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Enteral Formula Selection: A Review of Selected **Product Categories**



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The availability of specialized enteral formulas has burgeoned in the last 20 years, many touting pharmacologic effects in addition to standard nutrient delivery. Enteral formulas have been developed for many specific conditions including: renal failure, gastrointestinal (GI) disease, hyperglycemia/diabetes, liver failure, acute and chronic pulmonary disease and immunocompromised states. Elemental and fiber supplemented formulas are also frequently recommended for use in those with certain types of gastrointestinal dysfunction. This article will review the rationale for use of specialized formulas, provide the supportive evidence, if available, and provide suggestions for clinical application.

INTRODUCTION

n the last 25 years the number and variety of enteral formulas that are available for use has increased dramatically. Well over 100 enteral formulas are now available, making formula selection rather challenging. In addition, enteral formulas are considered food supplements by the Food and Drug Administration (FDA) and are therefore not under the same regulatory control as medications. As a result, enteral formula labels may make "structure and function" claims without prior

Ainsley M. Malone, MS, RD, LD, CNSD, Mt. Carmel West Hospital, Department of Pharmacy, Columbus, OH. FDA review or approval. Furthermore, there is a lack of prospective, randomized, controlled clinical trials supporting the purported indications for the majority of the specialized formulas currently on the market.

Enteral formulas may be classified as standard, elemental or specialized. Many formulas are available within each category, often containing significant differences in nutrient composition. Standard enteral formulas are defined as ones with intact protein containing balanced amounts of macronutrients and will often meet a patient's nutrient requirements at significantly less cost than specialized formulas (See Table 1 for

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	Cost/	
Enteral Formula	1000 Kcals (\$)*	Company
1.0 cal/mL		
Isocal	7.20	Novartis
Nutren 1.0	5.22	Nestle
Osmolite 1.0	5.73	Ross
1.2 cal/mL		
Fibersource 1.2	6.13	Novartis
Jevity 1.2	6.50	Ross
Osmolite 1.2	6.08	Ross
Probalance	6.83	Nestle
1.5 cal/mL		
Isosource 1.5	4.40	Novartis
Jevity 1.5	6.37	Ross
Nutren 1.5	3.72	Nestle
2.0 cal/mL		
Deliver 2.0	4.30	Novartis
Novasource 2.0	3.81	Novartis
Nutren 2.0	2.98	Nestle
TwoCal HN	3.21	Ross

commonly used products). Specialized formulas are designed for a variety of clinical conditions or disease states. There are over thirty-five specialized formulas currently on the market. The purpose of this article is to review the rationale behind specialized formulas, provide supportive evidence, if available, and to furnish suggestions for clinical application. Enteral formulas for common food allergies as well as homemade blenderized formulas are also discussed. Elemental and immune-modulated formulas will be reviewed in future issues of *Practical Gastroenterology*.

STANDARD FORMULAS

Standard formulas comprise the enteral product category most often used in patients requiring tube feedings. Their nutrient composition is meant to match that recommended for healthy individuals. Table 2 provides a comparison of nutrient sources in polymeric and hydrolyzed products.

Calorie Dense Products

Nutrient concentrations of standard formulas vary from 1.0–2.0 kcal/mL and products may or may not contain fiber. These formulas may be used with volume sensitive patients or patients needing fluid restriction. Such conditions may include congestive heart failure, renal failure or syndrome of inappropriate diuretic hormone (SIADH). However, this intervention may not always be clinically significant (Table 3). For example, if a patient requires 1800 kcal/day, changing a 1.0 calorie/mL to a 2.0-calorie/mL product would reduce the water content by 900 mL, but to change a patient from a 1.5 to a 2.0 kcal/mL product represents a mere 300 mL difference per 24 hour period. Calorically dense formulas are most practical for use in patients requiring nocturnal and/or bolus feeding.

FIBER SUPPLEMENTED FORMULAS

Proposed Rationale for Use

Dietary fiber is defined as a structural and storage polysaccharide found in plants that are not digested in the human gut (1). Sources of fiber in enteral formulas include soluble and insoluble (1). A recent fiber addition to selected formulas (Ross products) is fructooligosaccharides (FOS). FOS are defined as shortchain oligosaccharides and, similar to other dietary fibers, are rapidly fermented by the colonic bacteria to short-chain fatty acids (SCFA). SCFA influence gastrointestinal function through several mechanisms. They provide an energy source for colonocytes, increase intestinal mucosal growth and promote water and sodium absorption (2). Table 4 provides a listing of enteral formulas and their fiber content.

