randomly in 2 groups, among referred patients to Skin Disease and Leishmaniasis Research Center. One group was treated with intralesional glucantime for one week and the other group was treated with intralesional glucantime and also topical application of honey twice a day for a week. The patients were visited twice at each week and at the end of second, third and fourth month at the end of treatment. They were followed up and the results were evaluated clinically.

RESULT

In this study 45 patients that had cutaneous leishmaniasis were treated with intralesional glucantime and 45 patients were treated with honey and glucantime and 10 patients were excluded from study. In the group that was treated with glucantime at the end of treatment 32 patients (71.1%) had improved and in the group that treated honey along with glucantime 23 people (51.1%) had improved, which showed a significant difference in two groups ($p=0.04$).

CONCLUSION

It appears that drug interaction and prevention of intralesional glucantime bioavailability due to use of topical honey have resulted in a significant decrease in improvement of cutaneous leishmaniasis lesions.

Preliminary Study of Honey Hydrogel Dressing for Burn Wound Healing in Rat Model

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BACKGROUND

The objective of this study was to develop and evaluate honey hydrogel dressing for wound healing application.

MATERIALS AND METHOD

To enhance further the use of our local honey in wound treatment and for easy handling, Gelam honey was incorporated into our hydrogel dressing formulation which was then cross-linked and sterilized using electron beam irradiation (25 kGy). Study was carried out on the physical properties of the hydrogel and diffusion rate of the honey from the hydrogel. The healing properties of honey hydrogel dressing on burn wound healing were investigated using 18 Sprague-Dawley male rats weighing 200-300 g. Deep partial skin thickness burns were inflicted on the dorsal part of each animal. The progress of wound healing was observed at 7, 14 and 21 days post burn. Rats were euthanized at 21 day post burn and skin samples collected were subjected to histological study.

RESULTS

Release study of honey hydrogel showed sustained release of honey for up to 7 days. *In vivo* healing study showed that there was a significant acceleration of the dermal repair in wound healing treated with honey hydrogel dressing compared to control group. Early attenuation of inflammatory reaction and early reparative activities were observed in wounds treated with honey hydrogel dressing. In addition, epithelial regeneration appeared to be significant in honey hydrogel treated wound.

CONCLUSION

The results of this study suggested that honey hydrogel wound dressing has the potential to modulate wound healing compared to hydrogel alone.

Honey Prevents Biofilm Formation In Microbial Pathogens

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INTRODUCTION

Microorganisms often exist in nature not as single cells, but in biofilms, comprising one or more bacterial or fungal species in complex association with one another, adhering to an inert or living surface, and enclosed in an extracellular matrix. This matrix acts as a protective layer over the cells, making them more resistant to antimicrobial attack. As such,

infections involving biofilms are difficult to eradicate, and pose a particular problem in indwelling medical devices such as catheters. The antimicrobial activity of honey against planktonic cells is well established. This activity is due to the production of hydrogen peroxide in most honeys, as well as phytochemical factors in rare *Leptospermum* honeys from Australia and New Zealand. However, the effects of honey on microbial biofilms are yet to be elucidated.

MATERIALS AND METHODS

We investigated the effect of honey on biofilm formation in *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Candida albicans*. Four honeys were tested: Jarrah honey, with activity due to hydrogen peroxide; a blend of hydrogen peroxide-type and *Leptospermum* honeys (Medihoney); a pure *Leptospermum* honey (Comvita); and an artificial honey, used to simulate the high sugar content in natural honey.

RESULTS

In the case of *S. aureus*, all three floral honeys significantly reduced biofilm formation at a concentration of 1% (w/v), and completely prevented biofilm formation at 5% (w/v). Artificial honey at concentrations up to 5% (w/v) actually promoted biofilm formation, while reduced growth was seen at concentrations of 10% (w/v) and above, indicating that osmotic pressure alone is not sufficient to prevent biofilm formation.

CONCLUSIONS

This study argues for the clinical use of honey as prophylaxis against biofilm formation, particularly for indwelling medical devices.

The Role of Honey in the Treatment of Cancer by the Islamic & Traditional Medicine In Jordan and Syria

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BACKGROUND

Honey has been used in various cultures since ancient times. Historically, it has been used to treat a number of clinical conditions including cancer-like ailments. Traditional Healers in Syria and Jordan use honey mixed with herbs and natural products for healing cancer. In this presentation, we will examine the historical texts of usage of honey in the treatment of tumors by Muslim physicians and natural healers. We will also review contemporary and traditional information available in Syrian and Jordanian communities in which honey has shown positive results in the control of cancer disorders and/or the improvement of patients' health.

AIM

This study sought to gain a preliminary understanding of the evidence of benefits of honey in treatment of cancer in traditional medicine of Jordan and Syria. It also explores the use of honey in historic Islamic Medicine through surveying references and texts of Muslim physicians and scholars.

METHODS

In our presentation on our regional traditional medicine, we will depend on the information from claims of experienced natural healers, in addition to natural medicine literature published in traditional Healing Books, general magazines, and web sites.

CONCLUSION

The use of honey in cancer patients should be considered when more conventional therapies have failed. Through traditional and historical knowledge, the use of honey in combination with other natural materials against cancer ailments is noted. Further studies are required to understand the use of different types of honey for the treatment of tumors. This paper perhaps serves as a stimulus for future specific research.

Poster 1

Topical Bee Honey for the Treatment of Dysesthetic Vulvodenia

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BACKGROUND

Dysesthetic vulvodenia is a subset of the vulvodenia (vulvar pain) syndrome, which is a psychosomatic diagnosis, often accompanied by physical and psychological disabilities. It is a difficult management problem. Most systemic and topical treatments do not achieve real success.

