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Honey Protects Against Acidified Aspirin-Induced Gastric Mucosal Damage in Rats.

S. A. Yusuf*†, R. R. Ettarh** and P. K. Kems*

*Department of Human Physiology, Ahmadu Bello University, Zaria, Nigeria
**Department of Physiology, University of Calabar, Calabar, Nigeria

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ABSTRACT: The protective effect of natural honey against acute gastric mucosal lesions induced by acidified aspirin was studied in rats. Honey was mixed with saline and given by gavage as a pretreatment in varying doses. A dose-dependent reduction in the number of acute mucosal lesions was observed with administration of honey. Honey also reduced the volume and acidity of gastric juice secreted over 4 hours in conscious pylorus-ligated rats. It is suggested that honey may protect the gastric mucosa by its inhibition of gastric acid secretion, apart from its antibacterial effect against *Helicobacter pylori*. It may therefore be useful in the orevention of ulceration and ulcer recurrence, as well as in the management of the disease.

Key Words: Natural honey; Antibacterial effects; Gastric mucosa; Aspirin.

Introduction

The medicinal properties of honey are part of the legend of folk medicine. Honey has been found to relieve ulcer symptoms in clinical trials (1). Honey is effective in killing *Helicobacter pylori*, the bacteria responsible for duodenal and gastric ulcers. Although a vast number of papers have been published on honey, most have concentrated on the biochemical analyses or on its food and non-food commercial uses. All honeys -in varying degrees - are effective for the healing of major wounds, cuts, burns, abscesses, skin ulcers, bed sores, eye infections and varicose ulcers (2). These healing properties of honey are due mainly to the antibacterial agent - hydrogen peroxide - found in honey. Not only is honey antibacterial, it also draws body fluids and nutrients to the damaged area, and so assists cell growth while preventing scar formation by drying out the wound (3).

†To whom correspondence should be addressed.

Although honey has been proven to have varying degrees of healing properties due mainly to its antibacterial activity, the physiological mechanisms by which it relieves and prevents gastric ulcers is not fully understood. The present study was therefore designed to explore the protective effect of wild honey on aspirin-induced gastric mucosal damage, and to assess its effect on functional changes such as gastric acid secretion using pylorus-ligated rats.

Materials and Methods

Animals

Forty Wistar rats weighing 150 - 210g were used for the study. The animals were housed in cages with wide mesh wire bottoms to prevent coprophagy. They were fasted 24 h before study, but allowed free access to water. The rats were separated into four groups of ten animals each. Each rat was anaesthetized with ketamine hydrochloride (30mg/kg) intraperitoneally and pylorus ligation was done through a midline abdominal incision, care being taken not to interfere with blood supply to the stomach and duoderum (4). The abdomen was closed and 2 ml of either Solution A (2ml of 0.9% NaCl), Solution B (0.5 ml honey suspended in 1.5ml of 0.9% NaCl), Solution C (1.0ml honey suspended in 1.0 ml of 0.9% NaCl), or Solution D (1.5 ml honey suspended in 0.5ml of 0.9% NaCl) was instilled into the stomach using orogastric tube and the animals were allowed to recover from anaesthesia. One hour after pretreatment, 2ml of 20mM aspirin in 11.7mM HCl was instilled into the stomach by orogastric intubation. Two hours later the rats were killed and the stomachs were removed and opened along the greater curvature.

Gastric output measurement

The volume of intragastric contents was measured carefully with a calibrated cylinder. Individual samples were titrated with 0.1M NaOH using phenophthalein as indicator. Gastric acid output was calculated for each sample and expressed in nmol/4h.

Macroscopic mucosal lesions

The stomach was opened along the greater curvature and rinsed with cold saline. The mucosal surface was examined visually. The number of macroscopic lesions was counted using a x10 hand lens and scored. The total lesion score was obtained for each animal and the mean lesion score calculated for each study group. This method of scoring was a modification of the method of Robert and Nezamis (5).

Statistical Analysis

Results were expressed as mean ± SEM. The means of the different groups were compared using one-way ANOVA with post-hoc comparisons using Tukey's test Statistical significance was accepted at $p < 0.05$.

Results

Secretory Studies

Dose-dependent inhibition of gastric juice secretion and hydrogen ion secretion was produced by honey (Table 1 and Fig. 1). A maximum inhibition of 40% relative to control values was noted with Solution D (1.5 ml honey + 0.5 ml saline). Groups C and D had significantly lower acid output compared to Solution A (control).

