Bezoars are retained concretions of undigested foreign material that accumulate and coalesce within the gastrointestinal tract, most commonly in the stomach. Originally described in the stomach of ruminant animals such as goats, antelopes, and llamas, for centuries, bezoars were ascribed mystical and medicinal powers and considered invaluable possessions. Although the occurrence of bezoar formation has been well documented in humans, the diagnosis, management and treatment remains a difficult task for patients and healthcare professionals. Patients are often asymptomatic or display symptoms indistinguishable from other gastrointestinal disorders resulting in delayed diagnosis and potential life-threatening complications. Individuals may also present with considerable weight loss and compromised nutritional status due to early satiety and recurrent vomiting. Recognition of high-risk individuals and subtle clinical clues may assist in early diagnosis and prompt medical attention. Furthermore, understanding the pathophysiology of bezoar formation along with predisposing risk factors may aid in preventing recurrence.

INTRODUCTION

Bezoars are retained concretions of indigestible foreign material that accumulate and conglomerate in the gastrointestinal tract, most commonly in the stomach. Bezoars can be composed of virtually any substance including food, hair, medications, and chewing gum. Although they are most commonly found in the stomach, bezoars may occur anywhere from the esophagus to the rectum. Depending on a patient’s course, they may lose a considerable amount of weight due to early satiety and recurrent vomiting. Bezoars have been described in patients with normal gastrointestinal anatomy and physiology, however the majority of gastric bezoars occur as a complication of previous...
gastric surgery or altered gastrointestinal motility in which there is a loss of normal peristaltic activity, compromised pyloric function, or reduced gastric acidity. Understanding the pathophysiology of bezoar formation and recognizing high-risk individuals are critical elements in the diagnosis, management, and prevention of gastrointestinal bezoars.

HISTORY

For centuries, bezoars have been described in the stomach and intestines of humans and ruminants including certain goats, sheep, deer, llamas, and antelopes. The original bezoars came from the stomach of goats found in the mountains of Western Persia (1). They were introduced to Europe from the Middle East sometime during the 11th century and remained popular there as medicinal remedies until the eighteenth century. They have been ascribed mystical powers and employed as medical therapies as early as 1000 B.C. (2). Considered a panacea for a variety of physical ailments, they have been used to treat poisons such as arsenic, venomous bites, epilepsy, dysentery, and the plague. The term bezoar comes from either the Persian “pahnzehr” or the Arabic “badzehr,” both of which mean counter-poison or antidote (1,2). Bezoars were considered valuable possessions in the Middle Ages and were commonly set in gold and decorated with jewelry, given the name “bezoar stone.” Today, bezoars are recognized as a potentially serious medical problem in patients with compromised gastric anatomy and/or gastrointestinal motility.

CLASSIFICATION

Bezoars can be classified into four types based on their origin and components: phytobezoars, trichobezoars, lactobezoars, and pharmacobezoars (medication bezoars) (3) (Table 1). Understanding the classification system may provide further insight into treatment options and prevention of recurrence.

Phytobezoars are the most common type of bezoars today. They are composed of food material nondigestible by humans including cellulose, hemicellulose, lignin, and fruit tannins (leucoanthocyanins and catechins) (4,5). These nondigestible materials are found in foods such as celery, pumpkins, grape skins, prunes, raisins, and most notably persimmons. Bezoars resulting from ingestion of persimmons have been commonly described and referred to as diospyrobezoars. In high concentrations, fruit tannins may form a coagulum upon exposure to an acidic environment initiating the formation of a phytobezoar (6).

Trichobezoars are the classically described “hair bezoar” occurring most frequently in children and young adult females. Usually observed in individuals with psychiatric disorders, trichobezoars result from ingesting large quantities of hair, carpet fibers, rope, string, or clothing (7). The hair fibers become entangled in the gastric folds and resist peristalsis. Undigested fat and mucus may become trapped in the fibers (continued on page 40)
and ferment leading to a putrid odor. Gastric acid denatures the hair proteins and blackens the bezoar regardless of the intrinsic color. Trichobezoars are usually confined to the stomach; however, occasionally they have a “tail” which extends through the pylorus and into the proximal small intestine. There have been reported cases of trichobezoars extending throughout the entire length of the small intestine, known as the “Rapunzel syndrome” (8,9).

