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The BRAT Diet for Acute Diarrhea in Children: Should It Be Used?



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Oral rehydration and prompt feeding remain the cornerstones of therapy for acute diarrhea. Although many studies support the importance of enteral nutrition in recovery from diarrhea, there are few data concerning the efficacy of specific food types. One type of diet often prescribed during acute diarrhea is the Banana, Rice, Applesauce and Toast (or Tea) BRAT diet. We review the limited data that address the safety and efficacy of diets with bananas, rice, and other dietary components in treating diarrhea. In addition, we review the nutritional content of this restrictive diet and find it lacking in energy, fat and several micronutrients. Prompt feeding and age appropriate food should continue as the standard of nutritional care during acute diarrhea.

INTRODUCTION

Different dietary practices are applied worldwide to treat diarrheal diseases. The various approaches are influenced by the diversity of cultural beliefs and socioeconomic resources available in certain communities (1). Early nutrition intervention is crucial to avoid poor outcomes including malnutrition, persistent diarrhea and death. Controversy still exists

as to what types of foods are best indicated during the acute illness, as well as which foods will provide sufficient calories, easily absorbable nutrients, are palatable and are of low cost. Due to water and electrolyte loss during diarrhea, any dietary plan should always be accompanied by oral rehydration therapy (ORT) (2). ORT effectively treats and prevents dehydration in children and adults with diarrhea.

In the past, the concept of food restriction and bowel rest was based on the acknowledged effects of decreasing stool output (3). This concept of “gut rest” is now outdated, since randomized clinical trials confirm that refeeding immediately after rehydration is associated with lower stool output, shorter duration of

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illness, and better nutritional outcomes, compared with more gradual reintroduction of food (4). Current recommendations on feeding during diarrhea from the American Academy of Pediatrics, the Centers for Disease Control and Prevention, the World Health Organization and other groups include administering an oral diet as soon as the patient has been rehydrated.

The BRAT diet is one dietary management tool used by many clinicians and parents around the world during acute diarrhea. This paper will discuss some of the components of this diet and the relevant literature associated with it.

GENERAL PRINCIPLES SUPPORTING RE-FEEDING IN ACUTE DIARRHEA

Alterations in the small intestinal mucosa following an episode of acute diarrhea can impair nutrient absorption. Structural and functional changes such as blunted villi, decreased enzymatic and nutrient transport activities, increased crypt cell mitosis and mucosal inflammation can decrease absorptive function and may predispose to secondary carbohydrate malabsorption (5). Since the gastrointestinal mucosa receives nutrients both via the systemic blood supply (through the basolateral membrane) and via the lumen of the GI tract (across the apical membrane), reducing enteral nutrition deprives the recovering enterocyte of an important source of nutrients. Early enteral nutrition plays a major role in mucosal repair, improving the patient's nutritional state by the provision of adequate calories, and by reducing the duration of illness.

THE BRAT DIET

There is a large body of literature about a variety of nutrients and their role in protecting the GI mucosa from chronic or severe inflammatory diseases; these include micronutrients (e.g., vitamin A and zinc), amino acids (e.g., glutamine and arginine), and pro- and prebiotics (6). Very few studies, however, have been performed about which, if any, specific foods might help in this regard. As with many dietary habits, there are social and cultural beliefs about what foods should be given to sick or ill children. Many traditional diets for children with diarrhea are restrictive in one or many macro- or micronutrients.

An example of one of the oldest and most traditional of these restricted diets is the so-called BRAT diet, which is a combination of bland, low dietary fiber foods, which are supposedly well tolerated during diarrhea. It is commonly used and proposed as a short-term dietary management for acute diarrhea. BRAT is an acronym for Bananas, Rice, Applesauce and Toast (or Tea). To date, no clinical trials have been conducted to assess its effectiveness, although some data exist to evaluate the role of bananas and rice in treating diarrhea.

