Follow-Up of a Flatulent Patient

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An article published in 1976 described an excessively flatulent patient and concluded with the observation that the patient was "assiduously testing a variety of foods in an attempt to develop a flatus-free, palatable diet—thus far without even a whiff of success" (1). This conclusion now clearly appears to have been premature since the patient's "assiduous testing" has produced a diet which has rendered him normoflatulent. This report describes the diet and the technique developed by the patient to generate his antiflatulent regimen.

CASE REPORT

The patient is a 30-year-old male who had a seven-year history of passing excessive flatus. Barium and endoscopic studies of the gastrointestinal tract were normal. The patient, over a two-year period, kept meticulous recordings of each passage of rectal gas [an average of 34 ± 7 (± 1 SD) times per day (value for normal, age-matched controls was 14 ± 4 times per day)] (1). Based on his flatus records, it was found that treatment with simethicone, *Lactobacillus acidophilus*, charcoal, neomycin, and dicyclomine hydrochloride (Bentyl) did not significantly reduce his gas production. Analysis of his rectal gas showed that 70-80% was comprised of H_2 and CO_2, two gases which are not present in the atmosphere and hence must have been produced in the gut. After ingestion of a test meal containing 2 glasses of milk the patient, who was lactose intolerant, excreted about 800 ml of rectal gas per four hours as compared to less than 100 ml by normal controls. The patient excreted the same quantity of gas as did the controls after ingestion of the test meal without milk. A lactose-free diet resulted in a reduction in his gas excretion to 25 ± 8 times per day which was significantly ($P < 0.01$) less than his previous production but still significantly greater ($P < 0.01$) than normals.

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L.O. Sutalf is the nom de plume of the patient described in this paper. Mr. Sutalf designed the experiments and "generated" all the data described in this report.

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Flatugraphic Recording Technique

The flatugenic potential of various foods was studied using the "flatugraphic" recording technique developed by the patient and shown in original form in Figure 1. This recording system shows the exact time of passage of each bolus of flatus and each eructation by strokes below and above the line, respectively. In addition, the patient recorded all foods ingested.

Through experience with a rectal tube and syringe, the patient developed a sense of quantity of gas discharged. According to the patient, it is not difficult to distinguish two levels of discharges which, respectively, represent greater or less than 7 ml. In lay language, the distinction is between the feeling that a little gas slipped out ("a squeaker") and a sensation of an appreciable amount of gas being discharged. (Gas passages of less than 7 ml were not recorded.)

Elimination Diet

Beginning his testing with total fast days, except for water, the patient tested the effects of more than 130 different foods on his gas production. Foods he used as a basic test diet, after having been tested and proven in his case to be minimal gas producers, included tuna, eggs, peanut butter, lettuce, broccoli, orange juice, corn chips, and berries.

Following a light breakfast of minimal gas producing foods, individual test foods were ingested during the lunch hour in quantities of at least three times the amount normally eaten at a meal. Dinner also consisted of normoflatulent foods. Gas passages per 24 hr were recorded for the period from one lunch to the next.

Normoflatugenic Foods. Ingestion of the following foods was found to be associated with "normal" levels of flatulence (19 or less passages of gas per day).

1. Meat, fowl, and fish
2. Vegetables—lettuce, cucumber, broccoli, peppers, avocado, cauliflower, tomato, asparagus, zucchini, okra, olives
3. Fruits—cantaloupe, grapes, berries
4. Carbohydrates—rice, corn chips, potato chips, popcorn, graham crackers
5. All nuts
6. Miscellaneous—eggs, nonmilk chocolate, Jell-o, fruit ice
7. Water—probably the safest of all consumables