MATERIALS AND METHODS

Fifty one patients with dysesthetic vulvodenia, resistant to all conventional therapies, were evaluated and included in the study. They were treated with twice daily application of crude Egyptian clover flower honey till the symptoms disappeared or definitely subsided, or for a maximum of 8 weeks. The patients completed a pain scale (based on the Friedrich criteria) and Rosen's Female Sexual Function Index pre- and post-treatment.

RESULTS

A total of 51 patients were diagnosed as having dysesthetic vulvodenia at their initial office visit. Each patient identified the location and provided a description of the pain she was experiencing. The most common description of the pain sensation was "burning/pricking" (39%), followed by "burning" (24%). Thirty nine women (76%) had some degree of sexual dysfunction. One patient discontinued the treatment. No serious side effects were reported. Forty-five patients (90%) stated that, overall, their pain had improved, and twenty two (59%) had improvement in pain with sexual activity. Analysis of the pre- and post-treatment questionnaires revealed a significant decrease in pain intensity and in the frequency of the overall painful episodes.

CONCLUSION

Topical crude honey is safe and effective in providing temporary relief of dysesthetic vulvodenia with problems of vulvar pain and sexual dysfunction.

Poster 2

The Efficacy of Honey Dressing in Wound Management: A Clinical Observation

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OBJECTIVE

To evaluate the overall effectiveness of honey in promoting wound healing using standardised clinical parameters and correlating it to the known healing properties of honey.

METHODS

Clinical observation using standard parameters was done on 100 patients on honey wound dressing and 22 patients on saline dressing in University Malaya Medical Centre (UMMC) between July 1998 to January 2003. The wounds were classified using the Netherlands Wound-Care Society 1984 colour classification and assessment of wound size, surface area and wound depth were done prior to treatment.

RESULTS:

The positive effects of honey dressing on wound healing were seen in the reduction of mean wound size beginning in the second week of treatment with a statistically significant ($p < 0.05$) difference in mean wound size before and after 3 weeks of wound dressing between the two dressing groups. A sharp reduction in the depth of the wounds was seen in patients on honey dressing by the third week of treatment. Wound depth continued to decline significantly beyond the third week ($p < 0.05$). 98% of the wounds treated with honey reached 0-0.5cm wound depth before discharge. All wounds on honey dressing were colonized before treatment started. However, wound sterility was achieved by the third week of treatment. Wounds on honey dressing achieved better outcome in healing within 3 weeks compared to those on saline dressing ($p < 0.05$), although initially the wounds were in much worse condition. Duration of hospitalisation among patients treated with honey dressing was shorter compared to patients receiving saline wound dressing ($p < 0.05$).

CONCLUSION

From the study, it was clinically shown that honey dressing is able to reduce wound size and depth, promote wound healing processes and speed up wound healing which leads to decrease in the treatment period. Various factors present naturally in honey works synergistically to promote the healing process, eradicating the colonizing pathogen and improving overall patient well-being contributing to a better outcome. It is a cost effective wound management option with wide spectrum antimicrobial activity. Honey dressing can be used for multiple types of lesions, needing only simple alteration of its application, making this versatile and ready to use remedy a superior choice as an effective alternative wound dressing.

Poster 3

Bee Honey Nebulization as a Non Traditional Treatment of Acute Bronchial Asthma in Infants and Children

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BACKGROUND

Bee honey has been an outstanding household remedy used for the treatment of cough and wheezing associated with bronchitis. The therapeutic use of honey in the form of inhalation dates from very early days. This method is particularly effective in the treatment of diseases of the upper respiratory tract.

OBJECTIVE

The present work attempted to study the effects of bee honey in the form of nebulization in infants and children with acute asthma.

SUBJECTS AND METHODS

After obtaining consent from their parents, 300 infants and children with mild to moderate acute attacks of asthma were included in this study. The mean age of studied patients was 2.49 ± 3.02 years with male to female ratio of 1.2 to 1. All studied patients received Bee Honey Nebulization (BHN) for 30 minutes. Neither corticosteroids nor bronchodilators were given. The response was judged 60 minutes after BHN by changes in respiratory rate (RR), heart rate (HR), O₂ saturation at room air (SPO₂), dyspnoea, use of accessory respiratory muscles and chest wheezes.

RESULTS

There was a significant increase of SPO₂ and decrease of RR and HR 60 minutes after BHN. The dyspnoea improved in 94% of patients. The chest wheezes disappeared in 35% and decreased significantly in 31% of patients. Six (6) patients were admitted because of persistence of symptoms. During and after BHN increased frequency of productive cough occurred in 78.7% and it was severe and exhausting in 2%. The expectoration of sputum was followed by improvement in nearly all patients. Apart from severe exhausting cough, no side effects occurred during and after BHN.

CONCLUSION

BHN is an effective and safe treatment for mild and moderate acute attacks of asthma in infants and children.

Poster 4

The Potential Application of Honey in Enhancing the Acceptance of Herbal Lip Balm

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BACKGROUND

The aim of this study was to observe the influence of honey on the acceptance of herbal lip balm.

MATERIALS AND METHODS

Herbal lip balm was formulated with ingredients in specific percentages i.e. extracts of herbs, essential oils, honey, olive oil and natural pigment of Roselle (*Hibiscus sabdariffa* L.) for colorant. Acceptability of the lip balm was determined through sensory evaluation with the participation of 30 members (female) of untrained panelists comprising of staff of MINT during two weeks' application. A 7-point hedonic rating scale was used. The attributes evaluated were aroma, colour, texture, taste, smoothness, spreading ability and overall acceptance. Presence of mouth odour and cracks in lips were also observed.