POTENTIAL ADVANTAGES OF THE BRAT DIET: FIBER, BANANA AND RICE AS ANTI-SECRETORY AGENTS

The role of dietary fiber in diarrhea has been proposed to reduce the duration of liquid stools (7) as well as to reduce the bioavailability of some micronutrients (8). Banana is rich in amylase-resistant starch, which has been postulated to protect the gastrointestinal mucosa in animals (9) and improve symptoms of non-ulcer dyspepsia and peptic ulcer in humans (10). One mechanism by which fiber may improve gastrointestinal mucosa healing is by the generation of short-chain fatty acids (SCFA) in the colon. These are potent stimulators of colonocytes, providing energy, enhancing absorption of water and electrolytes, and inducing a trophic effect in the colonic and small bowel mucosa (11).

Rabbani, et al performed a double-blind controlled trial in Bangladeshi boys (n = 62), age 5–12 months randomly assigned to a diet of rice only or rice mixed with either cooked green banana or with pectin for seven days (12). The authors measured the duration of illness and characteristics of stools in these two treatment groups compared with rice only. Children receiving pectin or banana-containing diets had overall better outcomes than children receiving the rice diet alone. They observed a significant reduction in stool weight, by the third day in both groups, 55% and 59% of children stopped having diarrhea compared with only 15% in the rice diet group. Also both groups were observed to require less ORS ($p < 0.05$), intravenous fluid ($p < 0.05$) and a reduced frequency of vomiting ($p < 0.05$) compared to the group receiving rice alone.

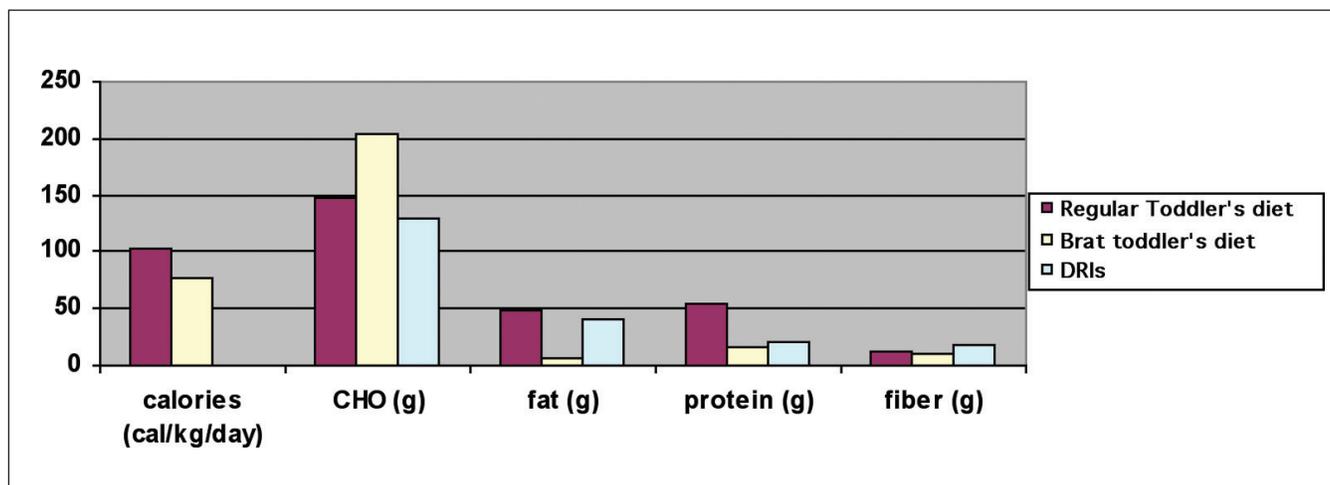


Figure 1. Represent a comparison of a regular toddler's diet based on a 2-year-old, 12 kg boy/girl with a BRAT toddler's diet and the Dietary Reference Intake (DRIs) for carbohydrate (CHO), fat, protein and fiber for the same age toddler.

Thus, there may be some benefit in including bananas and/or fiber in the diet of children with diarrhea.

Rice is commonly used in the diets of children with diarrhea. There are some *in vitro* data to suggest that rice may possess anti-secretory properties (13). Rice-based oral rehydration solutions (ORS) have also been shown to reduce the volume of stools and duration of diarrhea in patients with cholera (14). In addition to the potential anti-secretory effect of rice, rice-based ORS may provide additional glucose moieties for sodium-glucose co-transport, thus leading to optimal rehydration during severe diarrhea. In non-cholera diarrhea, rice-based ORS is no more effective than standard glucose-based ORS.