Fiber can be classified by its solubility in water. Soluble fibers, such as pectin and guar, are fermented by colonic bacteria providing fuel for the colonocyte, as described above (1). In addition, increased colonic sodium and water absorption have been demonstrated with soluble fiber, a potential benefit in the treatment of diarrhea associated with EN (2). Insoluble fiber, such as soy polysaccharide, increases fecal weight, thereby increasing peristalsis and decreasing fecal transit time (1).

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Enteral Formula	Carbohydrate	Protein	Fat
Polymeric	Corn syrup solids Hydrolyzed cornstarch Maltodextrin Sucrose Fructose Sugar alcohols	Casein Sodium, calcium, magnesium and potassium caseinates Soy protein isolate Whey protein concentrate Lactalbumin Milk protein concentrate	Borage oil Canola oil Corn oil Fish oil High oleic sunflower oil Medium chain triglycerides Menhaden oil Mono- and diglycerides Palm kernel oil Safflower oil Soybean oil Soy lecithin
Hydrolyzed	Cornstarch Hydrolyzed cornstarch Maltodextrin Fructose	Hydrolyzed casein Hydrolyzed whey protein Crystalline L-amino acids Hydrolyzed lactalbumin Soy protein isolate	Fatty acid esters Fish oil Medium chain triglycerides Safflower oil Sardine oil Soybean oil Soy lecithin Structured lipids

Caloric Density	% Water	Volume /1800 kcal (mL)	Water by density for 1800 Kcal (mL)
1.0 kcal/mL	84	1800	1530
1.2 kcal/mL	82	1500	1230
1.5 kcal/mL	76	1200	930
2.0 kcal/mL	70	900	630

Historically, soluble fiber has been difficult to add to enteral formulas due to its viscous nature. Many early fiber supplemented enteral formulas, therefore, contained soy polysaccharide as their primary fiber source. Subsequent technological advances have enabled the inclusion of soluble fiber sources to enteral formulas and many now contain a combination of both soluble and insoluble fibers.

Supporting Evidence

Research evaluating fiber-containing enteral formulas in the management of diarrhea has demonstrated incon-

sistent results (3–4). This may be related more to the type of fiber provided rather than the overall fiber intake. In a small crossover study, Frankenfield and Beyer compared insoluble fiber with a fiber free formula in nine head injured enterally fed patients and found no significant difference in diarrhea incidence (5). Khalil, et al compared a fiber free formula with a formula providing insoluble fiber on diarrhea incidence in surgery patients (6). No significant differences in stool frequency or stool consistency were demonstrated between groups. Conversely, Shankardass, et al compared long-term enterally fed patients receiving a for*(continued on page 50)*

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Table 4 Fiber Content of Selected Enteral Formulas

Product	Total Dietary Fiber (g/L)	% Insoluble Fiber	% Soluble Fiber	Cost / 1000 Kcal (\$)*	Manufacture
Compleat	4.3	74.0	26.0	10.9**	Novartis
Fibersource Std	10.0	75.0	25.0	5.83	Novartis
Fibersource HN	10.0	75.0	25.0	6.13	Novartis
Isosource 1.5	8.0	48.0	52.0	4.40	Novartis
Isosource VHN	10.0	48.0	52.0	8.80	Novartis
Jevity 1.0	14.4	100.0	0.0	6.60	Ross
Jevity 1.2	22.0	75.0	25.0	6.50	Ross
Jevity 1.5	22.0	75.0	25.0	6.37	Ross
Nutren 1.0 w/Fiber	14.0	95.0	5.0	5.98	Nestle
NutriFocus	20.8	75.0	25.0	4.44	Nestle
Novasource Pulmonary	8.0	48.0	52.0	6.72**	Novartis
Peptamen w/FOS	4.0	0	100.0	23.76	Nestle
Probalance	10.0	75.0	25.0	6.83	Nestle
Promote w/Fiber	14.4	94.0	6.0	6.60	Ross
Protain XL	9.1	94.0	6.0	5.86**	Novartis
Replete w/Fiber	14.0	95.0	5.0	8.45	Nestle
Ultracal	14.4	70.0	30.0	7.70	Novartis
Ultracal Plus HN	10.0	73.0	27	7.23	Novartis

mula containing insoluble fiber with those on a fiberfree formula. Fecal weight and number of stools per day were not significantly different between the groups but the incidence of diarrhea was significantly greater in the group receiving the fiber-free formula (7). Insoluble fiber has not been clearly shown to improve diarrhea, especially in the acutely ill patient (3). Soluble fiber has been associated with more promising results. In an evaluation of septic, critically ill patients in a medical intensive care unit (ICU), Spapen, et al compared a soluble fiber with a fiber-free enteral formula. Frequency of diarrhea was significantly decreased in those receiving the fiber-supplemented formula (8). In addition, a recent evaluation of patients in a medical intensive care unit receiving a soluble-fiber containing formula (N = 20), demonstrated a decrease in diarrheal episodes with the fiber-supplemented formula compared to a fiber-free formula (9).

