Effect of Manuka Honey on MDR TB: an in Vitro Study

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Abstract
The present in vitro study indicate the efficacy of manuka honey with higher concentration in multiple drug resistance tuberculosis (MDR TB). However, further study is required in vivo model for possible use in clinical practice.

Key Words
Manuka honey, Mutidrug Resistance Tuberculosis (MDR TB),

Introduction
Honey is common household product throughout the world. It is nonirritant, nontoxic, easily available and cheap. Honey comprises 40% glucose, 40% fructose, 20% water, with organic acids, vitamins, enzymes, and minerals; it has specific weight of 1.4 and pH of 3.6. The treatment with honey is simple and inexpensive, and honey need not to be sterile as it already possess a bactericidal property.\(^1\) Honey has anti-bactericidal activity against many pathogenic organisms, but its MDR TB effect has never been studied. It has been suggested that pure honey is bactericidal for many pathogenic microorganisms, including various gram negative and gram positive bacteria.\(^2,3\) MDR TB is become a common problem in developing as well as developed countries. MDR is defined as resistance to isoniazid and rifampicin with or without resistance to other drugs. The lack of comprehensive report on this subject is mainly due to limited facilities for culture and susceptibility tests. Much of the drug resistance is preserved clinically, when patients do not, improve or the symptoms return after initial relief where sputum remains positive for acid fast bacilli. According to Indian Council of Medical Research (ICMR) in 1960’s the results of a survey showed resistance levels of 8.25 to INH alone, 5.8% to streptomycin alone and 6.5% to both the drugs.\(^4,5\) Subsequently the resistance increased to 15.5% to INH and 13.8% to streptomycin and Jaipur but not in Gujarat because of the induction of short course chemotherapy.
regimens containing rifampicin. The rate of MDR-TB in India is very low and ranged from 0.6%. Primary MDR-TB is found to be less than equal to 3.2% and even the level of acquired MDR-TB is less than equal to 6.0% in Gujarat, where a high level was observed (11.4%-18.5%). When compared to the prevalence of MDR TB in other parts of the world where up to 48% have been encountered, lower level has been reported in Indian studies. So present study was conducted to evaluate effect of manuka honey on MDR TB and in vitro study.

The present study was conducted in Department of Pharmacology and Medical Microbiology, PGIMER, Chandigarh. The antimycobacterial effect of manuka honey were evaluated in culture media containing different concentrations of honey. The density of the evaluated honey is 1.4g/ml and it is composed of 75% sugar (especially fructose and glucose), 20% water and 5% other substances (various enzymes, amino acids , etc.).

The culture media was prepared as follows:
1) Control plates: Standard Lowenstein-Jensen media
2) L-J media containing 1% honey (1% from solvent component)
3) L-J containing 2.5% honey
4) L-J containing 5% honey
5) L-J containing 10% honey
6) L-J containing 20% honey

Fifty isolates of mycobacterium tuberculosis from the culture collection of the Mycobacterium laboratory in the department of Medical Microbiology, Postgraduate Institute of Medical Education & Research, Chandigarh were evaluated in the study. Positive cultures were identified on the basis of acid fastness on smear microscopy by Z-N strain and growth characteristics. The strain was preserved at 4°C on L-J slopes. Strains were subcultured on L-J media which were then incubated for 4 weeks and the identification was reconfirmed by growth characteristics as well as by standard biochemical tests. These strains were then subjected to susceptibility testing by standard proportion method.

As recommended by CDC with minor modifications, Two hundred microlitres of each of 10-2and 10-4 dilutions of growth was then cultured on to media containing honey and honey free media ( control). Bottles were examined for visible colonies at weekly intervals for four weeks, and for bacterial growth, it was recorded at the time the growth appeared. This percentage resistance, if found to be more than 1% was reported as resistant.

Statistical analysis will be done by using Mc- Nemar's test. The p value <0.05 will be considered statistically significant.

Of 50 clinical isolates , 6 were found to be MDR TB (resistant to INH and rifampicin) when the effect of honey was seen on these MDR TB strains, it was found that growth of Mycobacterium tuberculosis was inhibited in media containing 10% and 20% concentration of honey while it grew in 2.5% and 5% of honey. Of the 44 sensitive strains 7 strains were resistant to rifampicin alone and 2 were resistant to INH alone but all these strains were sensitive to honey at the 5%, 10% and 20% concentration.

Present study confirm that manuka honey is effective in multiple drug resistance tuberculosis at a higher concentration 10% & 20 %. So far no study have been reported regarding efficacy of honey in multiple drug resistance tuberculosis so this is the first study to confirm this findings. Though antimycobacterial mechanism of action of honey is not explored but probably it is mediated by its physicochemical properties for example osmotic pressure, pH and other factors. Similarly various studies reported efficacy with honey as antimycobacterial. Besides this various diclofenac acid hydrazones and amides have been already evaluated in vitro and in vivo study to evaluate antimycobacterial activities against
Mycobacterium tuberculosis. Preliminary results indicated that most of the compounds demonstrated better in vitro antimycobacterial activity.\[15]\]

In conclusion present study indicate the efficacy of manuka honey with higher concentration in multiple drug resistance tuberculosis (MDR TB). However further study is required in vivo model for possible use in clinical practice.

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**References**


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**Conflict of Interest** Declared

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