RESULTS

The lip balm had the ability to moisten and healed chapped lips and also reduced the mouth odour. This may be due to

the presence, in herbal lip balm, of essential oils and honey that have antibacterial and antioxidant properties. With increasing public concern about the safety of synthetic colorants, natural pigment extracts are assuming greater prominence. Anthocyanin, a natural pigment, was used as colorant and was responsible for the red colour. The reddish colour of the lip balm increased as the percentage of honey increased. The changes in pH of the lip balm by honey influenced the colour since anthocyanins are red-coloured in acidic solutions. Increased redness colour in lip balm scored higher value for the overall acceptability of the lip balm.

CONCLUSIONS

Honey has a role in enhancing the colour, taste, nutrition and medicinal properties of the herbal lip balm. Additional benefits were gained with combination with the essential oils and herbal extracts in producing a high quality, desirable herbal lip balm which was safe for human utilization.

Poster 5

Honey Supplemented with Bee Venom - A Novel Health Product

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BACKGROUND

Natural honey is usually contaminated with a trace amount of bee venom. Further artificial supplementation of natural honey with purified bee venom might significantly benefit its healing properties. The aim of this study was to estimate the concentration ranges of the major biologically active bee venom peptides in natural honey in order to determine the optimal safe and effective healing dose of the supplemented bee venom in our new honey health products.

METHODS

We used immuno-blot analysis to determine concentrations of the major bee venom peptides in natural honey. Honey samples as well as purified bee venom were subjected to electrophoresis in 15% polyacrylamide gel containing sodium dodecylsulphate (standard SDS-PAGE protocol). Separated protein bands were transferred from the gel into a nitrocellulose membrane and visualized using specific bee venom antiserum (Sigma, USA) and the chemiluminescent ECL reagent (Amersham, UK). Relative optical density of each individual protein band was measured using "Quantity One - 4.1.1" software (BioRad, USA).

RESULTS

We determined that a group of low molecular weight peptides of bee venom, such as melittin and protease inhibitors, is present in natural honey. All these peptides are known to have systemic action: anti-inflammatory, anti-fungal, anti-bacterial, anti-pyretic, stimulating vascular permeability. We revealed that the average concentration of melittin in natural honey corresponds to 1.1 - 1.7 ppm of purified bee venom. The main bee venom allergic component, Phospholipase A2, being in honey, loses the ability to interact with bee venom antibodies and thus loses its immuno and allergic activity. This suggests that natural honey inhibits allergic properties of bee venom and makes safer its use as a healing product.

CONCLUSIONS

The results allowed to develop safe and effective bee venom dosage and create new honey products with effective healing properties.

Poster 6

Effects of Tualang Honey on Reproductive Organs in Ovariectomised Rats

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BACKGROUND

Honey is used traditionally for treatment of various medical problems including peri and postmenopausal complications.

OBJECTIVE

Hence the objective of this study is to evaluate the effects of Tualang honey on reproductive organs (uterus and vagina) in ovariectomised rats (postmenopausal animal model).

MATERIALS AND METHODS

Twenty one (21) adult female Sprague Dawley rats were randomly divided into 3 groups (7 animals per group). Animals in group 1 were subjected to sham operation under general anesthesia (CS) and were given distilled water 0.5 ml daily

by gavaging for 14 days. Animals of group 2 and 3 underwent bilateral oophorectomy. Animals of Group 2 were given distilled water (CO) and animals of Group 3 received Tualang honey 2 g/kg daily (HO) for a similar duration. All animals were sacrificed 24 hours after the last dose (during diestrous phase). Reproductive organs were removed, weighed and subjected to histological examination.

RESULTS

The uterine and vaginal relative weights were not significantly different in honey treated and nontreated ovariectomised animals. Both vaginal epithelium and epithelium-muscles thicknesses were significantly improved in honey treated compared to non-treated ovariectomised rats. No significant differences were noted in endometrial and endometrial-muscle thicknesses of the uterus in honey treated and non-treated ovariectomised rats.

CONCLUSION

This findings support the traditional use of honey in postmenopausal women. Vaginal atrophy and dryness are among the important adverse effects of postmenopausal state. This problem could be overcome by consuming honey.

Poster 7

Honey Ameliorates Hematological and Biochemical Changes Following Hemorrhage and Food Restriction

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OBJECTIVE

The objective was to assess (1) effects of various diets including total food restriction with 50% honey feeding (TFRH), total food restriction with 50% dextrose feeding (TFRD) or ad libitum (control group) commercial regular diet (DCRD), on hematological and biochemical variables, and (2) influence of the various diets on the same parameters after acute blood loss (ABL).

MATERIALS AND METHODS

Thirty Sprague Dawley albino rats were divided into 3 groups, 10 rats each. Group A was fed DCRD, Group B TFRD and Group C TFRH. After 8 days of feeding, rats were subjected to ABL (6 ml/kg) and blood investigations were performed. After ABL, same feedings were continued for further 8 days and the blood tests were repeated at day 8 post-bleeding.

RESULTS

TFRD compared to DCRD reduced hematological and biochemical variables. TFRH compared with TFRD caused greater reduction in fasting blood sugar (FBS), AST, ALT, and triacylglycerol (TG). ABL caused elevation of WBC, lymphocyte percent, fasting blood sugar (FBS), BUN, Alkaline phosphatase, TG, and a reduction in serum albumin, protein, cholesterol, AST, serum creatinine and hemoglobin (Hb). The differences were significant ($p < 0.05$) for FBS, AST, alkaline phosphatase, serum albumin and protein. Significant reduction in FBS, WBC, BUN, AST, ALT, alkaline phosphatase, TG, and significant elevation of Hb and serum albumin were obtained after ABL in rats fed TFRH as compared to other two groups. TFRH increased serum albumin, serum protein, FBS, and caused lower reduction in Hb as compared to other groups.

