Gastric pH and Gastrointestinal Flora

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Abdtract

Samples of saliva, gastric juice and feces were collected from 33 fasting healthy adults. pH of saliva and feces varied mostly between 5-6.9 and the gastric juice between 1-2.9. Similar types of microorganisms were isolated from all three sites. A low gastric pH prevented the growth of infective microorganisms and thus their entrv in the small intestine (JPMA 32.100, 1982).

Introduction

Gastric acidity acts as a barrier to the ingested microorganisms (Sack et al., 1972; Franklin and Skoryna, 1971; Giannella et al., 1972). A high pH will therefore permit the bacteria to survive, multiply (Bhatetal., 1972; Drasar etal., 1969; Gorbach et al., 1967) and reach the lower bowel resulting in bacterial diarrhoeas.

The purpose of this study was to determine whether gastric acidity can prevent the survival of ingested microorganisms, and their access to the lower gastrointestinal tract.

Material and Methods

The specimens of saliva, gastric juice and feces were collected from 33 apparently healthy subjects.

Saliva:

About 5 ml of unstimulated saliva was collected in sterile vials in the morning. Subjects were asked not to brush their teeth or to consume any food or drink before coming to the laboratory.

Gastric Juice:

Sample of gastric juice was aspirated by Kyle's tube in fasting individuals prior to endoscopy. The first part of the specimen was discarded and the second portion was collected in a sterile bottle.

Feces:

Fecal samples were collected in sterile containers and promptly brought to the laboratory.

Determination of pH:

The pH of saliva; gastric juice and feces was determined by the glass electrode pi I meter using the surface contact method.

Culture:

Serial tenfold dilutions of saliva, gastric juice and feces were made in sterile saline and appropriate dilutions were streaked on the media and incubated (Table I).

Table I Media and Culture Method

Organisms Selected	*Medium*	*Incubation*	*Saliva dilution* (— *log* 10)	*Gastric juice dilution* (— *log* 10)	*Feces dilution* (— *log* 10)
Stretpococci	Blood Agar	37°C 24-48 hours Aerobic	6, 7, 8, 9,	1, 2, 3, 4,	6, 7, 8, 9,
Staphylococci	Mannitol Salt Agar.	37°C 24-48 hours Aerobic	2, 3, 4, 5,	1, 2, 3, 4,	2, 3, 4, 5,
Lactobacilli	Rogosa S.L. Agar.	37°C 24-96 hours Aerobic, Anaerobic	2, 3, 4, 5,	1, 2, 3, 4,	4, 5, 6, 7,
Coliforms	Mac Conkey Agar.	37°C 24-48 hours Aerobic	2, 3, 4, 5,	1, 2, 3, 4,	6, 7, 8, 9,
Veillonella	Veillonella Medium	37°C 48 hours Anaerobic	2, 3, 4, 5,	2, 3, 4, 5,	5, 6, 7, 8,
Candida	Sabouraudis Agar	28°C 72 hours Aerobic	1, 2, 3, 4,	1, 2, 3, 4,	1, 2, 3, 4,

Microorganisms isolated were subcultured to obtain the isolate in pure culture. Identification was performed on the basis of colony characteristic gram staining and biochemical reactions.

Results

Table II
Distribution of Samples of Saliva, Gastric juice and Feces According to pH.

	pH Ranges				
	1-2.9	3-4.9	5-6.9	7-8.9	*Total*
Saliva	—	—	25	8	33
Gastric Juice	12	8	10	3	33
Feces	—	2	22	9	33

Table II shows the variations in the pH of saliva, gastric juice and feces in healthy subjects. pH of saliva varied mostly between 5-6.9 gastric juice 1-6.9 and feces 5-6.9.

Microorganisms isolated from three sites of the same subject are shown in Table III.

