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Short Communication

Effect of natural honey on local isolates of diarrhea-causing bacteria in southwestern Nigeria

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The antimicrobial effect of natural honey on diarrhea-causing bacteria in southwestern Nigeria was investigated. The following bacteria were evaluated: *Escherichia coli, Campylobacter jejuni, Salmonella enterocolitis* and *Shigella dysenteriae.* The natural honey samples used were effective in inhibiting the growth of all the test organisms with zones of inhibition ranging from 5.0 to 20.0 mm except for *C. jejuni*. The inhibitory effect of the honey samples on *E. coli* was comparable to that of amoxycillin (20.0 mm) and chloramphenicol (17.0 mm). Tetracycline had no inhibitory effect on any of the test organisms. It is therefore being suggested that in the absence of these antibiotics, natural honey can be used to treat bacterial diarrhea caused by these organisms.

Key words: Natural honey, antibacterial effect, diarrhea.

INTRODUCTION

Diarrhea and gastroenteritis (diarrhea with vomiting) are a major cause of death and ill health in many developing countries, especially in areas of inadequate water supplies, sanitation and little or no health education. Loss of water and electrolytes from the body can lead to severe dehydration which can be fatal in young children, especially those already in poor health and malnourished. Diarrhea can be caused by organisms such as *Shigella* spp., *Campylobacter* spp., certain serotypes of *Escherichia coli* and other organisms such as *Salmonella* spp. and *Yersinia enterocolitica* (Billinghan, 1981).

Many research works have been done on the antimicrobial effect of honey on different bacterial isolates. Molan (1999) reported that honey is becoming accepted as a reputable and effective therapeutic agent by practitioners of convectional medicine and by the general public. This is because of good clinical results that are being obtained. Honey has been reported to be effective in the healing of infected postoperative wounds (Al-waili and Saloom, 1999). It has also been reported to inhibit the growth of a lot of bacteria such as *Bacillus cereus, Staphylococcus aureus, Salmonella dublin* and *Shigella dysenteriae* (El-Sukhon et al., 1994; Ceyhan and Ugar, 2001). It has also been reported to inhibit the growth of anaerobic bacteriodes (Elbagoury and Rasomy, 1993).

This work was carried out to investigate the effect of natural honey on some bacterial species that cause diarrhea in Nigeria.

MATERIALS AND METHODS

Honey sample

The honey samples used for this work were purchased from the Bee farms around Obafemi Awolowo University Teaching Complex (OAUTHC), Ile-Ife and Ede township and were designated honey A and honey B, respectively.

Organisms

The test organisms used in this study were collected from the Pharmacy Department of Obafemi Awolowo University, Ile-Ife. These are *Salmonella enterocolitis, Campylobacter jejuni, Escherichia coli and Shigella dysenteriae*. These organisms were confirmed using standard bacteriological methods.

Antibacterial assay

Solidified nutrient agar plates were separately flooded with different test organisms already activated in sterile nutrient broth by culturing at 37°C for 24 h. The plates were drained and allowed to dry at 37°C for 30 min before wells of 6 mm in diameter were punched

Table 1. Antimicrobial activity of natural honey samples used compared with that of conventional antibiotics on test organisms.

Diameter of zones of inhibition (mm)							
Organisms	**A**	**B**	**Amx**	**Gen**	**Chlor**	**Aug**	**Tetra**
E. coli	20.0	18.0	20.0	24.0	17.0	24.0	0.0
C. jejuni	0.0	0.0	23.0	25.0	26.0	24.0	0.0
S. enterocolitis	6.0	6.0	11.0	4.0	21.0	21.0	0.0
S. dysenteriae	7.0	5.0	20.0	6.0	23.0	22.0	0.0

Key
A = Honey A
B = Honey B Amx = Amoxycillin Gen = Gentamycin Chlo = Chloramphenicol Aug = Augmentin Tetra = Tetracycline

Table 2. Determination of the minimum inhibitory concentration of honey sample A.

Diameter of zones of inhibition (mm)					
Organisms	**1:2**	**1:4**	**1:8**	**1:16**	**1:32**
E. coli	17.0	15.0	6.0	0.0	0.0
C. jejuni	0.0	0.0	0.0	0.0	0.0
S. enterocolitis	3.0	0.0	0.0	0.0	0.0
S. dysenteriae	4.0	0.0	0.0	0.0	0.0

Table 3. Determination of the minimum inhibitory concentration of honey sample B.

Diameter of Zones of inhibition (mm)					
Organism	**1:2**	**1:4**	**1:8**	**1:16**	**1:32**
E.coli	15.0	12.0	4.0	0.0	0.0
C.jejuni	0.0	0.0	0.0	0.0	0.0
S.enterocolitis	3.0	0.0	0.0	0.0	0.0
S.dysenteriae	3.0	0.0	0.0	0.0	0.0

using a sterile cork borer at different sites on the plates. Different dilutions (1:2, 1:4, 1:8, 1:16 and 1:32) of a particular honey sample in sterile distilled water (v\v) were separately placed in the different punched wells and the plates were incubated at 37°C for 24 h. The diameter of the zones of inhibition was measured and recorded.

Also, solidified plates which had been flooded separately with different test organisms, were allowed to dry at 37°C for 30 min before placing conventional antibiotics' disks on them. The plates were incubated at 37°C for 24 h. The diameter of the zones of inhibition was measured and recorded.

RESULTS AND DISCUSSION

The honey samples tested had antimicrobial activity against all the selected bacteria except *C. jejuni* (Table 1). The inhibitory effect was highest on *E. coli* (20.0 mm for honey A and 18.0 mm for honey B) followed by *S. enterocolitis* (6.0 mm for both honey samples) and *S. dysenteriae* (7.0 mm and 5.0 mm, respectively). For the selected antibiotics, all of them except tetracycline inhibited the growth of all the test organisms. The Minimum Inhibitory Concentration (MIC) of the honey samples used can be seen in Tables 2 and 3. For *E. coli* it was 1:8 of honey in sterile distilled water (v/v) for both honey samples for *S. enterocolitis* and 1:2 for *S. dysenteriae* with both honey samples.

The growing resistance of microorganisms to convectional antimicrobial agents is a source of concern to clinical microbiologists all over the world. As a result, efforts are being made to develop antimicrobial agents from local sources for better chemotherapeutic effects (Gills, 1992). From this study, all the test organisms were inhibited by the two honey samples used except *C. jejuni.* The reason for this exception is not clear because Gram-negative bacteria, of which this organism is one, have been reported to be more sensitive to action of honey than Gram-positive bacteria (El-Sukhon et al., 1994). The inhibition of *E. coli* by the two honey samples used was the same in some cases with that of standard antibiotics. For example, honey sample A gave zone of inhibition of 20 mm which was the same as that of amoxycillin and honey sample B gave a zone of clearance of 18.0mm which was a little higher than that of chloramphenicol (17.0 mm). These results suggest that the honey samples used contain bio-components whose antibacterial activities are highly comparable with that of these two antibiotics against *E. coli*. The inability of tetracycline to inhibit the growth of any of these organisms may be as a result of misuse and abuse of this drug. Tetracycline is one of the common antibiotics that have been greatly abused.

This work has been able to show that honey has antimicrobial activity against bacteria that can cause diarrhea especially the ones that are caused by *E. coli*. So honey can be used in treating diarrhea caused by this organism.

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