CONCLUSION

Honey feeding during total food restriction significantly modifies and ameliorates biochemical and hematological changes observed after ABL. This will pave the way to use honey as a part of management of bleeding and during a food restriction regimen.

Poster 8

Knowledge, Attitude and Practice About Use of Honey Among Patients at A Teaching Hospital in Karachi

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OBJECTIVE

Study the knowledge, attitude and practices with regard to use of honey among patients.

METHODS

A questionnaire was developed to document the demographic profile of patients and their knowledge, attitude and practices with regard to use of honey. It was administered to outpatients visiting a teaching hospital in Karachi, Pakistan. Ethical requirement for the conduct of the study were met.

RESULTS

Four hundred patients were interviewed. Majority were educated men and women engaged in various professions, students and housewives. A majority (92.5%) believed that honey has medicinal uses and a substantial number (82%) had inclinations towards use of honey due to religious reasons. A substantial number of patients reported use of honey for disease prevention (59%) and treatment (71%). Sources for acquiring knowledge on honey were several and included friends (37%), family members (49%) and health care providers (47%). A majority of respondents (70.5%) believed that honey should be part of the daily diet. A significant number of patients believed honey should be given to pregnant women (62%), diabetic patients (37%) and newborns (62%). A small number (10%) reported side effects with use of honey. Honey use was reported for cough and cold, constipation, obesity, eye and skin diseases.

CONCLUSIONS

We have documented knowledge, attitude and practices with regard to honey use among our patients with important implications for medical practice.

Poster 9

The Antibacterial Effect of Honey on Staphylococcus and Pseudomonas in Comparison to Similar Sugar Solutions

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BACKGROUND

It has been suggested that pure honey is bactericidal for many pathogenic organisms, including various gram negative and gram positive bacteria. This *in vitro* study investigates the antibacterial effect of honey against coagulase-positive *Staphylococcus* and *Pseudomonas* in comparison to similar sugar solutions (with the same ingredients as honey).

METHODS

The growth of coagulase-positive *Staphylococcus* and *Pseudomonas* in media containing varying concentrations of honey and corresponding sugar solutions was measured. The density of the evaluated honey was 1.4 gram/ml and it was composed of 75% sugar (especially fructose and glucose), 20% water, and 5% other substances. A ratio of 2 to 1 of fructose to glucose was considered in the sugar solutions in order to prepare these solutions with similar sugar content as in the honey preparations.

RESULTS

It was demonstrated that the growth of common wound infection organisms was inhibited more efficiently by honey than by sugar. *Staphylococcus* did not grow in culture media containing 40% honey while it grew in culture media containing sugar similar to 40% honey. *Pseudomonas* did not grow in culture media containing 30% honey but it grew in culture media containing sugar similar to 30% honey, although its growth was inhibited by culture media containing sugar similar to 40% honey.

CONCLUSION

The good antibacterial effect, sterility, low cost and easy availability of honey makes it an ideal substance for prevention and treatment of wound infections.

Poster 10

The Antimycobacterial Effect of Honey: An In-Vitro Study

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BACKGROUND

Avicenna recommended honey in the treatment of tuberculosis. Honey has potent bactericidal activity against many pathogenic organisms, but its antimycobacterial effect has never been studied.

METHODS AND MATERIAL

In this study the antimycobacterial effect of honey was evaluated *in vitro*. Standard Lowenstein- Jenson media and L-J media containing various concentrations of honey were prepared. Two bacilli from positive cultures and two from positive smears of the affected patients were inoculated on each of the prepared plates.

RESULTS

It was demonstrated that the growth of mycobacteria was inhibited by adding 10% honey to the media. Mycobacteria did

not grow in culture media containing 10% and 20% honey while it grew in culture media containing 5%, 2.5% and 1% honey.

CONCLUSION

The good antimycobacterial effect, sterility, low cost, and easy availability of honey makes it an ideal antimycobacterial agent.

Poster 11

Effects of Mixed Culture of Human Isolates on Grade of Their Growth and Their Response to Honey

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BACKGROUND

The present study investigated activity of honey towards high dose of single and mixed microbial culture when isolates were grown in media containing honey. The study showed effect of mixed microbial culture on their growth and their response to honey.

MATERIAL AND METHODS

- 1) 10 ul specimens of *Staphylococcus aureus* (*S. aureus*), *Streptococcus pyogenes* (*S. pyogenes*), *E. coli* and *Candida albicans* (*C. albicans*) were cultured into 10 ml broth containing 10-100% (w/v) honey concentrations.
- 2) Six types of mixed microbial cultures were prepared by culturing the isolates with each other onto broth (control) and broth containing various concentrations of honey (10-100% w/v). Microbial growth was assessed on solid plate media after 24 hours' incubation.

RESULTS

Honey (30-70%) prevented growth of 10 ul specimens of all the isolates. Greater reduction in growth of *E. coli* was observed when cultured with *S. aureus*. Culturing of *S. aureus* with *S. pyogenes*, *C. albicans*, or *E. coli* increased its sensitivity to honey. *S. aureus* and *S. pyogenes* increased the sensitivity of *C. albicans* to honey while *E. coli* and *C. albicans* decreased the sensitivity of *S. pyogenes*.

CONCLUSION

Honey prevents and inhibits growth of single and mixed pathogenic isolates. Mixed microbial culture affects growth of the isolates and increases their sensitivity to honey.

Poster 12

Synergistic Effect of Starch on the Honey Antibacterial Activity Against Staphylococcus Aureus

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BACKGROUND

A comparative method of adding honey to culture media with and without starch was used to evaluate the role of amylases present in honey in enhancing its antibacterial activity.