Use in the Clinical Setting

Enteral formulas supplemented with soluble fiber are closer to a normal diet; however, evidence for their use

remains weak. Several cases of bowel obstruction associated with the use of insoluble fiber-containing formulas have been reported in the surgical and burn population (10,11). Until further evidence is available, a fiber-free enteral formula in patients who require motility suppressing medications and/or are at risk for bowel obstruction or ischemia may be prudent. In a recent review of enteral nutrition in the hypotensive patient, McClave and Chang, 2004, recommend the use of a fiber-free formula in critically ill patients at high risk for bowel ischemia (12).

DISEASE SPECIFIC FORMULAS

Renal Disease

Proposed Rationale For Use

Formulas designed for patients with renal disease vary in protein, electrolyte, vitamin and mineral content (Table 5). Generally, renal formulas are lower in pro-

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Table 5

Enteral Products Designed for Renal Disease

Product	Manufacturer	Kcals/mL	Protein (gm) * *	K (mEq)**	P (mg)**	Mg (mg)**	Cost/1000 Kcals (\$)**
Renal Formulas							
Magnacal Renal	Novartis	2.0	37.5	16	400	100	3.47
Nepro	Ross	2.0	35.0	14	343	108	6.08
NovaSource Renal	Novartis	2.0	37.0	14	325	100	5.64
Suplena	Ross	2.0	15.0	14	365	108	3.73
Nutri-Renal	Nestle	2.0	17.0	Negligible	Negligible	Negligible	4.17
Standard Concentra	ated Formulas						
Deliver 2.0	Novartis	2.0	37.5	21.5	555	200	4.30
NovaSource 2.0	Novartis	2.0	45.0	19	550	210	3.81
Nutren 2.0	Nestle	2.0	40.0	25	670	268	2.98
Two-Cal HN	Ross	2.0	42.0	31	538	213	3.21

tein, calorically dense and have lower levels of potassium, magnesium and phosphorus when compared to standard formulas.

Supporting Evidence

There are no clinical trials comparing the efficacy of renal formulas against standard products.

Use in the Clinical Setting

Formula selection depends upon a patient's degree of renal function, the presence or absence of renal replacement therapy, and the patient's overall nutrient requirements. Patients undergoing renal replacement therapy have significantly increased protein requirements that may not be met with the current renal formulas available. Persistent hyperkalemia, hypermanganesemia, hyperphosphatemia is often the driving factor that leads most clinicians to switch from a standard formula to a renal product. In patients undergoing renal replacement therapy, especially continuous venovenous hemodialysis (CVVHD), renal formulas are not always necessary. These patients typically do not require fluid restriction and have higher protein requirements of 1.5-2.0 gm/kg/day (13). In order to meet the higher protein needs of this patient population, supplemental protein powder is often necessary. In the absence of elevated levels of potassium, magne-

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sium and phosphorus, patients on dialysis should continue to receive a standard, high-protein formula.

Hepatic Disease

Proposed Rationale for Use

Hepatic formulas offer increased amounts of branched chain amino acids (BCAA): valine, leucine, and isoleucine; and reduced amounts of aromatic amino acids (AAA): phenylalanine, tyrosine and tryptophan, compared to standard products. These alterations have been purported to promote a reduced uptake of AAA at the blood brain barrier, reducing the synthesis of false neurotransmitters and thereby ameliorating the neurological symptoms that occur with hepatic encephalopathy (HE) (14). Two enteral formulas with increased BCAA are available. See Table 6 for formula characteristics.

Supporting Evidence

Evidence supporting the use of hepatic formulas is very limited. Several trials evaluating BCAA in patients with chronic encephalopathy have been conducted in an attempt to determine whether BCAA can improve neurological outcome or improve tolerance to dietary protein (15–18). In a multi-center trial, Horst,

