abdomen for 3 months, with total disregard for the prosthesis. As could be expected, decubitus ulceration of the penis occurred, with eventual extrusion of the prosthesis. With the exception of this case, no prosthesis has been removed and all patients are capable of sexual function.

Conclusions

If great care is given to every detail of preparation and operative technique, the Small-Carrion penile prosthesis is a simple and relatively cheap solution to a distressing problem. It is courting disaster to ignore the principles of prosthetic surgery.

REFERENCES


The antibacterial action of honey
An in vitro study


Summary

The reported antibacterial effect of pure honey was evaluated by an in vitro study testing the growth of various Gram-positive and Gram-negative bacteria in media containing varying concentrations of honey. It was found that most pathogenic bacteria failed to grow in honey at a concentration of 40% and above. The possible mechanisms of this effect are briefly outlined.

The antibacterial effect of honey in varying dilutions on common Gram-positive and Gram-negative pathogenic bacteria.

Materials and methods

The antibacterial effect of honey on intestinal and other pathogenic bacteria was evaluated as outlined below:

Solid agar plate media

1. Control plates: (i) nutrient agar plate (Mueller-Hinton media; Oxoid Ltd) prepared according to the manufacturer's instructions; (ii) blood agar plate — 7% sterile horse blood added to (i); and (iii) chocolate agar plate — blood agar prepared as in (ii) and heated to 80°C for 10 minutes.
2. Honey-agar plates: (i) honey-nutrient agar plates — varying concentrations of honey (10 - 50%) added to nutrient agar (Mueller-Hinton), autoclaved and then the plates poured; (ii) honey-blood agar plates — 7% sterile horse blood added to (i); honey-chocolate agar plates — honey-blood agar prepared as in (ii) and heated to 80°C for 10 minutes.

Bacteria tested

1. The bacteria tested on nutrient-agar and honey-nutrient agar plates were: Vibrio cholerae, enteropathogenic E. coli, Salmonella spp., Salmonella typhi, Shigella boydii, Klebsiella pneumoniae, Pr. mirabilis, Pseudomonas aeruginosa and Serratia marcescens.
2. The bacteria tested on blood agar and honey-blood agar plates were: Staph. aureus, Streptococcus pyogenes (Lancefield group A), group B streptococci, Strept. faecalis, and Listeria monocytogenes.
3. Chocolate-agar and honey-chocolate agar plates were used to test the growth of Haemophilus influenzae.
Inoculum of bacteria

The bacteria to be tested were grown on their respective plates as outlined above. The colonies were inoculated into 5 ml of tryptic soy broth and incubated at 37°C for a few hours. The turbidity of the bacterial broth culture was adjusted to McFarland 0.5 turbidity standard. A 1:20 dilution was prepared in sterile saline for inoculation. The honey-nutrient agar, honey-blood agar, honey-chocolate agar and control plates were inoculated using a multipoint inoculator. In each case 0.01 ml was delivered to the agar surface, thus giving an inoculum of 10⁴ colony-forming units. The plates were incubated aerobically for 18 hours at 37°C; the blood and chocolate plates were incubated aerobically with 5% CO₂.

Results

There was good growth of all bacteria on their respective control plates. Table I shows that all intestinal bacterial pathogens tested failed to grow in honey at a concentration of 40% and above. The growth of *V. cholerae* (as well as *Strept. pyogenes* and *H. influenzae*) was in fact inhibited in honey at as low a concentration as 20%. Honey also inhibited the growth of other pathogenic bacteria at concentrations of 50%.

Discussion

This study confirms the antibacterial effect of honey on various Gram-positive and Gram-negative bacteria. In particular, pure honey is a very potent inhibitor of the growth of bacteria such as *Salmonella*, *Shigella*, enteropathogenic *E. coli* and *V. cholerae*, all of which are known to cause considerable morbidity and mortality from diarrhoeal disease in developing countries. The mechanism of antibacterial effect remains speculative at present. Possible explanations are shrinkage and disruption of the bacterial cell because of the osmotic effect of the hypertonic sugar concentration in honey, the low pH or the presence of an as yet unidentified substance in honey with bactericidal properties. In the latter context a substance called 'inhibin' has been postulated by some workers.

In view of the antibacterial effect of honey on enteropathogens found in this and other studies, a clinical trial is currently in progress to evaluate the effect of orally administered honey in infantile gastro-enteritis.

REFERENCES