MATERIAL AND METHODS

Three varieties of honey from different origins were tested for their antibacterial activity against a strain of *Staphylococcus aureus* using an agar incorporation technique. For each variety the Minimum Inhibitory Concentration (MIC) was determined by finding the plate with the lowest concentration of honey on which the strain would not grow. A solution of 10 % starch was used to add the given concentration to honey. An equivalent volume of water was added to honey as control. Honey and starch as well as honey and water were incubated for 24 hours at 37°C before being incorporated to nutrient agar. The same volume of starch was added to media without honey as control. The MIC for each batch of media was then determined.

MAIN RESULTS

The MIC for the three varieties of honey without starch was 11 %, 24 % and 29 %. When starch was added to the media containing honey the MIC obtained was 5 %, 19 % and 25 % respectively. The inhibitory action was shown neither in the media containing starch only nor in media with honey and water with the corresponding MIC.

CONCLUSION

As amylases originating from bees and pollen are present in honey, these split starch chains to randomly produce dextrin and maltose and probably increase the osmotic effect in the media by increasing the amount of sugars and consequently increase the antibacterial activity. Clinical trials using a mixture of honey and starch to treat infections could validate this finding.

Poster 13

Sahara Honey Shows a Higher Potency Against *Pseudomonas Aeruginosa* Compared to Other Algerian Types of Honey

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BACKGROUND

Sahara honey was compared with other varieties of Algerian honey for its effectiveness against *Pseudomonas aeruginosa*.

MATERIAL AND METHODS

Six varieties of honey from different regions in Algeria were used to determine their potency against *Pseudomonas aeruginosa*. Four varieties originated from northern Algeria and two from the Sahara. Two types of media were used: nutrient broth and King A agar. The media incorporation technique was used. For each variety the Minimum Inhibitory Concentration (MIC) was determined by finding the plate with the lowest concentration of honey on which the strain would not grow or the tube with the lowest concentration of honey without the development of a veil of colonies on its top.

MAIN RESULTS

On the King A agar the MIC of the four northern varieties ranged from 25 % to 31 % whereas the MIC of the two varieties of Sahara honey was 12 % and 15 %. On nutrient broth the MIC of the northern varieties ranged from 10 % to 21 % whereas the MIC of the two varieties of Sahara honey was 9%.

CONCLUSION

The botanic flora of the Sahara is known in Algeria for its medicinal use. The higher potency of the Sahara honey is most probably due to its plant-derived antibacterial substances. Further studies may elucidate the nature of these substances.

Poster 14

Therapeutic Uses, Total Phenolic, Flavonoid & Proline Contents and Antioxidant Activity of Burkina Faso Honey

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BACKGROUND

The aim of the study was to describe the therapeutic uses of honey in Burkina Faso, and to study the total phenolic content and the antioxidant activity of some honey samples of the country.

METHODS

Traditional healers and family heads were interviewed in four regions from the central part of the country. Twenty seven honey samples were collected from apiarists during the surveys. Total phenolic, flavonoid and proline contents were determined according to the Folin-Ciocalteu, aluminium trichloride and ninhydrin reagent procedures respectively. The antioxidant activities were determined in terms of % inhibition and total antioxidant contents using DPPH.

MAIN RESULTS

The therapeutic uses described included treatment of various gastrointestinal disorders, respiratory ailments, fatigue, vertigo, ophthalmic disorders, toothache, measles, wounds, burns, chest pains, period pains and postnatal disorders, male impotence as well as its application as a skin cleansing agent. The honey samples consisted of 18 multifloral, 2 honeydew and 7 unifloral honeys, derived in the latter cases from flowers of Combretaceae, Vitellaria, Acacia and Lannea plant species. The total phenolic contents varied considerably with the highest values obtained for honeydew honey. Similarly, much variation was seen in total flavonoid and proline content, with Vitellaria honey having the highest proline content. Vitellaria honey was also found to have the highest antioxidant activity and content. The correlation between radical scavenging activity and proline content was higher than that for total phenolic compounds.

CONCLUSIONS

Our study showed anecdotal evidence supporting the beneficial use of honey as a remedy for various ailments. It also suggests that the amino acid content of honey should be considered more frequently when determining its antioxidant activity.

Poster 15

Phenolics Profile and Antibacterial Activity of Burkina Faso Honey

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BACKGROUND

The aim of the study was to determine the phenolic profile and the antibacterial activity of Burkina Faso honey samples (6).

METHODS

Pollen analysis of honey samples allowed the identification of one Acacia, one Lannea and four multifloral honeys according to their floral origin. The phenolic compounds were extracted using amberlite XAD-2 resin and identified via high performance liquid chromatography - diode array detector analysis. The antibacterial activity was determined via well diffusion assay using diluted honey samples and three strains of standard bacteria (*Shigella dysenteriae*, *Proteus mirabilis* and *Staphylococcus aureus*).

MAINS RESULTS

The HPLC-DAD analyses of phenolic acid profiles showed that Burkina Faso honeys (6) contained vanillic acid, ferulic acid, hydroxycinnamic acid, cinnamic acid, caffeic acid and ellagic acid, with highest level of hydroxycinnamic acid in the Acacia honey. Eleven flavonoids and one coumarin were found in the honey samples studied. The dominance of flavonols and, above all, quercetin was observed. All the honey samples were found to inhibit the growth of *Shigella dysenteriae*, *Proteus mirabilis* and *Staphylococcus aureus*, which are pathogens of some infections described in surveys.

CONCLUSIONS

Since phenolic acids and some flavonoids are known to exert antibacterial effect, their presence in honey explains its antibacterial activity.

Poster 16

Anti-Radical Activity and Total Polyphenol Content in Selected Pure and Commercial Honey

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BACKGROUND

Researchers have found that honey maybe a healthier alternative to corn syrup due to its higher level of antioxidants, compounds which are believed to fight cancer, heart disease and other diseases.

