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The Gourmet Colon Prep



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Traditionally, patients undergoing colonoscopy have faced long periods without food, followed by a bowel preparation consisting of seemingly unending (no pun intended) amounts of unpleasant tasting liquids, culminating in large volumes of liquid stool and a sore bottom. These regimens have led many a patient to report that the preparation was far worse than the procedure itself (1)! The long period without food not only makes compliance difficult for some patients, it also creates a level of anxiety that adds to the discomfort. Ultimately, the quality of the preparation is at risk, leading to poor results. Furthermore, not only will the unfortunate patient with an inadequately prepared colon need to go through the bowel cleansing process again, but valuable health-care resources are wasted as well (2). The goal of this article is to provide guidance on dietary measures that may make the bowel preparation more tolerable and ultimately more successful.

INTRODUCTION

Colonoscopy is a diagnostic procedure used to assess disorders of the large intestine. Colonoscopy is also widely recognized as the gold standard for colorectal cancer screening in average-risk individuals age 50 and above and in higher risk patients, such as those with a family history of colorectal neoplasia (3). Removal of polyps by colonoscopy has been

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demonstrated to significantly reduce the incidence of colorectal cancer (4).

Diet regimens for colon preps vary among individual physicians and facilities. Several bowel cleansing regimens are available and can be tailored to each patient based on the medical history. Table 1 lists selected colon preps and the manufacturers' diet and fluid intake recommendations that accompany them. While some patients will breeze right through the preparation and the procedure without complaint, many will experience at least some level of unpleasantness from the bowel preparation process.

Most diet regimens used during bowel preparation involve one to several days without solid food; this can lead patients to complain of hunger, lack of

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Table 1: Selected Colonoscopy Preparations with Manufacturer Diet and Liquid Recommendations*

<i>Product</i>	<i>Active Ingredients</i>	<i>How Supplied</i>	<i>Amount of prep required</i>	<i>Amount of additional clear liquid recommended by manufacturer</i>	<i>Manufacturer Recommended Diet</i>
Colyte®	PEG-3350	Powder with flavor packets (citrus berry, lemon lime, cherry, pineapple, orange)	3–4 liters		On the day before procedure: light lunch around noon; no solid food beginning 2–4 hours before prep begins (at 4–6 P.M.); clear liquids if allowed by physician; only small amounts of water on day of procedure
NuLytely®	PEG-3350	Powder with flavor packets (cherry, lemon lime, orange, pineapple)	3–4 liters		Clear liquid diet on day before procedure
Half-Lytely®	PEG-3350 and bisacodyl delayed release tablets	Powder (lemon lime flavor pack available) and 4 tablets	2 liters and 4 tablets		Clear liquids only on day of prep (no food or milk)
MoviPrep®	PEG-3350	Powder	2 liters	1 liter (approx 32 ounces) minimum	Clear soup or plain yogurt for dinner, finishing meal at least one hour prior to start of bowel prep. No solid food after prep starts
Fleet® Phospho-soda®	Monobasic sodium phosphate monohydrate, dibasic sodium phosphate heptahydrate	45 mL bottle or 75 mL prep kit Lemonade flavor packets available in EZ-Prep® kit	75–90 mL	72 ounces (approx. 2.1 L) minimum	Low residue lunch before 2 P.M. day before procedure; clear liquid diet after 2 P.M. on the day before procedure; adequate fluid intake emphasized
OsmoPrep®	Sodium phosphate monobasic monohydrate USP, sodium phosphate dibasic anhydrous USP	Tablets	32 tablets	64 ounces (approx 2 L) clear liquids minimum	Patients instructed to follow physician recommendations for diet and to drink as much clear liquid as possible
Lo-So Prep™	Magnesium carbonate, citric acid, potassium citrate; bisacodyl tablets; bisacodyl suppository	Powder, tablets, suppository	8 ounces, 4 tablets, one suppository	Not available	Not available

*Information obtained from product websites; accessed July 20, 2007.