Lactobezoars are a compact mass of undigested milk concretions located within the gastrointestinal tract. These bezoars have been traditionally associated with pre-term infants fed a highly concentrated formula within the first weeks of life (10). Poor neonatal gastric motility, dehydration, concentrated formulas, and milk products such as casein have been attributed to the formation of lactobezoars (11). However, a recent study suggests that the etiology is likely multifactorial and examples may be seen in a wide range of patients (up to three years of age) who consume breast milk, commercial infant formulas, and cow’s milk (12). Nevertheless, the preferred initial treatment for lactobezoars involves intravenous hydration and temporary cessation of enteral feedings.

Pharmacobezoars are conglomerates of medications or medication vehicles in the gastrointestinal tract of individuals at risk for bezoar formation. Several medications have been implicated in causing bezoars including cholestyramine, sucralfate, nifedipine, enteric-coated aspirin and antacids such as aluminum hydroxide (13). The majority of case reports describing pharmacobezoars have involved extended-release products such as nifedipine or verapamil (14,15). The tablet coating is composed of cellulose acetate; an indigestible semi-permeable casing that allows a continuous, controlled release of medication over a 24-hour period. However, in patients with altered gastrointestinal anatomy or motility, accumulation of these shell casings may lead to pharmacobezoar formation. Bulk forming laxatives such as perdium and psyllium have also been implicated in bezoar formation (15-18). The bulk-forming nature of these products in conjunction with an underlying GI abnormality is the proposed mechanism for bezoar formation. The manner through which medications initiate bezoar formation depends on the medication involved and underlying gastrointestinal abnormalities.

Although gastrointestinal bezoars are traditionally classified into these four types, other types of bezoars have been described including trichophytobezoars (a mixture of hair, fruit and vegetable fibers), diospyrobezoars (persimmons), worm bezoars (dead ascaris) and an unusual case of a toilet paper bezoar described in a young girl (19). The components of the bezoar often dictate the therapies necessary for removal and prevention of recurrence.

SYMPTOMS

Many patients with bezoars are asymptomatic or present with vague symptoms indistinguishable from other gastrointestinal disorders. One of the most common presenting symptoms is a vague feeling of epigastric discomfort that is present in as many as 80% of patients with bezoars (20). Other symptoms include abdominal bloating, nausea and vomiting, early satiety, post-prandial fullness, halitosis, anorexia, dysphagia and weight loss (3). The presenting symptoms may provide some insight into the anatomic location of the bezoar. Esophageal bezoars often present with signs and symptoms of dysphagia, odynophagia, reflux and retrosternal pain. Bezoars located in the stomach may result in abdominal pain, nausea and vomiting, gastric ulcerations from pressure necrosis and subsequent gastrointestinal bleeding as well as gastric outlet obstruction. Small bowel bezoars usually present with signs and symptoms of partial or complete intestinal obstruction or perforation requiring surgical intervention. Although the sequelae from gastrointestinal bezoars may be serious and potentially life threatening, most patients present with only vague symptoms indistinguishable from other gastrointestinal disorders. In evaluating for a potential bezoar, it is important to understand predisposing risk factors while obtaining a clinical history.

PREDISPOSING RISK FACTORS

Although bezoar formation may occur in individuals with normal gastrointestinal anatomy and physiology, patients with altered gastrointestinal anatomy and/or motility are at increased risk for developing bezoars (Table 2). For example, patients with a partial gastrec-
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Bezoars: From Mystical Charms to Medical and Nutritional Management