A recent study reported on the efficacy of rice-based ORS in a group of 189 Mexican children age three to 24 months with acute diarrhea (15). They were randomly assigned to receive rice-based ORS or glucose-based ORS. Although stool output was not different between the groups treated with rice-based ORS compared to glucose-based ORS, there was a reduced need for intravenous fluids in the rice group. An advantage of rice-based ORS may be lowered osmolarity, which has been associated with less vomiting, less stool output, and reduced need for unscheduled intravenous infusion compared with standard ORS in children during infectious diarrheal episodes (16).

Other cereal-based ORTs have also been evaluated and show promise as a way in which complex carbohydrates and other nutrients can be combined with oral rehydration therapy (17–19).

DISADVANTAGES OF THE BRAT DIET: INADEQUATE CALORIES, PROTEIN AND MICRONUTRIENTS

One concern about the use of a restricted diet is the effect on growth. Baker and Davis described two children who developed acute diarrhea and were treated with bowel rest and clear oral fluids followed by a BRAT diet (20). Both children subsequently developed severe malnutrition with hypoalbuminemia and edema, which resolved with nutritional support. One three-year-old girl developed kwashiorkor, presenting with an albumin of 1.6 g/dL after two weeks on the BRAT diet. One six-week-old boy developed marasmic kwashiorkor due to both the low protein and energy content of this diet. Although these two case reports represent an extreme outcome, they are reflective of what can happen with prolonged restrictive diets after an episode of infectious diarrhea.

In order to more precisely judge the nutritional value of the BRAT diet, we analyzed a 24-hour period of a healthy two-year-old's diet and compared the

Table 1

Represent a comparison of a regular toddler's diet based on a 2-year-old, 12 kg boy/girl with a BRAT toddler's diet in regards to Vitamin A, Vitamin B₁₂, Calcium and Dietary Reference Intake (DRIs).

Diet Type	Vitamin A (IU)	Vitamin B ₁₂ (mcg)	Calcium (mg)
Regular toddler diet	11210	2.3	1220
BRAT toddler diet	180	0	130
DRIs	1500	0.9	500

nutrient content with that provided as the BRAT diet to a hypothetical two-year-old. We used the software Food Processor SQL Version 9.9 to compare the macro- and micronutrient contents of the two diets. Comparison with Dietary Reference Intakes (21) was also performed. As seen in Figure 1, the BRAT diet provides approximately 300 calories per day less than a diet fed to a healthy toddler. While carbohydrate intake is high with the BRAT diet, fat, fiber and protein intake are all extremely low. As noted in Table 1, the BRAT diet also provides very low amounts of vitamin A, B₁₂ and calcium, compared with a healthy toddler diet. It seems clear that consumption of the BRAT diet is likely to lead to important deficiencies in dietary energy, protein, fat, fiber, and several critical micronutrients. It is important to emphasize prompt refeeding during an acute episode of diarrhea and avoiding unnecessarily restrictive diets, which is the recommended dietary therapy by the American Academy of Pediatrics (22).

SUMMARY

The selection of a single type of restrictive diet (e.g., the BRAT diet) during diarrhea can impair nutritional recovery and in fact lead to severe malnutrition. Dietary management during any acute illness should be balanced, providing all of the three major macronutrients, as well as meeting the DRI for micronutrients. Prompt feeding during an acute episode of diarrhea and avoiding unnecessarily restrictive diets is the recommended dietary therapy during acute diarrhea. Nursing should be continued for those infants who are breast-fed and standard full strength formula be given

to those formula-fed infants. Age appropriate foods from a variety of sources are recommended to optimize health outcomes. Future studies should evaluate whether certain dietary patterns are associated with more rapid recovery from acute diarrhea, but until these data are available, overly restricted diets should not be recommended.

Acknowledgement

We would like to thank Nicolle Quinn, R.D., for performing the nutrient analysis.

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