Table 6 Enteral Formulas Designed for Hepatic Disease % CHO % Fat % Pro Cost/ Product Manufacturer Kcals/mL Kcals Kcals Kcals Comments 1000 Kcal* Hepatic-Aid II Hormel Healthlabs 1.2 57.3 27.7 15.0 Increased levels of leucine. \$41.56 isoleucine and valine · Minimal phenylalanine tryptophan and tyrosine content · Contains negligible amounts of vitamins and minerals Contains standard amounts NutriHep Nestle 1.5 77.0 11.0 12.0 \$35.55 of vitamins and minerals 50% BCAA and 50% AAA 66% of fat is MCT *Based on 1-800 Company Home Delivery Numbers (see Table 17)

et al (16) compared a BCAA enriched versus a mixed protein enteral supplement. The BCAA supplemented group achieved nitrogen balance equal to that of the control group without precipitation of HE. Additional studies in which patients were randomized to receive either an oral diet enriched with BCAA or standard amino acids failed to demonstrate clinical benefit (17,18). In a recent publication, Marchesini and colleagues (15) compared the use of an oral BCAA supplement with either an isonitrogenous standard protein or isocaloric carbohydrate supplement on mortality, disease deterioration and the need for hospital admission in ambulatory patients with advanced cirrhosis. BCAA supplementation resulted in a statistically significant (p = 0.039) decrease in the primary occurrence events, death, and disease deterioration. The authors concluded that there are benefits to routinely supplementing BCAA in patients with advanced cirrhosis. However, the impact of this study is limited by several factors including a higher drop out rate in the treatment group. When the results are considered on an "intention to treat" basis there is no significant difference in mortality between the groups. Also, encephalopathy scores were not significantly different between the groups. The BCAA enriched group did have greater improvements in nutritional status, possibly contributing to the reduced hospital admissions in that group. In practice, attention to those factors that limit nutrition intake, providing an evening snack, and adequate medications to control encephalopathy may be adequate to allow similar improvements in nutrition status. While this study suggests a possible benefit to routine BCAA supplementation, routine use of BCAA in the hospitalized patient with HE is not recommended.

Use in the Clinical Setting

The routine use of BCAA enriched enteral formulas in patients with advanced liver disease and/or HE is not recommended at this time. Standard enteral formulas can successfully be used with most patients at a much lower cost. However, in those patients who are refractory to routine drug therapy for HE and are unable to tolerate standard protein intakes without precipitation of HE, the use of BCAA enriched enteral formulas may be worth a short trial.

Diabetes/Hyperglycemia

Proposed Rationale For Use

Several formulas have been developed for use in patients with diabetes mellitus (DM) (Table 7). These formulas offer a lower amount of total carbohydrate and a higher amount of fat than standard formulas as well as a variation in type of carbohydrate. Carbohydrate sources generally consist of oligosaccharides, fructose, cornstarch and fiber. In normal subjects, the *(continued on page 56)*

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Table 7

			% CHO	% PRO	% FAT	Fiber	Cost/1000
Product	Manufacturer	Kcals/mL	Kcals	Kcals	Kcals	(g/1000 mL)	Kcal (\$)*
Choice DM	Novartis	1.06	40.0	17.0	43.0	14.4	10.48
DiabetiSource AC	Novartis	1.0	36.0	20.0	44.0	4.3	8.33
Glucerna Select	Ross	1.0	22.8	20.0	49.0	21.1	* *
Glytrol	Nestle	1.0	40.0	18.0	420	15.0	8.20
Resource Diabetic	Novartis	1.06	36.0	24.0	40.0	12.8	6.22

*Based on 1-800 Company Home Delivery Numbers (see Table 17); **Ross Products was unable to provide this information

use of more complex carbohydrates, such as fructose, cornstarch and fiber has been shown to improve glycemic control as a result of delayed gastric emptying and reduced intestinal transit (19). Formulas designed for patients with DM are based on this premise. Due to the inherent viscosity of soluble fiber, most enteral formulas for DM contain a combination of soluble and insoluble fiber.

Supporting Evidence

There are few randomized, controlled trials evaluating diabetic formulas in hospitalized patients with DM. In a series of two studies, Peters, et al demonstrated that the use of a diabetic formula results in a reduced hyperglycemia compared to standard enteral formulas (20,21). It should be noted that these studies were conducted in *healthy volunteers* using a study protocol that attempted to mimic continuous tube feeding administration. Results of these studies cannot be generalized to hospitalized patients. Craig, et al (22) compared a formula for DM against a standard product in patients with Type 2 DM residing in a long-term care facility. There were no significant differences in HbgA₁C or fasting serum glucose levels at baseline, monthly or at the study completion. Of note, there was a trend towards lower infections in the study group.