Gastroenterology secondary to peptic ulcer disease have a higher risk for bezoar formation due to compromised pyloric function. Furthermore, vagotomies resulting from a partial gastrectomy can impair gastrointestinal motility thus further increasing the risk for concretions developing in the stomach. A 5%–12% incidence of bezoar formation has been reported in the postgastrectomy state (21). In patients with diabetes mellitus complicated by gastroparesis, there is an increased risk for bezoar formation, especially those on a high fiber diet. Bezoar formation has also been described in patients with coexistent illnesses affecting gastrointestinal motility such as Guillain-Barre syndrome, myotonic dystrophy, and hypothyroidism (3). Other medical conditions associated with increased risk for bezoar development include cystic fibrosis, intrahepatic cholestasis, and renal failure. Edentulous patients with poor mastication of food particles may also be at greater risk for bezoar development, especially if coexisting risk factors as described above are also present. In addition, patients with psychiatric illnesses are at an increased risk for bezoar formation due to possible ingestion of hair and medications (22). Recognizing the clinical symptoms in association with predisposing risk factors may enhance clinical suspicion leading to prompt diagnosis, treatment, and avoidance of potential complications.

**DIAGNOSIS**

Physical examination has limited utility in diagnosing bezoars. Occasionally, a palpable mass may be appreciated on abdominal exam or halitosis recognized from the putrefying material within the stomach. However, these findings are nonspecific and often difficult to discern. In patients with trichobezoars, patches of alopecia may be recognized in individuals with psychiatric conditions such as trichotillomania (23).

Plain abdominal radiographs may demonstrate a filling defect outlined by gas or dilated bowel along with evidence for obstruction. Barium studies may reveal filling defects as the contrast material coating the bezoar infiltrates the interstices of the concretion producing a characteristic mottled or streaked appearance. Although barium studies may assist in the diagnosis, unfortunately, the barium may also interfere with other diagnostic and therapeutic interventions such as endoscopy or surgery by impeding visualization of the bezoar and gastrointestinal mucosa. Abdominal computed tomography has proven useful in the diagnosis and evaluation for potential complications such as intestinal obstruction or perforation (24).

Endoscopy has been demonstrated to be the diagnostic technique of choice for bezoars located in the esophagus or stomach. When compared to barium studies, the barium swallow identifies only 25% of the bezoars found endoscopically (25). Moreover, endoscopy has the advantage of potentially offering therapeutic intervention, especially when dealing with phytobezoars. Endoscopically, the phytobezoar will usually be visualized as a dark brown or green ball of amorphous material located in the fundus or antrum of the stomach. (Figure 1). The trichobezoar may appear black secondary to the enzymatic and acid oxidation of the hair material (Figure 2).

**TREATMENT**

The ultimate goal of treatment is removal of the bezoar and prevention of recurrence. Current management consists of surgical extraction or endoscopic fragmen-
tation, dissolution with enzymatic therapy consisting of proteolytic or cellulase enzymes, gastric lavage, dietary modifications and prokinetic agents (26,27). The choice of therapy is largely dependent on the type of bezoar present and the presence of underlying risk factors such as delayed gastric emptying, psychiatric illness, and medications prone to bezoar formation.

Most authors would agree that trichobezoars require operative removal. The twisted strands of hair can develop a wire-like consistency resulting in pressure necrosis and subsequent perforation (23). Other complications include gastric outlet obstruction, small intestinal obstruction, ulceration, pancreatitis and bleeding. Medical therapy is usually unsuccessful and may potentially prove hazardous by delaying immediate removal. Although endoscopic techniques for removal of trichobezoars have been successful, failure of removal should prompt a surgical evaluation.

Phytobezoars are composed of fruit and vegetable fibers that can be enzymatically degraded by proteolytic and cellulase enzymes. Medical therapies for the management of gastric phytobezoars are shown in Table 3. Papain, a proteolytic enzyme from the carica papaya plant, has been used for the treatment of phytobezoars with varied success rates (0%–100%) (28,29). Although the mechanism of action remains unknown, it is thought to cleave protein linkages within the phytobezoar. Adverse reactions have been reported including gastric ulceration (30), esophageal perforation (31), and hypernatremia (32). Although these complications following papain therapy are seldom reported, cautionary discretion is raised due to lack of controlled clinical trials. Earlier studies with papain therapy were conducted with Papase tablets, which are no longer available in the United States. An available alternative source of papain is Adolph’s Meat Tenderizer, which is mixed with a clear liquid and administered orally or with gastric lavage (2–4 teaspoonfuls dissolved in 200mL of water) (32). The hypernatremia associated with papain use is believed to be secondary to the high sodium chloride concentration in Adolph’s Meat Tenderizer (Note: 1 teaspoon = 1680 mg (73 mEq) sodium in the “unseasoned” original; customer service: 800/328-7248). A salt free preparation may help to reduce this untoward side effect.