Please review all prescribing information prior to use. This is just a brief summary and prescribing information can change.

energy, and a feeling of “angst” and trepidation. Add an unpalatable bowel preparation, prolific diarrhea and a sore bottom and even clinicians undergoing the procedure will tell you it can be rather unpleasant (See Table 2 for one physician’s experience). The nutrition series editor will also attest to this letter’s validity; it is not a coincidence that this article falls on the heels of her own experience.

There is no doubt that poor bowel preparation may lead to inadequate results during the colonoscopy procedure, resulting in increased costs for patients and facilities, loss of revenue, and, finally, frustration on the part of both the patient and physician. According to one study, Rex and colleagues found that inadequate bowel preparation led to physicians lacking confidence in the procedure results and recommending follow-up colonoscopy at more frequent intervals than would otherwise be advised (2). They determined that unsatisfactory bowel preps increase colonoscopy cost by 12%–22%. The study did not evaluate the additional indirect costs of time lost from patients’ work for these repeat examinations, and the model assumes that the follow-up procedure is adequate (which may or may not be the case).

CLINICAL TRIALS ADDRESSING DIET IN BOWEL PREPARATION

In an effort to develop a bowel preparation that is more acceptable to patients (thereby increasing compliance and efficacy), several alternative regimens have been evaluated recently.

Scott, et al randomized 200 patients undergoing colonoscopy to receive a sodium phosphate oral solution preparation with either (5):

1. Standard light breakfast followed by clear liquids on the day before colonoscopy or,
2. Normal breakfast, low-residue lunch, and then clear liquids the remainder of the day prior to the exam.

There were no significant differences in the efficacy of the preparations, with 93%–95% reported as good or excellent. However, subjects consuming the low-residue lunch reported less hunger and more energy, permitting them to perform their usual daily activities.

Table 2 Tips for the GI Prep Based on a Physician’s Own Experience

TO THE EDITOR: “Doc, the GI ‘prep’ is worse than the procedure.” For 24 years, I’d heard this from patients. Recently, I personally learned that this was true. As a result of the experience, I believe it would be wise for all physicians who recommend gastrointestinal (GI) preps for patients to first endure one themselves.

There are several learning points. First, the taste of the oral solution is not what one would call good. My gut reaction was to chill it, squeeze the juice of a lemon into it and then use a straw to deposit it as far back in my mouth as I could. This helped tremendously.

Closely following this, I encountered another gut reaction: stuff, watery stuff, lots of watery stuff. The volume and frequency of the watery stuff (as inconvenient as it was) was not the problem, however. The problem was the intense burning in the perianal area. After about one half hour of this, I happened to notice our six-month-old child’s zinc oxide. Within seconds of applying zinc oxide to the affected area, all pain was gone, and as long as I reapplied it after each gush of liquid, there was no further pain! I highly recommend that physicians amend their colonoscopy and sigmoidoscopy protocols to add ice, lemon juice and a straw to the front end and zinc oxide to the rear end of the GI prep.

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Delegge, et al randomized 506 subjects scheduled for colonoscopy to receive either (6):

1. Clear liquids and sodium phosphate solution, or
2. A low residue diet kit (Table 3) and magnesium citrate colon preparation.

Both preparations resulted in >80% “good or excellent” colon cleansing rating by the endoscopist. The subjects receiving the low residue diet kit regimen reported improved tolerability ($p = <0.01$), and the majority of these subjects (85% versus 73%) reported that they would repeat this preparation for a future exam ($p = <0.001$).

Rapier, et al randomized 114 subjects into one of three treatment groups (7):

- Group 1: Clear liquid diet and a laxative kit containing magnesium citrate, oral bisacodyl tablets and a bisacodyl suppository

- Group 2: Low residue diet kit with the above laxative kit, or,
- Group 3: Low-residue diet kit with polyethylene glycol electrolyte solution (PEG-E).

Eighty-one percent of group 1, 89% of group 2, and 92% of group 3 had a good or excellent colon cleansing rating by the endoscopist. This study again showed that the use of a low residue diet is safe and effective; however, there were no significant differences in how the patients rated the tolerability of the regimen in this study.