MATERIAL AND METHODS

Four different types of honey were selected for this study; 'madu lebah asli' (Pahang) which contained 100% of pure honey, 'madu lebah tualang' (N'apis) which also contained 100% of pure honey, 'cuka madu asli' (Biofeld) and 'madu abang power' (N'apis) which contained the mixture of honey and selected herbs such as 'tongkat ali', 'ubi jaga' and 'penawar pahit'. DPPH free radical scavenging assay and Folin-Ciocalteu method were applied for determination of anti-radical activity and total polyphenol content of the samples, respectively. The anti-radical activity and total polyphenol content were expressed as mean of triplicate values and anti-radical activity was compared to synthetic antioxidant, butylated hydroxyl toluene (BHT). One way ANOVA test ($p < 0.05$) was used to determine the significant differences between samples.

RESULTS

The DPPH free radical scavenging activity of BHT at concentration of 200 mg/l was the highest (76.76%), followed by 'madu abang power' (N'apis) (55.17%), BHT at concentration of 50 mg/l (43.95%), 'madu lebah tualang' (N'apis) (33.39%), 'madu lebah asli' (Pahang) (30.89%) and 'cuka madu asli' (Biofeld) (29.79%). The same trend was also observed in the total polyphenol content. Among the honey samples tested, the total polyphenol content in 'madu abang power' (N'apis)

was the highest, followed by 'madu lebah tualang' (N'apis) and 'madu lebah asli' (Pahang). Total polyphenol content was least in 'cuka madu asli' (Biofeld). The values were 1.46, 0.60, 0.33 and 0.13 mg GAE / 10 g, respectively.

CONCLUSION

The anti-radical activity and total polyphenol content were higher in the mixture of honey and selected herbs (madu abang power) when compared to 100% of pure honey (madu lebah tualang and madu lebah asli). Cuka madu asli has the lowest anti-radical activity and total polyphenol content. This may be due to vinegar formation.

Poster 17

Antibacterial Activities of Some Honey Samples from Karnataka, India

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BACKGROUND

Honey is a natural hive product which has been used extensively for the treatment of many diseases including bacterial infections. Honey also acts as an antibiotic agent on few strains of bacteria.

METHODS

To analyze this function, different strains of bacteria were collected and cultured under laboratory conditions. The antibacterial activity of different honey samples of different dilutions were tested against *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Escherichia coli* and *Bacillus*.

MAIN RESULT

Honey showed significant variations in antibacterial activity. There were no inhibitory zones seen for all the diluted samples of honey of GKV of Bangalore and K.G.F. of Kolar regions. Kushal Nagar honey showed higher antibacterial activity than the other honey samples.

CONCLUSION

Hence, it can be used as a topical agent for curing infective wounds or burns. The cause for the antibacterial activity of honey, which upon mild dilutions leads to the higher concentrations of hydrogen peroxide and HMF, may be due to the presence of glucose oxidase enzyme in the honey samples.

Poster 18

Effect of Propolis Production on Honey Yield and Population in Honeybee Colonies

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INTRODUCTION

Propolis, a resinous wax-like substance produced by honey bees (*Apis mellifera*), has been well known in recent years. Some diseases curable with propolis include bad breath, eczema, eye infections, throat infection, ulcers and urinary tract infections. Propolis is available for purchase as an ingredient in capsule form, lip balm, skin cream, tincture, toothpaste, and sore-throat lozenges. Considering the importance of the propolis, four propolis-producing methods were studied during 1999-2000 in Animal Science Research Institute, Karaj, Iran.

OBJECTIVE

The aim of this study was to survey the influence of the increasing propolis production on the honey yield and the population in honey bee colonies.

MATERIALS AND METHODS

Net (mesh18), Tarpaulin, Fibre, and Roland bell trap were used for propolis production. In this experiment, population of adult bees and broods, the amount of honey and pollen in the hive were uniformed, and also, young queen sisters were introduced to the colonies. This study was conducted for 3.5 months in 1999 and 2.5 months in the year 2000. The amount of propolis production was measured twice a week, population size once per month, and the amount of honey at the end of autumn.

RESULTS

The Rolland bell method of propolis production gave significantly lower amounts of propolis than the others in October. However, it did not differ significantly compared to others in December. The maximum amount of harvested propolis was

51.27 g/hive, using the fiber method. Population density of colonies did not significantly differ ($p < 5\%$) among the methods in this study. A significantly positive correlation was observed between population and honey yield, and between honey yield and propolis production ($p < 5\%$).

CONCLUSIONS

Propolis- producing methods studied did not have undesirable effects on honey yield and colony population. These results indicated that propolis-producing methods might not have undesirable effects on bee population density and honey production.

Poster 19

Study and Identification of Medical Plant Species Used by Honeybee in Markazi State

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BACKGROUND

Iranians have been aware of applications of honey for centuries. The great Iranian scientists such as Avi Sina have noted these applications. There is evidence for medical application of honey in Holy Koran (Nahl Sura, paradigm 67 and 68). WHO has reported that 80% of the population prefer to use herbal extracts for primary health care. This is good news for bee keepers interested in producing honey from medicinal plants.

METHOD

In this study the medicinal plants visited by honeybees were identified and their flowering periods noted. The honeybee colonies were established on all of the selected stands during the growing season. The pollen grains were collected by making pollen traps in front of the colonies. The plants which the honeybees visited upto a distance of 3km was studied using direct observation. The kind and rate of honeybee activity were determined as well (from the point of view of nectar or pollen). The samples were collected and pressed and identified according to national and international valid references. In order to control direct observation, the pollen grains were analyzed according to Erdtman method.

RESULT AND CONCLUSION

On the basis of this investigation 56 medicinal plant species which are used by honeybees were identified.