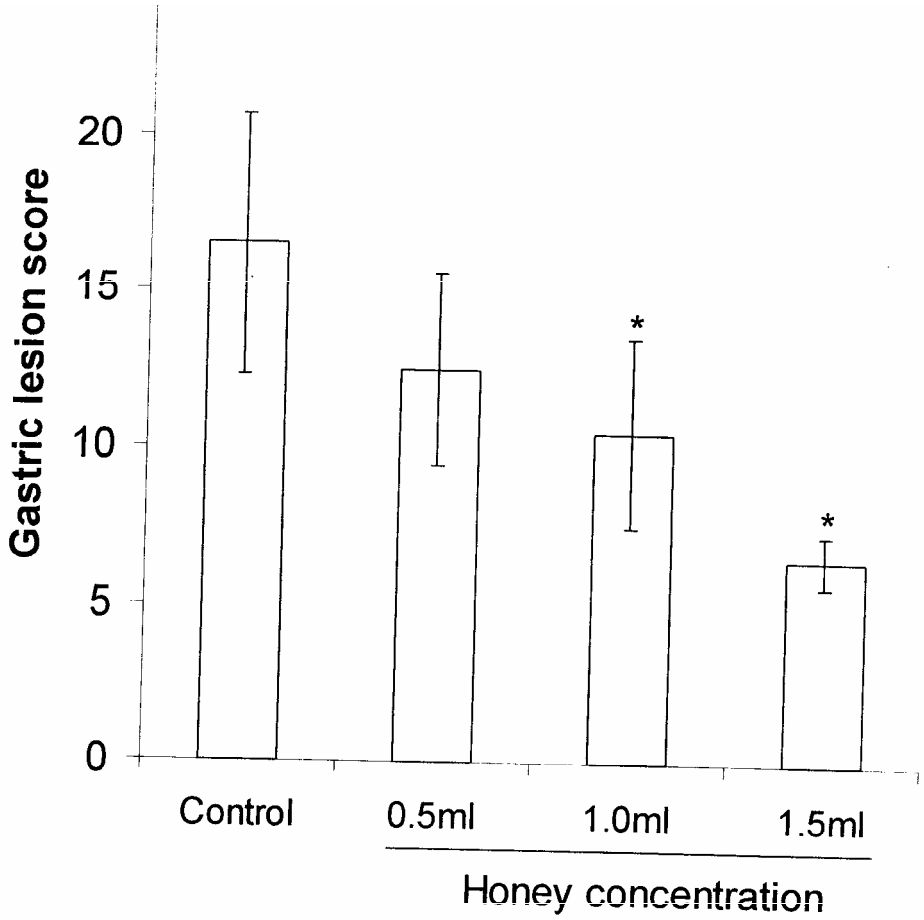

Figure 1. Effect of intragastric honey on gastric mucosal lesions produced by acidified aspirin in pylorus-ligated rats. *$p<0.05$ compared with control group. n=10 per group.

Gastric ulcer studies

Intragastric instillation of acidified aspirin produced visible hemorrhage lesions over most of the mucosal area. The mean (± SEM) score was 16.5 ± 4.2 for the control group. In contrast, administration of honey reduced the mean lesion score in a dose-dependent manner (Fig. 1). Statistical analysis showed that the rats administered 1ml and 1.5ml of honey had significantly fewer lesions than the control ($P<0.05$). The mean lesion scores of the two groups were 10.5 ± 3.0 and 6.5 ± 0.8 respectively (Fig. 1).

Table 1: Effect of honey on gastric acid output and the volume of gastric juice in pylorus-ligated rats.

Treatment	Gastric acid output (mmol/4h)	Volume of gastric juice (ml/4h)
Solution A (1.0ml saline) (Control group)	12.7 ± 3.3	6.5 ± 1.1
Solution B (0.5ml honey + 1.5ml saline)	9.1 ± 1.5	5.2 ± 0.5
Solution C (1.0ml honey + 1.0ml saline)	5.3 ± 1.7*	3.3 ± 0.7*
Solution D (1.5ml honey + 0.5ml saline)	3.2 ± 1.5*	2.6 ± 0.5*

Values are mean ± SEM and n = 10 for each group.
*$p < 0.05$ compared with control group (Solution A).

Discussion

The results show that wild honey possess antiulcer activity against aspirin-induced mucosal damage in rats. The protective effect of honey on the mucosa was both morphologic and functional. This is because pretreatment with honey reduced the volume of gastric juice secreted, gastric acid output and the number of mucosal lesions. Although various studies have demonstrated the antibacterial properties of honey (1, 6-8), very little has been done on its effect on experimentally-induced gastric mucosal damage.

The morphologic and functional features of the protective effect of honey are similar to those of prostaglandins found in similar experimental models (9). The findings of this study suggest that honey influences the normal gastric mucosa in a way that enhances the mucosal defence mechanisms. The protection by honey is partly mediated by factors independent of antibacterial activity. It is possible that the effect of honey on gastric acid secretion may account for part of this protective action.

The present study demonstrates that honey is able to reduce gastric mucosal lesions produced by aspirin. This protection has many of the features of the protection offered by prostaglandins and sucralfate. Thus, it is concluded that honey has cytoprotective properties apart from its antibacterial activity. If this protective effect is demonstrated in human studies, it would suggest a usefulness of honey in the prevention of gastric ulceration and its recurrence, as well as therapy for acute gastric injury.

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