Aoun, et al took this one step further and evaluated the effectiveness of an unrestricted diet on the day before colonoscopy (8). A total of 141 subjects were randomized to:

1. 4 L polyethylene glycol electrolyte solution (PEG-E) and clear liquid diet on the day before the procedure, or
2. 2 L PEG-E and regular diet (up until 6:30 P.M. on the day before the procedure) and 2 L PEG-E on the morning of the procedure.

Endoscopists who were blinded to the treatment group reviewed videotapes from the colonoscopy procedures and rated the bowel preparation. The preparation was rated as excellent in 5.5% of the clear liquid group, compared with 44.1% of the regular diet group ($p < 0.001$). When the ratings were grouped into satisfactory (excellent and good) versus unsatisfactory (fair and poor), the clear liquid group had 56.2% satisfactory compared to 76.5% satisfactory in the regular diet group ($p = 0.011$). The regular diet group did report increased bloating ($p = 0.039$); however, there were no significant differences in the incidence of nausea, vomiting, or cramping. The regular diet group demonstrated a non-significant trend toward increased compliance (90% versus 78%; $p = 0.062$).

Table 3
Contents of Prepackaged Diet Kit (NutraPrep®) (6)

- Potato poppers
- Cinnamon applesauce
- Lemon drink
- Chocolate energy bar
- Chicken soup
- Vanilla shake

Table 4
Clear Liquid Diet
NO Alcoholic Beverages

→ NO RED OR PURPLE COLORED ITEMS ←

- Water
- Tea
- Plain coffee
- Clear juices such as apple or white grape
- Lemonade from powdered mix
- Fruit-flavored drinks, such as Kool-Aid®, Crystal Light®, etc.*
- Carbonated beverages / soda
- Sports drinks such as Gatorade®, All-Sport®, Powerade®, etc.*
- Fat free broth / bouillon / consommé
- Plain / flavored gelatins*
- Fruit Ices / Italian ices*
- Sorbet*
- Popsicles® (without milk or added fruit pieces)*
- Clear liquid nutritional supplements (see Table 5 for product contact information)
- Honey
- Sugar
- Hard candy*

*Remember: no red or purple

In summary, the available literature demonstrates that most patients do not require a full day of clear liquids prior to a colonoscopy procedure. For the majority of patients with normal gut motility, a regimen that includes a low residue lunch on the day prior to colonoscopy is well tolerated and permits effective bowel cleansing. Further liberalization of the diet in conjunction with a split dose PEG-E solution may be an option for some patients; further study in this area may provide more information on the use and indications for this regimen. Patients with a history of severe constipation or other dysmotility syndromes should be assessed on an individual basis.

THE CLEAR LIQUID DIET

A clear liquid diet has long been the necessary companion of the colonoscopy bowel preparation. Clear liquids are often recommended for one or more days prior to the procedure (9). Occasionally, longer periods of dietary restriction are advised if there is a history of severe constipation.

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**Table 5
Clear Liquid Commercial Nutritional Supplements**

Brand Name	Flavors available	Manufacturer	Website / Phone
Enlive®	Apple Peach	Ross	www.rosstore.com (800) 258-7677
Resource® Breeze	Orange and Peach only	Novartis	www.novartisnutrition.com (800) 333-3785
Carnation® Instant Breakfast® Juice Drink (NOT regular Carnation Instant Breakfast)	Orange only	Nestlé	www.nestle-nutrition.com (800) 442-2752

**Table 6
Clear Liquid Drink Recipes**

➔ NO RED OR PURPLE COLORED ITEMS ◀

High Protein Fruit Drink
8 oz commercial clear liquid nutritional drink (see Table 5)
1/2 cup sorbet
6 ounces ginger ale
Mix all ingredients and blend until smooth

Fruit Fizz
1 cup clear fruit juice from clear liquid list
1/2 cup sparkling water
1/2 cup ice
Blend ice and juice until slushy. Pour in glass and add sparkling water

Frozen Fruit Slush
1-6 oz can of frozen clear juice concentrate
4 tbsp sugar
3 cups crushed ice
Mix all ingredients and blend until smooth

Lemon Lime Slushie
Juice from two limes
Juice from one lemon
1 cup sparkling water
1 cup ice
4 tsp. sugar or to taste
Blend ice and juice until slushy. Pour in glass and add sparkling water

Home-made ice pops can also be made using fruit juice, a sports drink or other favorite clear liquids.
Remember: no red or purple liquids.