An alternative enzymatic therapy, which has become more widely accepted, is cellulase, an enzyme (continued on page 44)
Table 3
Medical Management of Gastric Phytobezoars

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellulase</td>
<td>3-5 g dissolved in 300-500 mL of water and administered po for 2-5 days</td>
</tr>
<tr>
<td>Papain (Adolph’s Meat Tenderizer)</td>
<td>1-2 teaspoon/s in 250 mL of water po TID for 2-5 days</td>
</tr>
<tr>
<td>Acetylcysteine</td>
<td>15 mL diluted in 50 mL NaCl 0.9% administered via nasogastric lavage TID for 2 days</td>
</tr>
<tr>
<td>Metoclopramide</td>
<td>10 mg liquid, po with each meal and at night</td>
</tr>
<tr>
<td>Coca-Cola Nasogastric lavage</td>
<td>3 Liters of Coca-Cola administered via nasogastric lavage over 12 hours</td>
</tr>
</tbody>
</table>

A single case of treatment of a phytobezoar with gastric lavage followed by instillation of acetylcysteine was successful with no reported side effects (38). Recently, Coca-Cola nasogastric lavage was reported to be effective in five consecutive patients with large gastric bezoars (39). Continuous gastric lavage with 3 L of Coca-Cola over a 12-hour period showed complete dissolution of the phytobezoars without adverse side effects. Furthermore, patients were advised to drink two glasses of Coca-Cola every other day after discharge and no bezoar recurrence was observed after 3-15 months. An acidic environment is important in the digestion of fiber. Coca-Cola contains carbonic and phosphoric acid and has a pH of 2.6 (40), which is similar to the pH of 1–2 in normal gastric secretions. Therefore, the authors suggest that Coca-Cola acidifies the gastric contents and liberates carbon dioxide in the stomach resulting in the disintegration of phytobezoars. Other cola beverages, such as Diet Coca-Cola, a sugar free product, may be equally effective and offer an alternative for patients with diabetes mellitus. Coca-Cola gastric lavage represents a potentially safe, cheap and effective treatment for the dissolution of gastric bezoars (Note: 3 L of Coca-Cola contains ~1240 calories or 318 g of CHO). Further studies of Coca-Cola lavage in a large, controlled trial is necessary to confirm the efficacy of this treatment modality.

Endoscopic therapy focuses on mechanical disruption using instruments such as tripod forceps (41), polypectomy snare (42), water pike (43), neodymium yttrium aluminum garnet (Nd:YAG) laser (44), and bezotriptors, or bezotomes (45). Electrohydraulic lithotripsy, a well-established method for treating urinary and hepatobiliary stones, has also been successful in the endoscopic management of gastric phytobezoars (46). Surgical extraction is indicated if medical therapy has failed and/or endoscopic removal is unsuccessful. Although endoscopic removal of large, hard bezoars (i.e. trichobezoars, diospyrobezoars) has been

that cleaves the leucoanthocyanidin-hemicellulose-cellulose bonds, resulting in dissolution of the phytobezoar (33). In the limited studies reported, cellulase has a success rate of 100% on therapy ranging from 2 to 7 days with no reported adverse side effects (33-36). The tablet form, gastroenterase, is no longer available in the U.S.; however the powder form is available and has shown similar success rates. Cellulase (3–5 grams) dissolved in 300–500 mL of water and administered orally for 2–5 days has proven successful by some investigators (36). Patients initially assumed the left lateral recumbent position for 20–30 minutes as they drank the solution, and assumed a supine position for 30 minutes after ingesting the solution. The impressive success rates and lack of adverse events with cellulase treatment makes this an attractive medical therapy for the management of phytobezoars.

Patients with delayed gastric emptying may benefit from long-term therapy with prokinetic agents such as metoclopramide for the management and prevention of gastric bezoars (37). Although no studies have been reported, other prokinetic agents such as erythromycin or domperidone may be efficacious given their effect on gastrointestinal motility. However, future studies are necessary to confirm the potential efficacy of these medications.