Two recent studies have evaluated diabetic formulas in hospitalized patients. Mesejo, et al compared a diabetic formula with a standard formula in hyperglycemic critically ill patients (23). Mean plasma and capillary glucose levels as well as units of insulin infused per day were significantly lower in the diabetic formula group. There were, however, no differences in secondary end points: intensive care unit length of stay, ventilator days or mortality between the two groups. In an evaluation of hospitalized type 2 diabetics, Leon-Sanz, et al compared the effect of a diabetic formula versus a standard formula on glycemic control (24). Mean glucose levels, at each of the three weekly measurement intervals, did not significantly change in those who received the diabetic formula. Mean glucose levels in those receiving the standard formula increased significantly between weeks one and two with no change occurring in week three. Mean insulin dose was not different between the two groups during the study period. The authors concluded the use of a diabetic formula is associated with a neutral effect on glycemic control. The clinical significance of the results from this study is unclear. The mean blood glucose levels in the diabetic formula group for all three weeks were >200 mg/dL ranging from 215-229 mg/dL whereas in the standard group mean blood glucose levels ranged from 198-229 mg/dL. These results confirm that glucose control is variable in a hospital setting and that while the use of a diabetic formula can affect blood glucose levels, the effect has yet to be shown to be *clinically* important. Furthermore, the important findings of Van den Berghe G, et al of a 40% reduction in infectious complications in a surgical (primarily cardiac) ICU with attention to tight glucose control via insulin drips, may make these products even less alluring in the ICU population (25).

Use in the Clinical Setting

Although inviting, the routine use of a formula for DM is not currently supported by the evidence at this time (26). However, in some circumstances when blood

Formulas Designed for P	ulmonary Disease					
Product	Manufacturer	Kcals/mL	% CHO Kcals	% PRO Kcals	% FAT Kcals	Cost/1000 Kcals (\$)*
COPD Formulas						
NovaSource Pulmonary	Novartis	1.5	40.0	20.0	40.0	6.72
NutriVent	Nestle	1.5	27.0	18.0	55.0	5.33
Pulmocare	Ross	1.5	28.2	16.7	55.1	4.28
Respalor	Novartis	1.5	40.0	20.0	40.0	7.50
ARDS Formula						
Охера	Ross	1.5	28.1	16.7	55.2	* *
*Based on 1-800 Company Home Delivery Numbers (see Table 17); **Ross Products was unable to provide this information						

Table 8 Formulas Designed for Pulmonary Disease

glucose control is borderline, and the addition of insulin may present the greater burden, use of a diabetic formula may offer an advantage.

Pulmonary Disease

Specialized enteral formulas have been developed for two types of pulmonary disease: chronic obstructive pulmonary disease (COPD) and acute respiratory distress syndrome (ARDS). While there are similarities with these products, distinct differences do exist (Table 8).

Chronic Obstructive Pulmonary Disease (COPD)

Rationale for Use

In the 1980's, reports began to appear describing adverse ventilatory effects when large amounts of dextrose-based parenteral nutrition solutions were provided to patients with and without COPD. The high amounts of dextrose provided in standard parenteral nutrition formulas were deemed culpable. This concept was carried over into the enteral nutrition arena with the introduction of a modified macronutrient formula designed for the COPD patient. Substituting a portion of carbohydrate calories with fat calories was thought to limit carbon dioxide production resulting in improved ventilatory status.

Supporting Evidence

Multiple studies comparing the effects of macronutrient metabolism on respiratory function and status offer conflicting results. Some have involved ambulatory COPD patients, while others have evaluated hospitalized patients with and without COPD. Therefore, it is not possible to extrapolate equivocal results to patients in the hospital setting.

In 1985, Angelillo, et al (27) studied the effect of fat and carbohydrate content on carbon dioxide (CO_2) production in ambulatory COPD patients with hypercapnia. They demonstrated both a reduced CO₂ production and respiratory quotient in those who received a high fat formula. Al-Saady, et al in 1989 (28) compared the effects of a high fat enteral formula with a standard formula on ventilatory status in hospitalized patients. Carbon dioxide levels and ventilatory time were significantly reduced in the high fat formula group. In a more recent study, Akrabawi, et al (29) in 1996 evaluated pulmonary function and gas exchange in ambulatory COPD patients receiving a high fat formula. No significant differences in respiratory quotient were demonstrated with the high fat formula. Of note, gastric emptying time was noted to be significantly longer following the high fat meal, however, the clinical significance of this is unknown.

Early reports citing increased work of breathing and respiratory failure with large glucose intake were found to have provided excessive calories overall (1.7 to 2.25 times the measured energy expenditure). In a classic study by Talpers, et al (30), 20 mechanically ventilated patients received either varying amounts of carbohydrate (40%, 60% and 75%) or total kcals (1.0, 1.5 and 2.0 times the basal energy expenditure). There

was no significant difference in $vC0_2$ among the varying carbohydrate regimens; however $vC0_2$ significantly increased as the total kcal intake increased. The authors concluded that avoidance of overfeeding is of greater significance than carbohydrate intake in avoiding nutritionally related hypercapnia. This lends support for the argument that reducing total calorie intake is more important than limiting carbohydrate calories in preventing adverse ventilatory effects.