Regardless of exactly when the clear liquid diet is started, patients will need to continue to drink large amounts of clear fluids *throughout* the actual bowel preparation process to prevent dehydration. Providing patients with a variety of clear liquid options may increase compliance with the regimen (Table 4). Table 5 includes a list of commercial clear liquid nutritional supplements, and Table 6 provides suggested recipes for adding more variety to a clear liquid diet.

Keep in mind that not all patients find sweet tasting liquids appealing. For these patients, the prospect of a day (or several days) of fruit flavored drinks, Popsicles®, and Jell-O® can be especially disconcerting. Providing less sweet options such as clear broth, unsweetened tea, coffee without milk (can be iced), or water flavored with lemon, lime, or other flavors might help.

LACTOSE-FREE, FIBER-FREE NUTRITIONAL SUPPLEMENTS

Although not generally considered clear liquids, many nutritional supplements (such as Ensure®, Boost® and many enteral nutrition formulas) are not milk-based, but water-based. As long as a **fiber-free** formula is selected, these formulas are also low in residue and can be used in conjunction with a clear liquid diet for bowel preparation.

Kruss, et al randomized 72 ambulatory men to receive one of three regimens for bowel preparation (10):

- A. Prep—Magnesium citrate for two nights before colonoscopy, enemas if needed before procedure
Diet—at least six cans of Ensure® on day before colonoscopy; additional cans, coffee and tea were also allowed

Table 7
Consumer Information for Selected Lactose-Free /
Fiber-Free Nutritional Supplements*

<i>Supplement</i>	<i>Where to Buy</i>
Check to make sure brands are non-milk based and fiber free.	
Ensure [®] Ensure [®] Plus	Available at many pharmacies, grocery, and discount stores or from Ross at www.rosstore.com or (800) 258-7677
Boost [®] Boost [®] Plus	Available at many pharmacies, grocery, and discount stores or from Nestlé, at www.boost.com or (800) 828-9194
Nutren [®] 1.0	http://www.nestle-nutrition.com or (800) 442-2752
Equate Equate Plus	Wal-Mart stores
Liquid Nutrition Liquid Nutrition Plus	CVS stores
Nutritional Drink	Target stores
Unsweetened (must be ordered in case of 24 cans)	
Osmolite [®] Osmolite [®] 1.2 cal Osmolite [®] 1.5 cal Promote [®]	www.rosstore.com or 800-258-7677
Isosource [®] (NOT Isosource 1.5)	http://www.novartisnutrition.com or Novartis Nutrition at (800) 333-3785

*Many other grocery stores and pharmacies may have their own brands.

- B. Prep—magnesium citrate on evening before colonoscopy and enemas until clear two hours before colonoscopy
 Diet—Clear liquids for two days
- C. Prep—Magnesium citrate for two nights before colonoscopy, enemas if needed before procedure
 Diet—at least six cans of Ensure[®] on day before colonoscopy; additional cans, coffee and tea were also allowed

The authors found that the efficacy of bowel preparation in all three groups was similar. In the two groups allowed Ensure[®], subjects recorded significantly higher intake of calories, protein, vitamins and minerals than the clear liquid group. Both group C and groups A and C combined rated the acceptability of the regimen significantly better than the clear liquid group.

