

# Variation in the pH of faeces in disease

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**SUMMARY** Although it is highly unlikely that a disease can be definitively diagnosed from a study of the pH of the faeces alone, the present study has helped to dispel the past belief that the pH of faeces in acute amoebic dysentery is more likely to be acidic. Culture for other pathogenic organisms has not been done in the present series of cases, but the chances of the coincidence of bacillary dysentery in this group would probably not have been significant. Further, in the past a simple litmus paper test was suggested to differentiate an amoebic dysentery from a bacillary dysentery, a procedure which can no longer hold good.

Very little information is available about the variations in pH of faeces in various disease states. The reaction of normal faeces is quoted as varying between 6.8 and 7.3 (Bockus, 1964). Davidsohn and Wells (1962) state that normally the reaction is either acidic or slightly alkaline. It is maintained that much can depend on the diet and that excessive fermentation of carbohydrate can make the reaction more acidic, while putrefaction of proteins makes it alkaline.

Methods used to record the pH have been the glass electrode pH meter and nitrazene indicator papers. For simple clinical work litmus papers have been used. 'High acidity' has been recorded in diarrhoeal diseases due to deficiency of intestinal disaccharidases (Peternel, 1968).

A small series of cases studied by Blackwell (1961) confirm the view of other workers that stools from cholera patients are alkaline. He observed that those who had more alkaline stools prove to be the ones showing the most characteristic clinical signs of cholera and were bacteriologically positive for cholera vibrio. But since it is known that growth of cholera vibrio is favoured by an alkaline medium, it is possible that the finding of cholera vibrio associated with alkaline stool simply reflects the pH sensitivity of the organisms. Other instances pointing to the possible value of reaction of faeces in diagnosis have

been in amoebic dysentery (Manson and Bahr, 1966; Chatterjee, 1967). It used to be said that the typical stool in amoebic dysentery, which is unusually offensive in odour, containing blood and mucus mixed with a considerable amount of faecal matter, has an acid reaction whereas the typical faeces of bacillary dysentery are offensive, containing a large amount of pus and mucus and only a small amount of faeces, are alkaline (Wells, 1962). Indeed, this has even been suggested in the past as a useful screening test. But no statistical data have been available.

The present work comprises an initial study carried out at the Central Middlesex Hospital, London, and subsequently continued at the Government General Hospital, Madras.

## Method

In the initial study the pH of faeces was estimated using a glass electrode pH meter by the surface contact method using ion-free water for washing and wetting as and when required. A fresh sample of faeces was studied in most of the cases and the interval between collection and examination of the faeces never exceeded two hours. Measurements were made on three separate portions of each stool and the mean of the three measurements

was taken as the pH of the sample.

In the second part of the study a pH meter was not available and the pH was recorded with indicator paper.<sup>1</sup>

## Results

Variations in pH were recorded within a single specimen of stool. Three measurements were made on each specimen. In 17 specimens there was no variation; a variation of 0.1 to 0.2 was found in 52 specimens, of 0.3 to 0.4 in 21, of 0.5 to 0.9 in 21, and a variation of 1.0 in two specimens.

One hundred and thirteen samples of faeces in the British hospital series were examined from 94 patients. The 17 control subjects included patients with diabetes, pneumonia, cardiac disease, and hemiplegia, all in the convalescent phase. The other patients suffered from various gastrointestinal disorders. The results are set out in Table I.

The range of pH observed in the control

<sup>1</sup>Supplied by British Drug Houses (India) Pvt. Ltd.

	Range of pH Values						Total Specimens (113)
	9.1-10.0	8.1-9.0	7.1-8.0	6.1-7.0	5.1-6.0	4.1-5.0	
Control (17)	—	3(1)	14	4	(1)	—	23
Peptic ulcer and obscure alimentary bleed (23)	1	9(1)	10(2)	2	1	—	26
Surgically treated peptic ulcer <sup>2</sup> (12)	—	1(1)	4(1)	4	(1)	—	12
Non-specific diarrhoea (4)	—	1	—	1(3)	(1)	—	6
Crohn's disease (3)	—	—	—	2(1)	—	—	3
Ulcerative colitis (14)	—	1	1(1)	3(5)	2(3)	(2)	18
Ileostomy (13)	—	—	1(3)	1(2)	(8)	(1)	16
Abdominal malignancy (8)	—	1	1(2)	2	3	—	9
	—	1	1(2)	2	3	—	9

Table I pH of faeces measured with a glass electrode<sup>1</sup>

<sup>1</sup>Formed stools are shown on the left of each column and unformed stools in brackets on the right of each column.

<sup>2</sup>Including partial gastrectomy and gastroenterostomy.

pH	Amoebic Dysentery		Non-amoebic Conditions	
	Unformed Stools	Formed Stools	Unformed Stools	Formed Stools
10	8	—	—	—
9	34	—	—	1
8	10	3	—	3
7	26	13	—	10
6	13	9	—	12
5	—	—	—	—
4	9	7	—	9
Total	100	32	—	35

Table II pH of faeces in amoebic dysentery and non-amoebic conditions measured with indicator paper

subjects was 5.13 to 8.47, only five of 23 samples having a pH value of 7.0 or below. The sample of pH 5.13 was from a diabetic patient with unformed stools.

The overall pH range in the cases studied was 4.87 to 9.20. Unformed faeces tended to be more acidic (27 of 40 more acid than pH 7.0) than formed stools (48 of 73 more alkaline than pH 7.0). The ileostomy specimens tended to be frequently more acidic, being pH 7.0 in 12 out of 16 cases.

In the Madras series, the pH values (estimated immediately after defaecation) of the stools of 100 patients with acute amoebic dysentery, diagnosed on the finding of vegetative forms of *E. histolyca* in the stools and by a rectal swab and their responses to anti-amoebic drugs, without antibiotics, were compared with similar measurements in 67 patients with nondysenteric conditions (peptic ulcer 14, miscellaneous 53). These results are shown in Table II. Contrary to expectation the stools of the patients with amoebic dysentery were found to be alkaline more often than acidic (Table III). Thus, 52 of the 100 patients passed stools with a pH of 8.0 or above and only 22 stool specimens had a pH of 6.0 or below. The pH of the faeces of the majority of the non-dysenteric subjects, unlike that of their British counterparts, tended to more acid than pH 7.0.

pH	Number of Patients
9.1-10.0	3
8.1-9.0	8
7.1-8.0	3
6.1-7.0	4
Total	18

Table III pH of unformed faeces in acute amoebic dysentery<sup>1</sup>

<sup>1</sup>Since this paper was sent for publication, pH of freshly voided faeces from 18 patients with acute amoebic dysentery was recorded. Only four specimens had a pH below 7.0; culture for other pathogenic organisms was negative. All faeces were unformed, and culture for pathogenic bacteria were negative.

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