Use in Clinical Setting

Overall results demonstrating whether "chronic" pulmonary enteral products offer a clinical advantage to the hospitalized patient are inconclusive. In the patient with chronic pulmonary disease and limited respiratory reserves, it is critical to monitor $PaCO_2$ levels in relationship to overfeeding. The provision of hypocaloric feeding may be the best option in this type of patient. *Editor's note: If a patient has an elevated PaCO_2 while severely hyperglycemic, then it is unlikely that enteral nutrition is driving the excess PaCO_2. Enteral feeding must not only get into our patients, but also into the cells to effect CO*₂ production.

ARDS

Rationale for Use

Acute respiratory distress syndrome (ARDS) is a clinical illness characterized by hypoxemia ultimately resulting in respiratory failure (31). The cascade of events that occurs in ARDS is thought to involve alveolar macrophages and their release of pro-inflammatory eicosanoids derived from the metabolism of arachidonic acid. Several of these metabolites, thromboxane A2, leukotrienes and prostaglandin E2, have been implicated in the development of acute lung injury (32). A specialized enteral formula (Table 8) offering a modified lipid component designed to modulate the inflammatory cascade is available for use with ARDS. This formula contains borage and fish oils, sources of g-linolenic and eicosapentanoic acids as well as increased amounts of antioxidants. The increased presence of these fatty acids, through metabolic alterations known to occur in ARDS, lead to an increased production of prostaglandins of the 1 series

and leukotrienes of the 5 series, metabolites associated with an anti-inflammatory and vasodilatory state. Vasoconstriction, platelet aggregation, and neutrophil accumulation are reduced when the eicosanoid balance favors anti-inflammatory rather than proinflammatory mediators (33).

Supporting Evidence

The evidence supporting the use of a specialized enteral formula for ARDS may have some merit. Preclinical animal data demonstrating positive effects of eicosapentanoic (EPA) and g-linolenic acids (GLA) on pro-inflammatory mediator production, gas exchange, and oxygen delivery work led to the completion of a multi-center trial (N = 98) evaluating the use of an ARDS formula in patients with evidence of either ARDS or acute lung injury (ALI) (33). Patients receiving the specialized formula showed a significant improvement in gas exchange, required significantly fewer days of mechanical ventilatory support, and had decreased ICU stays compared to the control group. The authors concluded that the use of a specialized enteral formula would be useful in the management of those with or at risk of developing ARDS. However, questions have been raised about the possibility that the high omega-6 fat content of the control formula may have exacerbated ARDS symptoms.

In a recent report Tehila, et al (34), demonstrated similar results to the multicenter study by Gadek (33). Fifty-two ventilated patients with ARDS and/or acute lung injury were randomized to receive either an ARDS or control formula. Patients who received the ARDS formula had a significantly shorter length of ventilator time as well as a reduced ICU length of stay compared to the control patients. There was no difference in either hospital length of stay or mortality between the two groups. The study has received criticism in that the control group might have done worse due to the increased omega-6 fat content of the control formula vs the beneficial effect of the study formula.

Use in the Clinical Setting

Although promising, the evidence to date does not support the routine use of a specialized ARDS product at this time.

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Table 9 Resources for Food Allergy

- Food Allergy and Anaphylaxis Network http://www.foodallergy.org/
- Food Allergy and Intolerances—National Institutes of Health http://www.niaid.nih.gov/factsheets/food.htm
- Food Contents
 U.S. Department of Agriculture
 Food and Nutrition Information Center
 301/436-7725
 http://www.nalusda.gov/fnic/index.html
- American College of Allergy, Asthma and Immunology 1/800/842-7777 http://allergy.mcg.edu

ENTERAL FEEDING IN PATIENTS WITH ALLERGIES

It is important to be aware of the composition of enteral feeding products for patients with suspected or documented food allergies. Approximately 20% of the population in industrialized nations has been reported to suffer from adverse reactions to food. Nuts, fruits and milk are the most common triggers (35,36). Epidemiological data indicate that these reactions are caused by different mechanisms, with only about a third of the reactions in children and 10 percent of those in adults due to actual food allergy. The majority of adverse reactions to food are non-immunologic in origin with lactose intolerance being the most common type of adverse reaction worldwide. However, true food allergies are thought to affect up to 6% to 8% of children under the age of ten and between 1%–4% of

Table 10

Formulas/Modulars That Do Not Contain Corn in Product Formulation

This list indicates that the ingredient was not used in the formulation of the product. The production facilities do abide by good manufacturing practices, but the products are *NOT* represented to be hypoallergenic.* This list does not guarantee complete absence of the ingredient in the product listed under each category. The information contained in this list, although accurate at the time of publication (June 2005), may change due to product reformulation and/or different suppliers providing ingredients for the products. The most current information may be obtained by referring to product labels.

