EFFECT OF MAGGI CUBE ON INTESTINAL PROPULSION AND MOUTH-COLON TRANSIT TIME OF RAT

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Abstract

Intestinal propulsive activity determines the effects of substances on gut motility. Rats of both sexes weighing between 140 and 200 grams were fed with 'Star Maggi cubes' using the esophageal tube. Twenty minutes after the administration of "Maggi", the animals received 0.5ml $BaS0_4$ (0.25mg/ml) orally. The animals were then sacrificed 60 minutes later. The distance between the leading mass of $13aS0_4$ over the whole length of the intestine x 100 gives the percentage intestinal propulsion 11'%. There was a gradual increase in 1P% with increase in concentration of "Maggi" (5-20g/kg). However, the maximum increase in propulsion with Maggi was 40.41% less than that of controls given distilled water. For mouth-colon transit time (MCTT), 3 groups of *Cwc* rats were given different doses of "Maggi" together with a 5g/10ml charcoal suspension. The rats were kept under observation and visual examination of excrement was used to determine time of charcoal excretion. Results also showed that increase in the dose of "Maggi" shortened the Transit Time to a maximum of 39.32% at 20g/kg while increasing 1P% in the same dose range. This shows an inverse relationship between the effect of "Maggi" on intestinal transit time and intestinal propulsion. This suggests that "Maggi" is a bowel stimulant and may serve as a bulk laxative.

Introduction

Food additives are used either as preservatives, or to enhance appetite (CEC, 1991; WHO 1990, 1993). "Maggi" is a food additive, sold openly in market stalls and stores in Nigeria. 'Star Maggi Cube[1] is manufactured by Nestle Foods PLC. "Maggi", as it is popularly called is a dark brown cube which in foods influences the appetite positively. As a food additive it contains a chemical, monosodium glutamate, which enhances flavour to bring about the natural flavour of foods and give a desirable effect (Hui, 1992). Because of its taste, "Maggi" is much used in the flavouring of foods. However, the level of use of this flavour-enhancing agent varies from one household to another. Also little children and even adults lick the "Maggi" cube as "sweet" because of its flavour. This increases the possibility of the misuse of this food enhancer and a manifestation of possible toxic effects. The Food and Drug Administration (FDA) have established standards for such food enhancers for the purpose of the maintenance of better quality control through scientific testing of foods to determine whether they meet federal specifications (Beacham, 1995 and Nash, 1995). In Nigeria, this function is effected by National Agency for Food and Drug Administration and Control, NAFDAC. Ukoko, (2003) reports that "NAFDAC was established in 1995 to control and regulate locally manufactured and imported products..." This study seeks to investigate the effects of various concentrations of "Maggi" on intestinal propulsion (IP) and mouth-colon transit time (MCTT).

It is expected that this study will provide information that will, in some measure, inform consumers of the possible toxic effects of the consumption of large quantities of "Maggi", and also improve if necessary the quality of its production.

Methodology

Intestinal Propulsion Rate Test

Albino rats (140-200g) were used in the investigations. The rats were obtained from the University of Port Harcourt animal house. They were acclimatized for at least two weeks before onset of the experiment. They were then subjected to 12 hours fast period prior to the time of use.

Each cube of Maggi was dissolved in 1ml of distilled water to make aqueous extract of 1.6g/ml. The extract of "Maggi" was administered to rats, in groups of five using the stomach tube while control rats received distilled water. Twenty minutes after "Maggi" administration each rat received 0.5 ml of $BaS0_4$(M&B, England) suspended in water (0.25 mg/ml orally). Two hours later,

the rats were sacrificed by cervical vertebral luxation to take out the small intestines (Koezuka, et al, 1985).

The effect of the Maggi on intestinal propulsion was calculated by the formula:

$$IP\% = \frac{\text{(Distance between leading mass of } BaS0_4 \text{ and the pylorus)}}{\text{(Whole length of the small intestine)}} \times 100$$

Mouth-Colon Transit Time (MCTT)

This test was carried out using the charcoal excretion test as described by Koezuka et.al (1985). The rats were divided into groups of five and were given different doses of "Maggi". Control rats in two groups received distilled water. The animals received 1 ml charcoal suspension (5g/10 ml water) orally, simultaneously with the extract. The charcoal suspension served as a marker. The rats were then allowed free access to food and water in their cages. Visual observation of excrement of charcoal was noted and the time interval recorded.