Poster 20

The Presence of Synthetic and Adulterated Honeys in Malaysia

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BACKGROUND

The subject of honey purity is gaining public attention in Malaysia. In fact, the first question asked by any buyer of honey is: is this honey sample pure? The presence of synthetic and adulterated honeys is on the increase. This study was conducted to screen some honeys available in Malaysia to ascertain their purity. Only samples claimed to be of Malaysian origin were analysed in this study.

METHODS

40 samples were analysed for their reducing sugar (fructose, glucose, maltose and turanose), nonreducing sugar (sucrose) and hydroxymethylfurfuraldehyde (HMF) contents. Methods of analysis were based on those recommended by International Honey Commission (IHC) and Department of Standards Malaysia, with a minor modification.

RESULTS

Nine samples gave results conforming to international accepted values indicating pure honey. Thirty one samples showed values indicating that they were either synthetic or adulterated honeys. Synthetic honeys were made by acid treatment of sugar solutions which leads to the formation of a byproduct, hydroxymethylfurfuraldehyde (HMF) in large quantity (more than 200 mg/Kg whereas values not exceeding 80mg/Kg is allowed in honeys from tropical countries). Adulterated honeys were on the other hand, produced by mixing certain portions of pure honey with sugar solution (cane sugar).

CONCLUSION

Our findings clearly indicate that only 23 % of honey sold in Malaysia is pure. obscure.

Poster 21

Surface Characterization of Selected Malaysian Honey Observed Under VPSEM

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INTRODUCTION

In 1989 an editorial column of the Journal of the Royal Society of Medicine expressed "The therapeutic potential of uncontaminated, pure honey is grossly underutilized. It is widely available in most communities and although the mechanism of action of several of its properties remains obscure. Thus there is a need for further investigation; the time has now come for conventional medicine to lift the blinds off this 'traditional remedy' and give it its due recognition". Honey is widely used in traditional medical systems as a food supplement, an aid or remedy to manage diversity of wounds and as a preservative for herbal medicines.

OBJECTIVE

The present pilot study discusses the variable pressure scanning electron microscopic (VPSEM) data and its role in determining topographical minute morphology at various phases of dried honey and qualitative analysis for its elemental ingredients. Tualang, Kelulut and local forest honey, 'Hutan' were selected. Data collected can provide further advisory information with regard to the reported biochemical and pharmacological properties and the mechanism related to the beneficial effect of honey.

MATERIAL AND METHODS

The pilot study utilizes LEO SUPRA 50 VPSEM (incorporated with energy dispersive x-ray scanning EDX) at 27 Pascal pressure and 8mm working distance. The honey was dried on a glass plate via the critical point drying technique and then sputter coated with thin layer of titanium.

RESULTS

VPSEM of the dried forest honey revealed a smear that is observable in various phases. The superior most surface can be described as a top film that is presented with multiple osteonal like presentations with well defined circumferentially placed outer and inner core layers. This top film was thin, translucent and rests on the actual thick smear of the forest 'Hutan' honey below it. In this honey, EDX detected a 48.89 weight % of carbon and 47.40% of oxygen. VPSEM of the critically dried 'Tualang' and 'Kelulut' honey also revealed a well-defined top film that is superimposed as if blanketing the actual main bulk of the 'Tualang' and 'Kelulut' honey that is situated below it. This top film is thin and easily crumpled like that of crumpled wasted tissue paper in presentation. In tualang, EDX detected a 41.81 weight % of carbon and 58.19 % of oxygen

CONCLUSIONS

The introduction of VPSEM in honey research can help healthcare providers acquire more knowledge on this highly commercialized entity. Research which provides information on local honey must be enhanced.

Poster 22

Qualitative Studies of Multifloral, Wild and Apiary Honey of *Apis Cerana Indica* in Western Ghats of Karnataka, India

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METHOD

Multifloral, wild and apiary honey of *Apis cerana indica* was collected from Western ghats of Karnataka, India during 2004-05. Data pertaining to its physical and chemical characterizations like optical density, viscosity, moisture level, total sugars, ash content etc. have been determined.

RESULTS AND CONCLUSION

The colour of the honey varied from light to dark brown. The viscosity of honey depends on the nature of nectar, flower types and the weather conditions of the region. There were variations in the enzyme level and mineral content. Honey samples were known to contain some amount of pollen grains and pollen profiles have been prepared for different samples. The multifloral honey has mixed flavour and aroma due to its diversified flora in the study area. Depending on the type of pollen available in the tested samples, the sources have been classified into minor, medium and major sources. In addition random pollen content in squeezed and extracted honey was estimated and pollen profiles were prepared. Factors influencing and affecting the quality of honey in different regions in the study areas are discussed.

Poster 23

Honey and Angiogenesis - A Preliminary Investigation

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BACKGROUND

The healing properties of honey have been demonstrated in both animals and humans, although not all studies report positive findings. The lack of positive effects on healing could be due factors such as the type and/or the concentration of honey. The observed effects of honey include angiogenesis. Honey appears to influence the wound environment and modulate immune responses during the healing process. Angiogenesis occurs during the proliferative phase of wound healing and requires the development of an extracellular matrix (ECM) to support new capillaries. It is possible that either honey influences angiogenesis by the release of cytokines or that glucose in honey is converted to hyaluronic acid, a component of the ECM that has been shown to affect angiogenesis. The aim of this study was to investigate the potential angiogenic effects of honey.

MATERIALS AND METHODS

Using an established aortic ring assay, the angiogenic properties of three types of honey and a control at various dilutions were investigated: artificial honey (fructose, glucose and water equal to a 70% sugar solution), Rowse (commercial honey), Mesitran™ and Activon™ ointment.