*Hypoallergenic is defined as "diminished potential for causing an allergic reaction." *Taber's Cyclopedic Medical Dictionary.* 19th ed. Philadelphia; F.A. Davis Company, 2001.

	Ross	Novartis	Nestle
Adult Products			
Tube Feeding Formulas	EleCare (1)	None	None
Oral Supplements	None	Arginaid	
Boost Breeze	None		
Modulars	ProMod	Benecalorie	
Benefiber			
Beneprotein	None		
Pediatric Products			
Tube Feeding Formulas	EleCare (1)		
Infant Formulas	EleCare (1)	None	None

(1) EleCare is a hypoallergenic, nutritionally complete amino acid-based medical food and infant formula that can be fed to children and adults with severe, multiple food allergies. EleCare contains corn syrup solids, and is clinically documented to be hypoallergenic, virtually eliminating the potential for allergic reaction.

Tables 10–15 were prepared by UVAHS dietetic interns: Brandis Thornton and Carolyn Powell, Spring 2005; Used with permission from the University of Virginia Health System Nutrition Support Traineeship Syllabus Available at: http://www.healthsystem.virginia.edu/internet/dietitian/dh/traineeship.cfm.

Table 11

Formulas/Modulars That Do Not Contain Casein in Product Formulation

This list indicates that the ingredient was not used in the formulation of the product. The production facilities do abide by good manufacturing practices, but the products are NOT represented to be hypoallergenic.* This list does not guarantee complete absence of the ingredient in the product listed under each category. The information contained in this list, although accurate at the time of publication (June 2005), may change due to product reformulation and/or different suppliers providing ingredients for the products. The most current information may be obtained by referring to product labels.

*Hypoallergenic is defined as "diminished potential for causing an allergic reaction." *Taber's Cyclopedic Medical Dictionary.* 19th ed. Philadelphia; F.A. Davis Company, 2001.

	Ross (1)	Novartis	Nestle
Adult Products			
Tube Feeding Formulas	EleCare EquaLYTE	Diabetisource AC Fibersource, Fibersource HN Isosource, Isosource HN Subdue Plus Tolerex Vivonex Plus, RTF, TEN	f.a.a. Peptamen, VHP, PreBio 1, 1.5
Oral Supplements	Juven	Boost Breeze Impact Recover Peptinex Resource Arginaid Resource Arginaid Extra	None
Modulars	Polycose	Benefiber Beneprotein	None
Pediatric Products			
Tube Feeding Formulas	EleCare	Vivonex Pediatric	Peptamen Junior Peptamen Junior Powder Peptamen Junior with PreBio1
Infant Formulas	EleCare	None	Goodstart Essentials Goodstart Supreme Goodstart Supreme with DHA & ARA Goodstart 2 Essentials Goodstart 2 Supreme with DHA & ARA Goodstart Supreme Soy with DHA & ARA Goodstart 2 Essentials Soy

(1) The product manufacturer stipulates these products as having "No Milk in the Product Formulation." These products are NOT manufactured to be hypoallergenic, excluding EleCare which is clinically documented to be hypoallergenic.

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Table 12

Formulas/Modulars That Do Not Contain Soy in Product Formulation

This list indicates that the ingredient was not used in the formulation of the product. The production facilities do abide by good manufacturing practices, but the products are NOT represented to be hypoallergenic.* This list does not guarantee complete absence of the ingredient in the product listed under each category. The information contained in this list, although accurate at the time of publication (June 2005), may change due to product reformulation and/or different suppliers providing ingredients for the products. The most current information may be obtained by referring to product labels.

*Hypoallergenic is defined as "diminished potential for causing an allergic reaction." Taber's Cyclopedic Medical Dictionary. 19th ed. Philadelphia; F.A. Davis Company, 2001.