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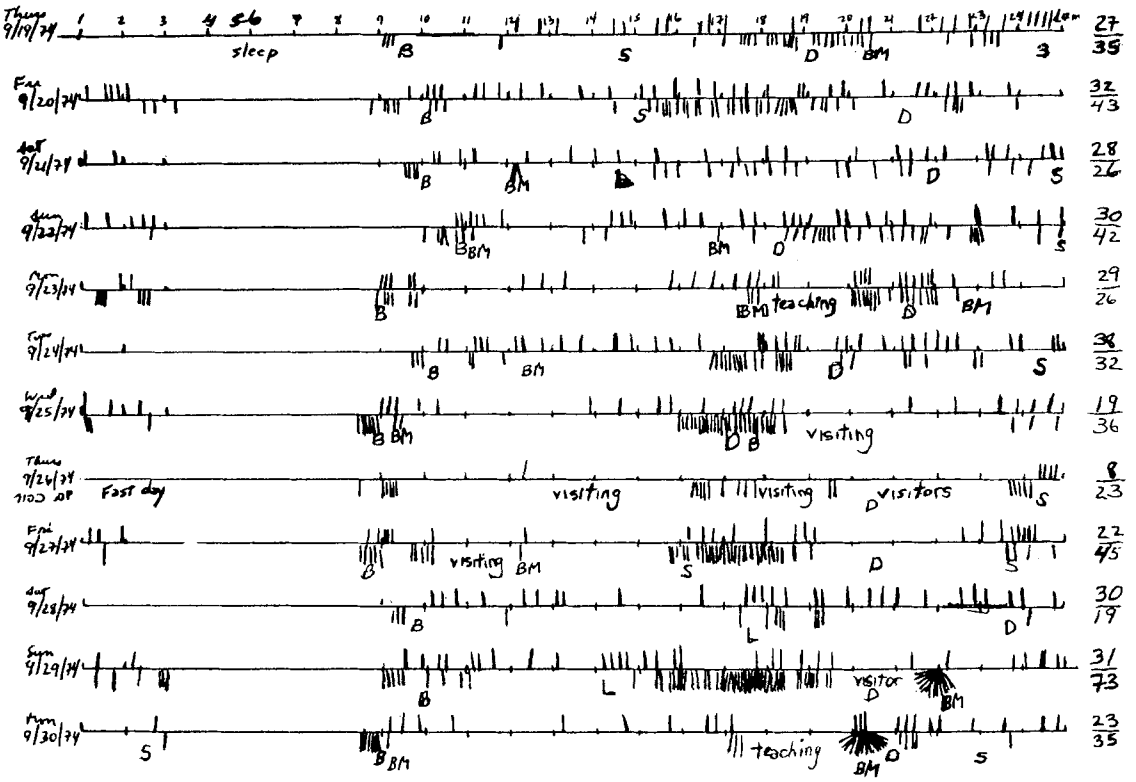

Fig 1. Copy of patient's "flatugraphic" recording system. Date is on the left vertical axis and hour of the day is on the upper horizontal axis. A stroke above the line indicates a belch and below the line indicates a passage of gas per rectum. Numbers along right vertical axis indicate total belches and rectal gas passages. Letters B, L, D, S, and BM respectively, indicate breakfast, lunch, dinner, snack and bowel movement.

Moderately Flatugenic Foods (20–40 passages per 24 hr): pastries, potatoes, eggplant, citrus fruit, apples, bread.

Extremely Flatugenic Foods (greater than 40 passages per 24 hr): milk and milk products, onions, beans, celery, carrots, raisins, bananas, apricots, prune juice, pretzels, bagels, wheat germ, Brussels sprouts.

Evidence that adherence to this diet could reduce the patient's flatulence was provided by a three-week test period during which the patient consumed only foods from the normoflatugenic list. During this period, he passed gas a mean of only 16.8 ± 4.5 (± 1 SD) times per day which is not significantly different ($P > 0.10$) from the previous established output of 13.6 ± 5.6 for age-matched controls and which is significantly lower ($P < 0.001$) than his previous output on a lactose-free diet. He consumed about 2500 cal/day during this period and maintained his normal weight of approximately 145 lb.

Following this test period, the patient tested the possibility that his gas-producing ability had diminished. Addition of one quart of milk to the nonflatugenic diet resulted in 90 passages of gas per 24 hr including 58 in one 3-hr period. On another day, the ingestion of a chocolate malt was associated with 50 passages of gas. Lastly, ingestion on another day of flatugenic foods (grapefruit, bagels, celery and carrots) caused 68 passages of gas.