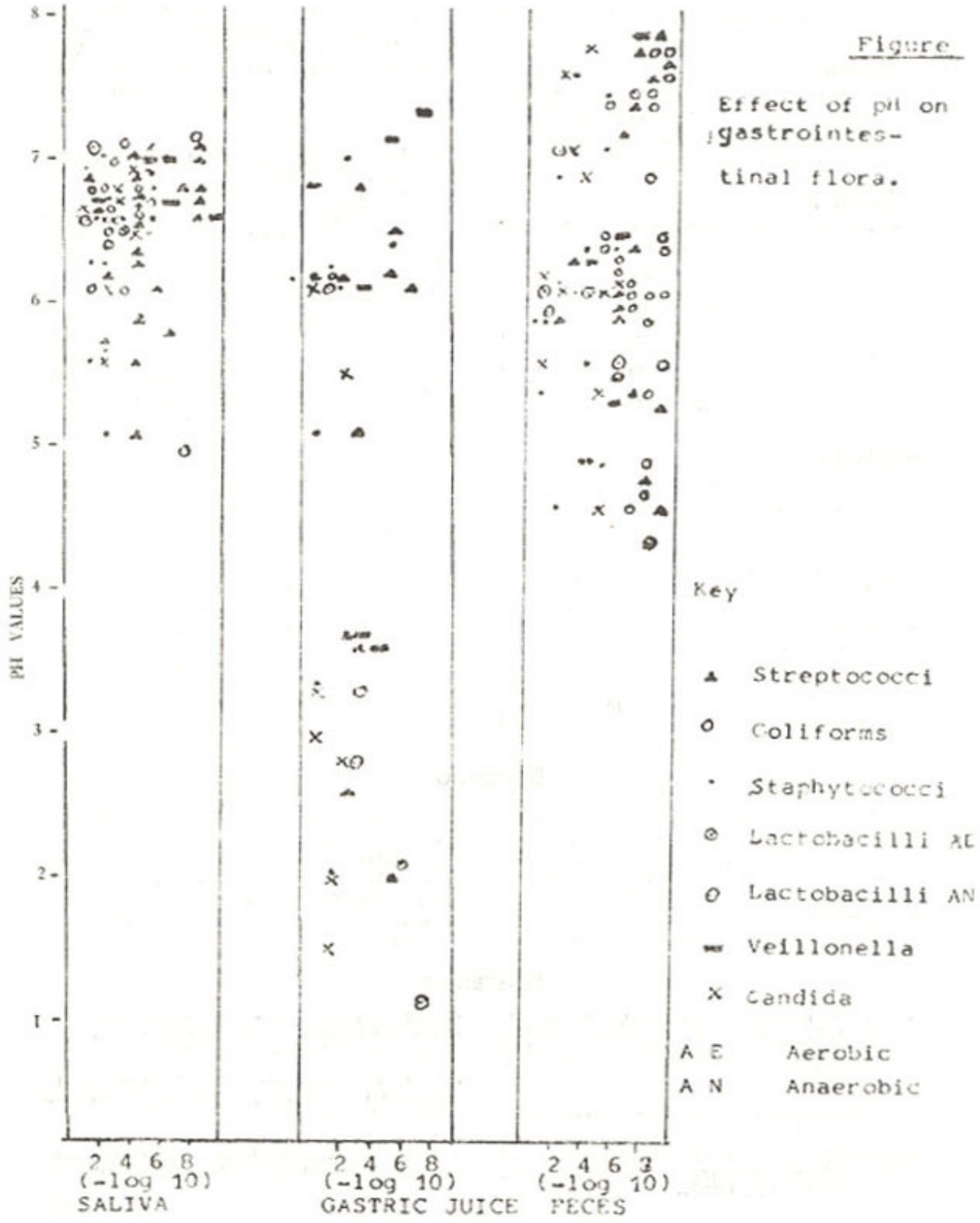
Table III

Microorganisms isolated from saliva, gastric juice and feces

	Strepto-cocci	*Staphy-lococci*	*Lactoba-cilli AE*	*Coliform*	*Veillonella*	*Lactob i- cilli*	*Candida*
Saliva	5.4	2.8	2.6	2.7	5.7	4.7	2.7
Gastric Juice	4.7	2.8	2.7	2.5	5.9	2.3	2.3
Feces	6.6	4.0	3.6	8.1	6.6	5.1	3.8

The values are expressed Mean $\log^{10}$ nunber of organisms.
AE—A:robic AN—Anaerobic

Similar types of microorganisms were isolated from all the three sites. Streptococci and Veillonella were predominant in all samples while coliforms were found with a greater frequency in feces.
pH affects the growth of various microorganisms. Bacterial growth was marked in salivary sample with a pH above 6.6 and scanty at lower pH. Only a few' of the gastric samples were positive for culture and the growth corn-prized mostly of acid resistant organisms. With the rise in pH nearly all organisms which were isolated in saliva were also found in the gastric juice (Fig. 1).



Fecal samples indicated positive growth for a large variety of organisms above pH 5.0. Coliforms and streptococci were present in high counts and in larger number of samples.

Discussion

Low gastric pH prevents the entry of pathogenic bacteria into the small bowel. In this study a significant growth of only acid resistant bacteria and fungi was seen in the gastric juice at low pH. With the increase in pH no difference was seen in the bacterial growth in salivary, gastric and fecal specimcns. Similar observations had previously been reported by Bhat et al. (1972) and Drasar et al. (1969). In countries where water and food pollution is common the frequency of infective diarrhoea is likely to increase with the indiscriminate use of antacids and H2 receptor antagonists.

References

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