Lavage therapy to mechanically fragment and dissolve gastric bezoars has been reported to be effective.
reported (45), operative removal is often required. Follow up studies (i.e. endoscopy or radiographic imaging) to confirm dissolution of the bezoar may be considered on a case-by-case basis depending on recurrent symptoms or complications.

NUTRITION

Identifying high-risk individuals and recognizing nutritional elements contributing to the formation of bezoars are critical components to preventing the recurrence of bezoars. Patients should be instructed to avoid a high fiber diet especially citrus fruits and raw vegetables (47). Certain medications known to precipitate bezoar formation should also be avoided (see Table 4). Eliminating bulk laxatives such as perdiem and psyllium in high-risk individuals (i.e. partial gastrectomy or patients with gastroparesis) is an important point that may be overlooked by healthcare professionals. In the acute setting, treatment with an adequate liquid diet ranging from one to two weeks in addition to medications may assist in dissolution of the bezoar and prevention of recurrence (see Appendix A, B and C for liquid suggestions, commercial products and recipes). If a liquid diet is required for greater than one week, consider nutritional counseling with a registered dietitian to ensure nutritional adequacy especially in a patient with nutritional compromise at presentation. A liquid or chewable vitamin/mineral supplement may also be beneficial if nutrient deficiencies are present. To find a registered dietitian, try calling a local hospital. After reaching the clinical nutrition department, ask for references for outpatient counseling. Although dietary discretion is an important component in the management of bezoars, dietary therapy alone is rarely successful and often requires additional interventions such as medications or mechanical disruption with endoscopy.

SUMMARY

Although the prevalence of bezoars in humans is low, the potential for complications in untreated patients remains high emphasizing the importance of early diagnosis and treatment along with prevention of recurrence. Recognition of high-risk individuals and subtle clinical findings by knowledgeable healthcare professionals may prompt early investigation and prevention of potential life-threatening sequelae. Avoiding certain medications and advising dietary discretion in patients with altered gastrointestinal anatomy and/or motility may also aid in the prevention of bezoar formation.

Table 4
Foods and Medications Implicated in Bezoar Formation

<table>
<thead>
<tr>
<th>Fruits</th>
<th>Bulk forming laxatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples, Oranges</td>
<td>Perdiem</td>
</tr>
<tr>
<td>Persimmons</td>
<td>Psyllium</td>
</tr>
<tr>
<td>Figs, berries</td>
<td></td>
</tr>
<tr>
<td>Grape skins, Coconuts</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vegetables</th>
<th>Extended Release Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green beans, legumes</td>
<td>Nifedipine</td>
</tr>
<tr>
<td>Potato peels</td>
<td>Verapamil</td>
</tr>
<tr>
<td>Brussel sprouts, sauerkraut</td>
<td></td>
</tr>
<tr>
<td>Celery</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vitamins and Natural Products</th>
<th>Other medications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ascorbic acid</td>
<td>Aluminum hydroxide</td>
</tr>
<tr>
<td>Ferrous sulfate</td>
<td>Cholestyramine</td>
</tr>
<tr>
<td>Lecithin</td>
<td>ECASA</td>
</tr>
</tbody>
</table>

References

Also allowed:
- Butter, margarine, sugar, hard candy, honey, syrups

Appendix A
Options While on a Liquid Diet

Clear Liquids
Tea, Coffee
Clear juices such as apple, cranberry, grape
Fruit-flavored drinks
Carbonated beverages
Broth or bouillon
Plain, flavored gelatin
Fruit ices, popsicles, sorbets
Clear liquid type supplements (see contact information below):
  - Boost Breeze (Mead Johnson)
  - Enlive (Ross)
  - Resource Fruit Beverage (Novartis)