Testing of Altered Milk Products

Ingestion of one quart of homogenized milk with *Lactobacillus acidophilus* culture resulted in 76 passages of gas per 24 hr. The possibility that incubation of milk with lactase (Lact-Aid, SugarLo Co., Atlantic City, New Jersey) could reduce gas excretion was tested on four separate days. In addition to the normoflatulent diet, the patient drank one quart of milk which had been incubated with one or two packets of lactase (0.7 g/packet) for 24 or 48 hr. He excreted gas only 22, 26, 26, and 29 times per day, far less than his output following one quart of nondigested milk.

General Application of Diet

The ability of this diet to reduce flatulence was studied in three additional patients with excessive flatulence. The rectal gas of all three subjects was shown to be primarily H_2 and CO_2 and flatugraphic recordings for five days on a basal diet showed that their daily number of gas passages was more than 2 standard deviations beyond the previously established normal mean of 13.6 ± 5.6. While adhering to the diet, the productivity of two patients fell significantly from 29 ± 4 and 26 ± 3 gas passages per day to respective values of 9 ± 3 and 11 ± 4 passages per day (P

< 0.02 in both cases) while the third subject showed no significant improvement.

DISCUSSION

The relation of dietary constituents to flatulence is a subject of much anecdotal discussion but little rigorous investigation. The only foods which have been clearly shown to cause excessive gas production are beans [soy (2) or baked (3)] and milk (1). Thus, the diet described in this paper appears to be the first published account of a diet purported to be low in flatulence potential.

Since the patient's rectal gas primarily consisted of two gases (H_2 and CO_2) which resulted from bacterial fermentation of ingested carbohydrates in the colon, presumably the normoflatulent diet contains a minimum of carbohydrates which are not totally absorbed in the small bowel. The patient who developed the diet was lactase deficient and the diet is devoid of milk-containing foods. However, simple lactose restriction did not reduce his flatulence to normal levels, and the salutory effect of the diet appears to depend on factors in addition to simple lactose restriction.

The addition of *Lactobacillus acidophilus* culture to milk did not reduce its tendency to induce flatulence, despite the manufacturer's claim that this product is of benefit for those who suffer from a variety of digestive disturbances. In contrast, incubation with a commercial source of lactase appreciably reduced the flatulence potential of the milk. Lactose restriction or treatment of milk with lactase possibly may also be of benefit to the apparently lactose-tolerant subject with excessive gas since ileal aspirates of subjects with normal lactose tolerance tests indicated failure to absorb as much as 8% of a 12.5 g dose of lactose (4).

In addition to lactose restriction, the antiflatulent diet is low in wheat products. Presumably, a small fraction of such carbohydrates is not absorbed in the small bowel and thus passes to the colon where fermentation yields gas. It is not clear if the excessive gas results from somewhat greater than normal malabsorption of these carbohydrates or a colonic flora that is extraordinarily efficient in producing gas from the small quantities of carbohydrate which may normally escape absorption in the small bowel.

The low-flatulence diet described in this paper was derived empirically by meticulous "flatugraphic" recordings of gas passages following the addition of various foods to a basal low flatulence diet. Admittedly, this diet has been shown to be of value in only three flatulent subjects, while one subject did not respond. Further testing will be required to determine if the diet will benefit most flatulent patients.

The most rational approach to the patient with excessive gas would be to first analyze a rectal gas sample. If N_2 is the predominant gas, air swallowing is presumably the cause and dietary manipulation will not be beneficial. If H_2 and CO_2 are the predominant gases, dietary therapy may well be helpful. If the diet described in this paper does not relieve the problem, further dietary manipulation in conjunction with meticulous flatugraphic recording may lead to a diet that is normoflatulent for that individual.

SUMMARY

This paper describes a low-flatulence diet developed by an extremely flatulent patient. Based on meticulous recording of each passage of flatus, the patient employed an elimination diet to determine what foods were responsible for his gas production. The diet reduced the frequency of his gas passage from 34 ± 7 to 17 ± 5 times per day (normal: 14 ± 6) and similar reductions were observed by two other flatulent patients during adherence to the diet. The rectal gas of each of these subjects largely consisted of two gases (CO_2 and H_2) which result from bacterial fermentation of carbohydrates. The diet, which is low in lactose and wheat products, presumably minimizes the quantity of carbohydrates delivered to the colonic bacteria.

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