Table 8
Recipes for Nutritional Supplements

→ NO RED OR PURPLE COLORED ITEMS ←

Sorbet Drink

8 oz vanilla Ensure[®], Nutren[®] or Boost[®]
 1 cup sorbet

Directions:
 Mix all ingredients and blend until smooth

Coffee Drink

1 can vanilla Ensure[®], Nutren[®] or Boost[®] drink
 1 tsp instant coffee

Directions:
 1. Pour nutritional drink into large microwavable mug.
 2. Microwave on high 1-1/2 to 2 minutes or until hot.
 (Caution: mug may be hot.)
 3. Stir in coffee and serve

Vanilla Soda

8 oz vanilla Ensure[®], Nutren[®] or Boost[®]
 1/2 cup carbonated mineral water

Directions:
 Combine nutritional drink and mineral water in a tall glass and serve

Orange Dreamsicle

8 oz vanilla Ensure[®], Nutren[®] or Boost[®]
 1/2 cup orange soda or orange drink from mix (not orange juice)

Directions:
 Combine nutritional drink and orange drink in a tall glass and serve

Iced Cocoa

1/2 cup ice cubes
 1/2 cup chocolate Ensure[®], Nutren[®] or Boost[®]
 1 package hot cocoa mix

Directions:
 Mix supplement and hot cocoa mix; pour over ice

The authors concluded that Ensure[®] was a safe, effective, and nutritious adjunct to colonoscopy preparation.

In another small study, Brown, et al reported on 67 outpatients scheduled for colonoscopy who underwent bowel preparation with metoclopramide, bisacodyl, and Fleet[®] Phospho-soda[®] (11). The subjects were randomized to two dietary groups: 1) clear liquids for 24 hours (n = 32) or 2) Ensure[®] (up to 8 cans) in addition to clear

Table 9
Low Residue Diet Options

<i>Foods to Choose</i>	<i>Foods to Avoid</i>
<i>Breads & Starches</i>	
White bread, roll, biscuit	Whole wheat breads, cereals, crackers, rolls
White rice or noodles	Whole wheat pasta
Plain crackers	Brown or wild rice
Potato roll	Breads or cereals with nuts, seeds, or fruit
Skinless cooked potato	Buckwheat
Pretzels	Granola
Puffed rice, Rice Krispies®	Cornbread
	Pumpernickel bread
<i>Meat</i>	
Skinless chicken	Tough fibrous meats
Skinless turkey	
Fish or seafood	
<i>Fruit</i>	
Applesauce	Other raw fruit
Soft honeydew or cantaloupe	Prunes or prune juice
Canned fruit without seeds or skin	Raisins and dried fruit
Ripe banana	Berries
<i>Vegetables</i>	
Cooked or canned vegetables without seeds (examples: green beans, carrots, potatoes)	Raw or partially cooked vegetables
	Corn, Brussels sprouts, cabbage, broccoli, onions, cauliflower, beans, peas, winter squash, sauerkraut
<i>Desserts</i>	
Vanilla wafers	Those with nuts, seeds or fruit
Sherbet	
Animal crackers	
<i>Other</i>	
Eggs	Nuts, seeds, popcorn
Chicken noodle soup without vegetables	
Margarine, mayonnaise, mustard	
All items included on the clear liquid diet	

liquids (n = 35). Although the overall response rate to the preparation in the Ensure® group was not as good as the control group (80% versus 97%), participants who consumed fewer than 4 cans of Ensure® (n = 16) had colonoscopy results similar to the control group.

Larger trials would be helpful as these supplements not only provide more options to patients but could decrease the sensation of hunger experienced with the traditional clear liquid diet. Further studies might also provide useful information for patients

receiving enteral nutrition (for whom adequate nutritional intake is often key) to determine how long fiber-free, low-residue enteral feedings need to be held prior to colonoscopy.

See Table 7 for examples of non-milk based, lactose-free, fiber-free nutritional supplements. Table 8 provides recipes for use with the allowed commercial nutritional supplements. Patients may also use these allowed supplements in coffee (rather than milk) during the bowel
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Table 10
Sample of a Low Residue Diet Menu

Choose *one* item from each group:

Main entrée

- 3 oz skinless chicken, turkey, fish or seafood
- 1 large or 2 medium eggs
- 1 can of chicken noodle soup without vegetables

Vegetable/Fruit

- 1/2 cup applesauce
- 1/2 cup cooked or canned vegetables without seeds (example: green beans). **NO corn**

Bread

- 1 white potato roll
- 2 slices white bread
- 1 white flour tortilla
- 1 cup cooked white rice
- 1 cup cooked pasta

Condiments

- 2 tsp soft tub margarine
- 1 tsp mustard or mayonnaise

Dessert

- 4 vanilla wafers
- 1/4 cup pretzels
- 1/2 cup sherbet

NOTE: Any items allowed on the clear liquid diet are also allowed.