Results

Intestinal Propulsion Test

The average 1P% increased with increasing concentrations of "Maggi". When compared with control (water), results showed that "Maggi" had a significant inhibitory effect on IP%. The IP% increased significantly from 45.20% at 5g/kg to 54.56% at 20g/kg "Maggi" ($p < 0.05$), Table 1.

Table 1: Intestinal Propulsion (I)%) of Maggi in Rats

Dose of Maggi (g/kg)	**Mean IP%**	% **Inhibition**
5	43.63±1.4	52.38
10	46.0±1.3	49.80
15	50.0+0.0	45.43
20	54.73±0.4	40.27
Distilled H_20 (Control) (1 ml)	91.63±0.2	0.0

Table 2: Mouth-Colon Transit Time (MCTT) of Maggi in Rats

Dose of Maggi (g/kg)	**MCTT (hours) ± sem**	% **Increase in Time**
5	10.7+ 1.2	8.55
10	10.3± 1.1	11.97
15	9.4+ 1.2	19.66
20	7.1± 1.9	39.32
Distilled H_20 (Control) (1 ml)	11.7± 1.4	0.0

Table 2 shows that there was a significant decrease in average MCTT as the dose of "Maggi" increased from 5 to 20g/kg in test animals. This shows that "Maggi" has dose-dependent increasing effect on intestinal transit time. This effect of "Maggi" at 5g/kg is not significantly different from that of water, but at 20g/kg, "Maggi" had increased MCTT by 39.32%. The higher the dose of "Maggi", the greater the stimulation, hence the decrease in the transit time. Comparison of test results with that of control shows this effect (Table 2).

Discussion

The results show that a gradual increase in the concentration of "Maggi" (5g/kg - 20g/kg) increased intestinal propulsion. Intestinal propulsion is an indication of the rate at which substances pass through the intestine. Using the effects of distilled water as control, the 1P% for water was 91.56%. Normally water is expected to promote movement of substances along the intestine, hence encouraging digestion of food. Thus 1P% of water was 37% higher than that of the highest dose of Maggi (20g/kg), suggesting that Maggi has a lower effect on Intestinal Propulsion than water.

For the mouth-colon transit time, increasing the dose of "Maggi" decreased transit time, such that an animal that received 5g/kg of "Maggi" took a longer time to excrete charcoal than an animal that took a higher dose (20g/kg). The increase in 1P% with increasing dose of "Maggi" and the decrease in mouth-colon transit time suggests that "Maggi" stimulates motility. These results are in line with the findings of Best and Taylor (1985) who said that any substance that decreases motility, increases transit time and that motility or propulsion of intestines is inversely proportional to transit time.

The suspension of $BaS0_4$ used in the study enables the peristaltic movement of the stomach and intestines to be clearly observed. The movement of the $BaS0_4$ along the intestines indicates the rate of propulsive movement of the substance given.

The implication of these findings is that the presence of a higher concentration of "Maggi" in food may modulate motor phenomena in the gut. As a result of this, bowel transit time will be shortened. Usually a decrease in bowel transit time may affect food and drug absorption and decrease digestion. On the other hand "Maggi" may fall into the category of bulk laxative, for example, the inorganic and organic hydrophilic colloids which aid bowel movement and prevent constipation. These exert their effects by absorbing and retaining water, increasing bulk, stimulating colonic peristaltic movements, and lubricating and hydrating the desiccating faecal materials (Ebadi, M.1997). The action of "Maggi" in increasing mouth-colon transit time is of interest and further investigations on the mechanism of action of "Maggi" and the level of its toxicity if any, will contribute towards proper regulatory measures on its use. This study has shown that in large quantities, especially when licked raw, as is commonly observed with children, "Maggi" may stimulate bowel activity and may enhance the elimination of orally administered drugs.

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