

A Note on the Bacteriologic Examination of Stomach Contents in Puerto Rico¹

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BACTERIOLOGIC studies were performed on the gastric juice of 106 patients, coming to the Outpatient Department of the University Hospital of the School of Tropical Medicine. In each instance, a sterile gastric tube was introduced by mouth, and the gastric residue aspirated with a sterile syringe and transferred to a sterile container. Smears were made as soon as possible after and stained by the Gram method.

Cultures were then prepared in 3 percent blood agar, MacConkey agar, tryptose phosphate and thioglycollate broths without previous neutralization of the acidity. After the gastric residue was obtained, histamine hydrochloride—0.01 mg. per kg. of body weight—was injected subcutaneously. The stomach contents were emptied as completely as possible every fifteen minutes. The fourth specimen, following the injection of histamine, was selected for the same bacteriologic study as was carried out on the gastric residue. The usual chemical tests were performed on all samples of gastric contents aspirated.

Study of the stained smears of the gastric residue revealed the results presented in Table 1. Gram-positive and Gram-negative cocci appeared with great frequency, the Gram-positive cocci slightly predominating. The variety of bacteria encountered was striking.

Table 2 shows the results from examining stained smears made from the gastric contents aspirated sixty minutes after the injection of histamine. Here Gram-negative bacteria predominated over the Gram-positive. In 23 cases no examination was performed.

The results of the cultures performed on samples from gastric residue are given in Table 3. Gram-negative cocci were most frequently cultured; no growths occurred in 24 instances, however.

The results obtained from cultures on samples, aspirated one hour after the injection of histamine, are detailed in Table 4. No growths occurred in 60 cases. As in the other groups, the growth of various organisms was observed.

Chemical studies revealed no free acid in the residue from 57 samples. In 22, the value for free acid was below 25 units. No free

acid was reported in 11 samples obtained one hour after the histamine injection. In 19, the value for total acid in Table 4 was below 25 units in the residue of 21 samples and below 50, not including those below 25, in 39 samples. Twenty-one patients had the sprue syndrome. Table 5 shows the results obtained.

DISCUSSION

The type and frequency of the organisms encountered in these gastric contents correspond, in general, to those found by Pomales Lebrón² in the normal throats of Puerto Ricans. This is in agreement with Bockus,³ who states that the organisms generally found in gastric contents come from the upper respiratory passages. It is interesting to observe, however, that in spite of the fact that the gastric acidity was not neutralized, prior to culturing the specimen, growth of organisms of different types could be observed in a good number of instances.

In this respect, Topley and Wilson⁴ state that normal gastric contents are sterile, since the acidity of the gastric juice rapidly kills any bacteria injected with the food. Dick⁵ corroborated the preceding statement and reported that, as a rule, gastric juice containing free hydrochloric acid is sterile. This author finds that the number of bacteria present in the gastric contents of pernicious anemia patients is very large, and that there is a predominance of green-forming streptococci and organisms of the colon group. In 11 of 15 cases, anaerobic cultures revealed the presence of "long Gram-negative thread-like filaments, forming dense tangled masses on the slides."

In a local group of sprue patients we could observe no difference from other cases. In seven instances, *B. coli* was cultured either in the gastric residue (six instances) or in the contents of tube IV. In two of these cases the clinical diagnosis was sprue. In both no free acid was found in the residue. Out of the five remaining cases, three had histamine-resistant anachlorhydria and the other two, no free acid in the residue.

2. A. Pomales Lebrón, A bacteriologic study of normal throats, pathologic throats, and tonsils removed at operation in Puerto Rico. *Bol. Asoc. Méd. P.R.*, 26:372-390, 1934.

3. H. L. Bockus, *Gastroenterology*, vol. 1 (Philadelphia: W. B. Saunders Company, 1943).

4. W. W. C. Topley and G. S. Wilson, *The Principles of Bacteriology and Immunity*, 2nd ed. (Baltimore: W. Woods and Company, 1936).

5. G. F. Dick, The bacteriologic examination of the stomach contents in pernicious anemia. *Am. J. Dig. Dis.*, 8:255-260, 1941.

SUMMARY

Bacteriologic studies were carried out on the gastric contents of 106 patients. The gastric residue and the aspirated material, obtained sixty minutes after the administration of histamine hydrochloride, were examined immediately and cultured without previous neutralization in 3 percent blood agar, MacConkey agar, and tryptose phosphate and thioglycollate broths.

The organisms obtained corresponded, in general, to those found by Pomales Lebrón in the throats of normal Puerto Ricans. In spite of the fact that no neutralization of the gastric acidity was performed, bacteria could be cultured from the fourth sample of gastric juice obtained sixty minutes after the injection of histamine hydrochloride. In contrast to the findings in pernicious anemia patients, reported by Dick, the bacteriologic studies of local sprue cases did not reveal any difference from the rest of the groups studied.

