



# Antibacterial activity of different types of honey on pathogenic bacteria

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## Introduction

Honey has been used as a food and natural sweetener since ancient times. Thus, its application is mentioned in Sumerian records, and this not only as food but also as a therapeutic agent. Between in many crops and civilizations during the history of use in medicine and for the improvement of the general physiological state. However, only in recent times have medically recognized and its positive drug activity.

The aim of this study was to determine the antibacterial activity of five samples of honey from different geographic origin, from the Republic of Srpska (Bosnia and Herzegovina), Slovenia and New Zealand and also to determine the type of antibacterial activity. The disc diffusion method on agar was used to test the honey samples with incubation at 37°C for 24 hours.

## Material and methods

In this study we used five honey samples: acacia honey, acacia honey comb, chestnut honey, flower (meadow) honey and manuka honey. Acacia honey, acacia honey comb and flower honey is raw honey from the Republic of Srpska, raw chestnut honey is from the area of Slovenia, and Manuka Honey UMF 15+ is originally from New Zealand (purchased at a commercial sale at Žužemberk Pharmacy, Grajski trg 41, Žužemberk, Slovenia).

For testing the antimicrobial activity of five different types of honey we used the following bacterial culture: *Streptococcus* group D (*S. group D*), *Escherichia coli* (*E. coli*), *S. aureus*, *Salmonella* Enteritidis (*S. Enteritidis*) and *Salmonella* Typhimurium (*S. Typhimurium*) from the collection of isolates laboratory for microbiology (Public Institution Veterinary Institute Republic of Srpska "Dr Vaso Butozan", Banja Luka) and certified reference material *S. aureus* WDCM 00034. The cultures were seeded in nutritive broth and incubated at 37°C for 18 hours. Petri plates with an appropriate substrate (Müller Hinton Agar) were seeded with 100 µl of the bacterial suspension at concentrations of 10<sup>5</sup>cfu/ml.

The disks diffusion method was used by placing 9 mm diameter paper disks on a solid sterile medium (Müller-Hinton agar). The micropipette was piped with 100 µl of honey on paper disks.

In order to determine whether honey acted bactericidal or bacteriostatically, the type of action was determined. A small slice of agar was added from the inhibition zones in nutrient broth. The incubation was performed at 37°C for 24 hours. If after incubation occurred blur of broth is considered to be a bacteriostatic effect of honey, but, if the broth remained clear its bactericidal effect of honey.

## Results

The research results of the antibacterial activity of honey from different botanical and geographical origin are shown in Table 1.

Table 1. Antibacterial activity of different types of honey on selected strains of pathogenic bacteria

Pathogenic bacteria	Inhibition zone in mm				
	Acacia Honey	Acacia honey comb	Flower honey	Chestnut honey	Manuka honey
<b>S. group D</b>	37.00	39.00	33.33	24.66	34.00
<b>S. aureus (clinical isolate)</b>	0.00	0.00	30.00	23.66	31.00
<b>S. aureus WDCM 00034</b>	39.33	30.33	28.33	22.00	30.00
<b>E. coli</b>	29.00	25.33	31.33	26.66	27.00
<b>S. Enteritidis</b>	28.00	26.00	22.00	33.33	27.66
<b>S. Typhimurium</b>	28.66	24.66	27.66	30.00	28.33

All types of honey, except chestnut, proved greater inhibitory activity against Gram positive bacteria. Chestnut honey had greater inhibitory activity against Gram-negative bacteria, particularly *S. Enteritidis* and *S. Typhimurium*, which is in accordance with the observations of other authors (Kwakman et al, 2011; Mandal and Mandal, 2011; Estevinho et al., 2008).

## Conclusion

Acacia honey, acacia comb honey, floral and manuka honey expressed higher antibacterial activity against Gram-positive bacteria. Chestnut honey had a higher antibacterial activity against Gram-negative bacteria, especially against *S. Enteritidis* and *S. Typhimurium*. All tested honey's showed the strongest antibacterial effect on *S. group D*. Acacia honey and acacia honey comb did not show antibacterial activity against the clinical isolate of *S. aureus*. The best antimicrobial effect was manifested by manuka and flower honey, with the strongest bacteriostatic effect, while chestnut honey showed the strongest bactericidal effect. Although some researchers have concluded that honey from certain plants has better antibacterial properties than others, there is little evidence to support this claim. Some claims are based on the data of a very small number of samples, while other studies show that there are different antimicrobial activities of honey originating from the same floral pattern.

The osmolarity and acidity of honey is not the decisive factors which are responsible for the inhibitory and antibacterial potential of honey, but only in combination with many other factors that are integral to the honey-forming mixture. The antimicrobial properties of honey are generally little explored, a lack of knowledge on the composition and antimicrobial factors holders is a major problem possible clinical application of honey in the treatment of certain infections. It is necessary to carry out research of this type over a number of consecutive years and on a large number of samples of honey of different botanical composition, in order to determine more precisely the effectiveness of certain types of honey and finally determine honey for use in medicine within the honey varieties in Republic of Srpska (Bosnia and Herzegovina), as is done in Australia (manuka honey)

Results of antibacterial effects are shown in Chart 1.

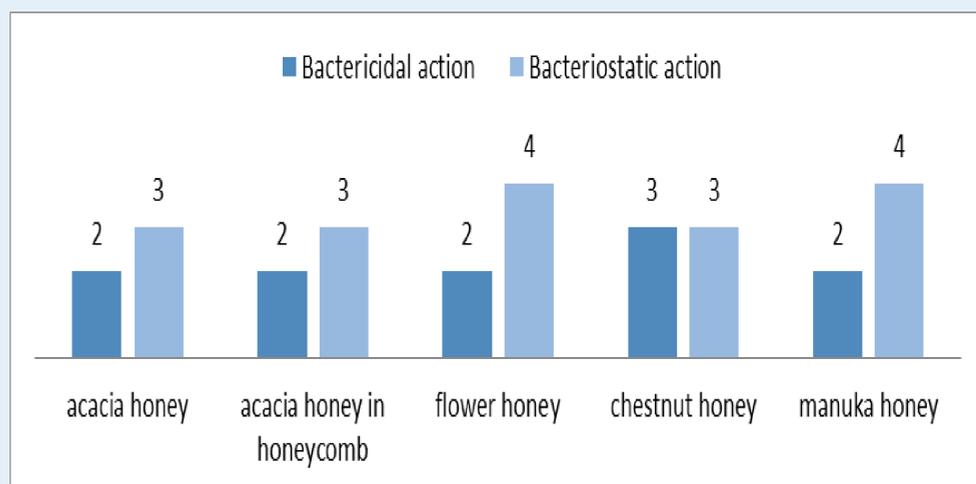


Chart 1. Bactericidal and bacteriostatic activity of different types of honey

All tested honey samples showed good bactericidal and bacteriostatic properties.