Derived from Scott, et al (5)

preparation stage (again, anything that can be done to make the regimen as palatable and as close to normal as possible will ultimately be of benefit). Some enteral nutrition formulas, such as Osmolite[®], Promote[®], and Isosource are fiber-free and come in an unflavored variety, for those patients who prefer less sweet beverages.

DAY BEFORE PROCEDURE LOW RESIDUE LUNCH

Those patients permitted to have a low residue diet on the day before their procedures have several options. Some authors have used a pre-packaged low residue diet pack (Table 3) in conjunction with the cathartic bowel regimen (6,7) (http://www.ezem.com/virtual_colon/nutra.htm). The advantage to this approach is that

Table 11
Additional Tips

Tips for improving acceptability:

- Most agree the bowel prep solutions taste best well-chilled; try chilling the glass, too
- If lukewarm liquids are preferred, remove the dose from refrigerator for 15–30 minutes before drinking.
- Drink the whole dose quickly rather than sipping small amounts
- Try drinking the bowel prep solution through a straw
- Rinse mouth with water, clear soda, or mouthwash after drinking
- Suck on hard candy or lollipops (No red or purple)

Tips to avoid a sore bottom from frequent bowel movements

- Avoid rubbing; gently pat area with wet washcloth or pre-moistened wipe or rinse with water
- Apply Vaseline[®], Aquaphor, Preparation-H[®], or diaper rash cream/zinc oxide LIBERALLY after each trip to the bathroom
- Wipe with refrigerated Tucks[®] or Fleet[®] relief pads (available over the counter)
- Have reading material handy in the bathroom, MP3 player, iPod[®], etc.

it takes the guesswork out of the diet—any items in the box are approved. The disadvantage of these kits may be the cost (approximately \$25.00/kit) and they are not as readily available as regular, low residue foods.

Alternatively, patients can choose from widely available low residue foods in the supermarket. See Table 9 for a list of low residue foods and Table 10 for a sample menu such as the one advocated for use during preparation with oral sodium phosphate solution (5).

COMMENT FROM THE SERIES EDITOR: PREPS FOR PATIENTS WITH ILEOSTOMIES AND JEJUNOSTOMIES?

In clinical practice, confusion sometimes arises as to whether patients with an ileostomy or jejunostomy need to undergo a bowel preparation prior to an endoscopic procedure from below. In contrast to the colon, material passes quickly through the small bowel (generally in 6–8 hours—in addition to the fact that there is no reservoir to hold effluent) abolishing the need to prep these patients prior to a procedure. Also, most traditional bowel preps act mainly within the colon and

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are of little use in these situations. Therefore, the experts we communicated with agreed that bowel preparation is unnecessary in patients with a jejunostomy or ileostomy (12,13). In general, a period of NPO status is all that is necessary. However, an occasional patient with an ileostomy may require a single dose of a saline laxative (12).

CONCLUSION

The bowel preparation is a necessary and essential part of the colonoscopy procedure. Providing specific guidelines and suggestions can reduce the patient's level of uncertainty and anxiety about the prep (Table 11 for additional tips). For many patients, a low residue lunch on the day before the procedure can be consumed without impairing colon cleansing. Liberalizing the pre-procedure diet may not only decrease hunger during the prep, but can decrease the patient's dread of such a long period without food. Emphasizing the importance of adequate intake to prevent dehydration is also valuable, and providing a variety of options for the liquid diet may be helpful. Minimizing a patient's discomfort during the prep can lead to increased compliance with the regimen, ultimately allowing better results, decreased healthcare costs and less frustration for both clinicians and patients. ■

Disclosures

Dr. Balaban is a medical consultant to Fleet Pharmaceuticals and has received research support and speaker honoraria from Fleet Pharmaceuticals.

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