Full Liquids
All juices (nectars, fruits juices of any kind), tomato or V-8 juice
Milk, chocolate milk, buttermilk, lactaid milk
Carnation instant breakfast (or equivalent), Ovaltine, Nesquik, etc.
Milkshakes, Eggnog
Flavored coffees
  - Add whole milk, cream or flavored creamers such as: hazelnut, vanilla cream, etc.
  - Starbucks’s Frappuccino’s
Smoothies* (see recipes in Appendix C)
Soy Milks
Kefir (liquid yogurts), Yoplait Nouriche, Go-gurts, etc.
Creamy type yogurt (vanilla, lemon, key lime, etc)
Custard, puddings
Smooth ice cream (no nuts, etc)
Hot cereal (low in fiber) such as: grits, cream of wheat, cream of rice, farina
Strained creamed soups
Thinned down strained vegetables, fruits, meats (such as strained baby foods)
  - Can also add to broths or cream soups to increase nutritional value
Also allowed:
  - Butter, margarine, sugar, hard candy, honey, syrups


(continued on page 48)
(continued from page 46)


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## Appendix B
### Commercial Nutritional Supplements

<table>
<thead>
<tr>
<th>Brand</th>
<th>Company</th>
<th>Phone</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensure</td>
<td>Ross</td>
<td>800/986-8502</td>
<td><a href="http://www.ross.com">www.ross.com</a></td>
</tr>
<tr>
<td>Ensure Plus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enlive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource Plus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource Fruit Beverage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boost</td>
<td>Mead Johnson</td>
<td>800/831-3959</td>
<td><a href="http://www.meadjohnson.com">www.meadjohnson.com</a></td>
</tr>
<tr>
<td>Boost Plus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boost Breeze</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NuBasics</td>
<td>Nestle</td>
<td>800/776-5446</td>
<td><a href="http://www.nestleclinicalnutrition.com">www.nestleclinicalnutrition.com</a></td>
</tr>
<tr>
<td>NuBasics Plus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NuBasics Juices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk Shake Plus Mix</td>
<td>Tad Enterprises</td>
<td>800/438-6153</td>
<td>Must order a case</td>
</tr>
<tr>
<td>Egg Nog Mix</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Many larger pharmacy and food chains have their own “Ensure or Boost equivalents.”

**Examples:**
- Wal-Mart = “Nutritional Supplement”
- CVS Pharmacy = “Liquid nutrition”
- Kroger = “Fortify” and Fortify Plus”
- Giant = “Nutritional Drink”

**Cost based on pricing for December 2003. Prices can be variable among stores.**
### Appendix C
Recipes for Smoothies, Fruit Blends, Shakes, Fruit Drinks

#### Smoothies

<table>
<thead>
<tr>
<th>Smoothie</th>
<th>Ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Smoothie</td>
<td>½ cup vanilla (or other creamy smooth yogurt) 1 small ripe banana</td>
</tr>
<tr>
<td>Strawberry Yogurt Frappe</td>
<td>1 tbsp strawberry syrup or other flavoring ½ cup vanilla yogurt ½ cup milk ¼ cup orange Juice Dash vanilla</td>
</tr>
<tr>
<td>Peach Plus</td>
<td>½ Peach, canned ¼ cup vanilla yogurt ¼ cup milk Dash vanilla Dash nutmeg</td>
</tr>
<tr>
<td>Tropical Smoothie</td>
<td>½ cup creamy fruit yogurt ½ banana 1 oz. orange Juice</td>
</tr>
<tr>
<td>Fruity Yogurt Sipper</td>
<td>1 ripe large banana or, 2 medium peaches, peeled and pitted 1 ½ cups whole milk 1 8 oz carton vanilla yogurt 1-2 tbsp powdered sugar ½ cup ice cubes</td>
</tr>
</tbody>
</table>

**Cut fruit into chunks. Combine all ingredients except ice in a blender until smooth. Add ice, one cube at a time. Blend until smooth.**

#### Fruit Blends

<table>
<thead>
<tr>
<th>Blend</th>
<th>Ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pear</td>
<td>½ cup canned pears ½ cup cottage cheese</td>
</tr>
<tr>
<td>Peach</td>
<td>½ cup canned peach ½ cup cottage cheese</td>
</tr>
<tr>
<td>Banana-Apple</td>
<td>½ small banana ½ cup cottage cheese ¼ cup apple juice</td>
</tr>
</tbody>
</table>