PRELIMINARY RESULTS

Total tubule lengths were as follows: artificial honey 0.008% - 11cm²; Rowse 0.04% - 12.5cm²; Mesitran™ 0.20% - 13.0cm²; and Activon™ 0.20% - 15.0cm². The most pro-angiogenic honey was Activon™ which showed the highest number of junctions and tubule formations. However, at a dilution of 0.04% all honeys were pro-angiogenic compared with the control. All honeys were anti-angiogenic at a concentration of 5% and above.

CONCLUSIONS

The concentration and/or type of honey may be a factor in wound healing in response to honey. There may be an unidentified factor in some honeys stimulating angiogenesis and/or the glucose in honey contributes to the hyaluronic acid content of the ECM, which stimulates angiogenesis. Anti-angiogenesis may be due to the cytotoxic effects of honey.

Poster 24

In-vitro *Milk Anti-Bacterial Activity Enhancement by the Use of Honey*

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OBJECTIVE

This study aims to investigate the anti-Staphylococcal activity of honey in combination with bovine milk.

MATERIALS & METHODS

One sample of Omani honey (OH26) was investigated for its activity against *Staphylococcus aureus* (NCTC 6571), using an agar well diffusion technique. The honey sample gave excellent anti-Staphylococcal activity. Four different samples of bovine milk (Al Marai, Al Rawabi, A'Sfwa and Sohar) were investigated for their anti-Staphylococcal activity. Two of the milk samples were investigated for their *Staphylococcus aureus* killing rates, each on its own and in combination with the Omani honey using tube dilution technique.

RESULTS

Two samples of milk demonstrated moderate anti-Staphylococcal inhibitory activity (zone of inhibition 20mm). OH26 demonstrated excellent anti-Staphylococcal activity (zone of inhibition of 42 mm). OH26 in combination with milk demonstrated enhanced killing activity. At 2 hours, honey demonstrated 50% killing, while the combination of honey with either Al-Marai or Al Rawabi milk demonstrated 66% and 69% killing, respectively. At 6 hours, honey killed 71% while the combination with either milk samples killed >90%. The combination of honey and milk showed better killing rates, enhancing the killing activity by approximately 20%. Honey alone requires more than 20 hours for killing all bacteria, whereas when milk is combined with honey the time for 100% killing is reduced to less than 16 hours.

CONCLUSIONS

Omani honey possesses in-vitro anti-*Staphylococcus aureus* activity. Not all milk samples possessed anti-Staphylococcal activity. The killing activity of milk is enhanced by the use of honey.

Poster 25

Effect of 'Tualang Honey' on Spermatogenesis in Rats

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BACKGROUND

Honey is frequently consumed by Malays for enhancement of fertility and vitality. Hence, the aim of this study was to determine the effect of Malaysian honey on spermatogenesis in rats.

MATERIALS AND METHODS

Male Sprague-Dawley rats, aged 8 weeks (200-230g) were treated with either 0.2, 1.2 or 2.4 g/kg/day of honey for 28 days (n=7 for each group) by gavaging. Control animals were given deionized water for the same duration. General health and body weight of the animals were monitored daily and weekly, respectively. At the end of the study, animals were sacrificed and reproductive organs were carefully removed and studied.

RESULTS

There were no significant differences for the percentage of body weight gain and for the absolute and relative weights of testes and male accessory organs (prostate, epididymis and seminal vesicles) among the groups. However, sperm counts were significantly higher in rats received 1.2 g/kg/day of honey ($p < 0.05$) when compared to those in control group and in rats that received 0.2 and 2.4 g/kg/day of honey.

CONCLUSION

Honey could enhance spermatogenesis in rats if given at the appropriate dose. However, its mechanism of action needs to be further elucidated.

Poster 26

A Pilot Study to Compare the Effect of Honey on Spermatogenesis In Rats Exposed to Cigarette Smoke

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BACKGROUND

Cigarette smoke has been postulated to produce an oxidative stress in testes resulting in an abnormal spermatogenesis. Honey contains a variety of substances that act as antioxidant. Hence, this pilot study was undertaken to compare the effect of honey on spermatogenesis in rats following chronic exposure to cigarette smoke.

MATERIALS AND METHODS

Two male Sprague-Dawley rats, aged 10 weeks (310-360g) were placed in a chamber and exposed to cigarette smoke for 10 minutes, 3 times/day for 30 days. One of the rats was also treated with 1.2 g/kg/day of honey by gavaging. General health and body weight of the animals were monitored daily and weekly, respectively. At the end of the study, animals were sacrificed and organs including epididymis and testes were carefully removed and studied.

RESULTS

The rat treated with honey had higher sperm and spermatid counts, lower percentage of abnormal sperms and body weight loss as well as slightly larger diameter of testicular seminiferous tubules and interstitial spaces when compared to those of the other rat.

CONCLUSION

Honey appeared to reduce the toxic effect of cigarette smoke on spermatogenesis in this rat. Further study is needed to validate these findings.

Poster 27

The Study and Evaluation of Medical Properties of Poly Floral Honey Produced in East Azerbaijan Region and Its Comparison with Mono Floral Honey

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METHOD

After gathering produced honey in Azerbaijan in North West of Iran, the samples were taken to laboratory and were compared with the samples prepared from mono floral honey. The factors that were considered were pH, moisture, antibacterial property etc. These honeys were used on bacterial cultured media and their antibacterial effects were assessed by gel diffusion test method. The positive extracts in the gel diffusion method, were selected and were used in MIC method on the specific bacteria. The selected bacteria were provided through the standard strains. Some of the clinical samples were also selected and the substances taken were compared with the standard strains. The MBC method as a complimentary test was also performed on them. In the above mentioned tests, control (untreated) disks were also considered.

RESULT

Some differences were observed among the samples with regard to pH and moisture. The results showed that the obtained extracts of Iranian poly floral honey have broad spectrum antibacterial activities, although their efficacy showed diversity on different bacterial species.