TABLE 1
Gastric Residue Smears

Gram-positive cocci:	
(a) Single	27
(b) Pairs	58
(c) Chains	59
Gram-negative cocci:	
(a) Single	46
(b) Pairs	40
(c) Chains	23
Gram-positive bacilli	13
Gram-negative bacilli	29
Gram-positive filaments	10
Gram-negative filaments	38
Gram-positive rods	36
Gram-negative rods	51
Gram-positive diplococci	18
Gram-negative diplococci	20
Large Gram-positive rods	13
Large Gram-negative rods	15

TABLE 2
Tube IV Smears

Gram-positive cocci:	
(a) Single	15
(b) Pairs	23
(c) Chains	17
Gram-negative cocci:	
(a) Single	40
(b) Pairs	17
(c) Chains	7
Gram-positive bacilli	2
Gram-negative bacilli	13
Gram-positive filaments	12
Gram-negative filaments	25
Gram-positive rods	30
Gram-negative rods	38
Gram-positive diplococci	28
Gram-negative diplococci	23
Large Gram-positive rods	11
Large Gram-negative rods	14
Not done	23

TABLE 3
Gastric Residue Cultures

Aerophilic subtilis	9
<i>B. coli</i>	6
<i>B. pycocyaneus</i>	2
Diphtheroid bacilli	2
Friedlander bacilli	4
Gram-negative bacilli	7
Gram-negative bacilli (not typhoid)	4
Gram-positive cocci	2
Gram-negative cocci	53
Gram-negative diplococci	2
Gram-negative filaments	2
Gram-positive micrococci	11
Gram-negative micrococci	3
Gram-negative rods (large)	2
Hemolytic streptococci	11
Hemolytic streptococci (slightly)	8
Hemolytic <i>Staphylococcus aureus</i>	9
<i>N. catarrhalis</i>	7
Non-hemolytic staphylococci	4
Non-hemolytic streptococci	31
<i>Staphylococcus albus</i>	1
<i>Staphylococcus aureus</i>	2
<i>Streptococcus viridans</i>	19

TABLE 4
Culture

<i>B. coli</i>	1
Diphtheroid bacilli	1
Friedlander bacilli	1
Gram-negative bacilli	4
Gram-negative cocci	10
Gram-negative micrococci	2
Hemolytic <i>Staphylococcus aureus</i>	1
Hemolytic streptococci	2
Non-hemolytic streptococci	5
<i>Streptococcus viridans</i>	5
Subtilis-like bacilli	2
Yeast cells	3
No growths	60
Not done	29

TABLE 5
Sprue

I. SMEARS	Gastric Residue	Tube IV
(a) Gram-positive cocci		
1. In chains	10	3
2. In pairs	8	4
3. Single	5	4
4. Clusters	1	
(b) Gram-negative cocci		
1. In chains	2	1
2. In pairs	8	3
3. Single	6	8
(c) Gram-positive bacilli	2	
(d) Gram-negative bacilli	8	2
(e) Gram-positive filaments	4	1
(f) Gram-negative filaments	9	1
(g) Gram-positive rods	8	4
(i) Gram-negative rods	7	6
(j) Gram-positive diplococci	4	4
(k) Gram-negative diplococci	5	3
(l) Large gram-positive rods	2	
(m) Large gram-negative rods	1	1
(n) Streptococci	1	
(o) Yeast	1	1
(p) Not done		7

II. CULTURES

	Gastric Residue	Tube IV
(a) Aerophilic subtilis	1	
(b) <i>B. coli</i>	2	
(c) <i>B. pyocyaneus</i>	1	
(d) Diphtheroid bacilli	0	
(e) Friedlander bacilli	2	
(f) Gram-negative bacilli (not typhoid)	2	1
(g) Gram-positive cocci	2	
(h) Gram-negative cocci	8	1
(i) Gram-negative diplococci	6	
(j) Gram-negative filaments	1	
(k) Gram-positive micrococci	3	
(l) Gram-negative micrococci	1	
(m) Gram-negative rods (large)	1	
(n) Hemolytic streptococci	4	
(o) Hemolytic streptococci (slightly)	0	
(p) Hemolytic <i>Staphylococcus aureus</i>	0	
(q) <i>Micrococcus catarrhalis</i>	1	
(r) Non-hemolytic staphylococci	2	
(s) Non-hemolytic streptococci	8	
(t) <i>Staphylococcus albus</i>	1	
(u) <i>Staphylococcus aureus</i>	1	
(v) <i>Streptococcus viridans</i>	2	1
(w) Yeast	1	
(x) No growths		11
(y) Not done		9

TABLE 6
List of Primary Diagnoses

Adenomyoma of uterus	1
Amebiasis (<i>E. histolytica</i>)	1
Apical abscesses	1
Appendicitis (chronic)	1
Arteriosclerosis (general)	1
Bacillary dysentery	1
Bronchial asthma	1
Carcinoma of pancreas	1
Cervicitis (chronic)	1
Cirrhosis of liver	1
Colitis (chronic)	4
Cystocele	1
Diabetes mellitus	1
Duodenal ulcer	7
Duodenitis	1
Elephantiasis	1
Gallbladder disease (chronic)	5
Gastritis (chronic)	9
Gastric neurosis	1
Hematuria	1
Hypochromic anemia	3
Hypothyroidism	4
Hydrops of gall bladder	1
Lymphogranuloma venereum	2
Mastoiditis	1
Melena	1
Menopausal syndrome	2
Nephrolithiasis	1
No diagnosis	6
Obesity, exogenous	1
Retroperitoneal lipoma	1
Recurrent lymphangitis	13
Salpingitis (chronic)	1
Schistosomiasis mansoni	5
Sprue	19
Syphilis	1
Tropical macrocytic anemia	1