**Combine these next 3 recipes in a blender until smooth. Chill until firm.**

- **Option 1**
  - ¼ cup cottage cheese
  - ¼ cup vanilla ice cream
  - ½ cup prepared gelatin

- **Option 2**
  - ¼ cup flavored yogurt
  - ¼ cup vanilla ice cream
  - ½ cup prepared gelatin

- **Option 3**
  - ¼ cup ricotta or cottage cheese
  - ¼ cup vanilla ice cream
  - ½ cup blended fruit
  - ½ cup prepared gelatin

#### Shakes

<table>
<thead>
<tr>
<th>Shake</th>
<th>Ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Super Milkshake</td>
<td>½ cup fortified milk 1-2 scoops high fat ice cream 1 packet Instant Breakfast</td>
</tr>
<tr>
<td>Chocolate Peanut Butter Shake</td>
<td>1 can chocolate Ensure or Boost (or “Plus”) 2 Tablespoons smooth peanut butter 2 scoops vanilla ice cream</td>
</tr>
<tr>
<td>High- Protein Shake</td>
<td>1 cup fortified milk ½ cup ice cream ½ tsp vanilla extract 2 tbsp butterscotch, chocolate, or your favorite fruit syrup or sauce</td>
</tr>
<tr>
<td>Orange Breakfast Nog</td>
<td>1½ cups buttermilk 2 tbsp brown sugar 1 tsp vanilla extract 2-3 large ice cubes 1/3 cup of frozen orange juice concentrate</td>
</tr>
</tbody>
</table>

*For variety, add ½ cup banana or 1 tbsp smooth peanut butter and 2 tsp sugar
Put all ingredients in a blender. Blend at low speed for 10 seconds.*

**Combine all ingredients except ice in a blender until smooth. Add ice, one cube at a time. Blend until smooth and frothy.**
### Recipes for Smoothies, Fruit Blends, Shakes, Fruit Drinks

#### Shakes (continued)

<table>
<thead>
<tr>
<th>Recipe</th>
<th>Ingredients</th>
<th>Instructions</th>
</tr>
</thead>
</table>
| Sherbet Drink                 | ½ cup milk or fortified milk (see below for recipe)                          | Can substitute for ½ cup milk:  
  • Nutren 1.5, unflavored  
  • Osmolite, Osmolite HN  
  • Isocal, Isocal HN  
  • Soy milk                                                      |
| Fruit and Cream               | 1 cup whole milk                                                            | Blend all ingredients and chill well before serving.                         |
| High-Calorie Malt             | ½ cup whole milk, 1 tbsp malted milk powder, ½ cup half and half, 1 oz package instant breakfast, any flavor, 2 cups ice cream, any flavor, 2 tbsp Ovaltine | Mix all ingredients together in a blender. Process until smooth.              |
| Fruit Drinks                  |                                                                             |                                                                            |
| Bucky Badger Punch            | 1 quart cranberry juice cocktail, 1 cup orange juice, 1 cup grapefruit juice, 2 cups 7-up or club soda | Combine the 3 juices in a pitcher. Add 7-up or club soda when ready to serve. |
| Sherbet Punch                 | 1 cup sherbet, 12 oz gingerale                                              |                                                                            |
| Slushy Punch                  | 1 cup sugar, 2 ripe medium bananas, cut up, 3 cups unsweetened pineapple juice, 2 tbsp lime juice, 1 6 oz can frozen orange juice concentrate, 1 1-liter bottle carbonated water or lemon-lime beverage, chilled |                                                                            |
| Frozen Fruit Slush            | 1-6 ounce can frozen fruit juice concentrate, 4 tablespoons sugar, 3 cups crushed ice | Combine carbonated water and sugar until dissolved. In a blender, combine bananas and juices. Blend until smooth. Add to sugar mixture. Pour in carbonated water. |

*Fortify milk by adding dry milk powder—1 cup powder to 1 quart milk.*  
- Soy milks can be substituted for milk in any recipe.  
- Flavor extracts such as vanilla, almond, coffee, etc can be added for interest.  
- Other flavorings such as dry gelatin or pudding mixes, syrups, etc. can be added for additional flavors or extra calories.