	Ross (1)	Novartis	Nestle
Adult Products Tube Feeding Formulas	EleCare EquaLYTE	Compleat (3) Comply (2) Deliver 2.0 (4) Impact (2), Impact 1.5 (3) Isocal HN Plus (2)	Crucial (4) f.a.a. (4) Glytrol (2) Modulen (2) Nutren 1.0 (2), 1.5 (2), 2.0 (2)
		Lipisorb (4) Magnacal Renal (2) Novasource 2.0 (2) Novasource Renal (2) Peptinex DT (4) Respalor (2) Subdue, Subdue Plus Tolerex Traumacal (4) Vivonex Plus (4), TEN, RTF (4)	Nutren Fiber (2) NutriHep (2) NutriRenal (2) NutriVent (2) Peptamen (4), VHP (4), with PreBio1(4), 1.5 (4) Renalcal (2) Replete (2)
Oral Supplements	Enlive! Ensure Pudding Juven	Boost (2) Boost Plus (2) Boost Breeze Impact Recover Peptinex (4) Resource Arginaid (2) Extra 2.0 (2)	Carnation Instant Breakfast (2) Carnation Instant Breakfast for the Carb Conscious (2) Carnation Instant Breakfast Juice Drink (2) Carnation Instant Breakfast Lactose Free (2) Carnation Instant Breakfast Lactose Free Plus (2) NutriHeal (2)
Modulars	Polycose	Benefiber Beneprotein (2)	Additions (2)
Pediatric Products Tube Feeding Formulas	EleCare	Compleat Pediatric (4) Pediatric Peptinex DT (4) Vivonex Pediatric (4)	Nutren Junior (4), Nutren Junior with Fiber (4) Peptamen Junior (liquid and powder) (4) Peptamen Junior with PreBio1 (4)
Oral Supplements	None	Resource Just for Kids (4)	Carnation Instant Breakfast Junior (2,4)
Infant Formulas	EleCare	None	Goodstart Essentials (2,4) Goodstart Supreme (2,4) Goodstart Supreme with DHA & ARA (2,4) Goodstart 2 Essentials (2,4) Goodstart 2 Supreme with DHA & ARA (2,4)

(1) The product manufacturer stipulates these products as having "No Soy Allergen in the Product Formulation." These products are *NOT* manufactured to be hypoallergenic, excluding EleCare which is clinically documented to be hypoallergenic.

(2) This product contains soy lecithin.

(3) This product contains hydroxylated soy lecithin.

(4) This product contains soy oil or soybean oil.

NOTE: According to the Food Allergy and Anaphylaxis Network, "studies show that most soy-allergic individuals may safely eat soybean oil (*NOT* cold pressed, expeller pressed, or extruded oil) and soy lecithin. Patients should ask their doctors whether or not to avoid these ingredients." (Reference: www.foodallergy.org/allergens.html#soy. Highly refined oils (such as soy oil) are not classified as an allergen by Public Law 108-282, August 2, 2004; however, this law does identify soy lecithin as an allergen. The authors of this table recommend that individuals with soy allergies check with their physicians before using products with soy lecithin or soy oil.

(continued from page 62)

Table 13

Formulas/Modulars That Do Not Contain Whey in Product Formulation

This list indicates that the ingredient was not used in the formulation of the product. The production facilities do abide by good manufacturing practices, but the products are NOT represented to be hypoallergenic.* This list does not guarantee complete absence of the ingredient in the product listed under each category. The information contained in this list, although accurate at the time of publication (June 2005), may change due to product reformulation and/or different suppliers providing ingredients for the products. The most current information may be obtained by referring to product labels.

*Hypoallergenic is defined as "diminished potential for causing an allergic reaction." *Taber's Cyclopedic Medical Dictionary.* 19th ed. Philadelphia; F.A. Davis Company, 2001.

	Ross (1)	Novartis	Nestle
Adult Products Tube Feeding Formulas	EleCare EquaLYTE	Compleat Comply Diabetisource AC Fibersource, Fibersource HN Deliver 2.0 Impact, Impact 1.5, Glutamine, with Fiber Isocal, Isocal HN Isosource, Isosource HN, 1.5, VHN Magnacal Renal Novasource 2.0, Pulmonary, Renal Peptinex DT Protain XL Respalor Tolerex Traumacal Vivonex Plus, RTF, TEN	Crucial f.a.a. Glytrol Modulen Nutren 1.0, 1.5, 2.0 Nutren Fiber NutriRenal NutriVent ProBalance Replete, Replete with Fiber
Oral Supplements	Juven	Lipisorb Resource 2.0, Arginaid NutriHeal	Carnation Instant Breakfast Lactose Free Carnation Instant Breakfast Lactose Free Plus Carnation Instant Breakfast Lactose Free VHC
Modulars	Polycose	Benecalorie Benefiber	None
Pediatric Products Tube Feeding Formulas	EleCare	Compleat Pediatric Pediatric Peptinex DT Vivonex Pediatric	None
Infant Formulas	EleCare	None	Goodstart Supreme Soy with DHA & ARA Goodstart 2 Essentials Soy

(1)The product manufacturer stipulates these products as having "No Milk in the Product Formulation." These products are *NOT* manufactured to be hypoallergenic, excluding EleCare which is clinically documented to be hypoallergenic.

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Table 14

Formulas/Modulars That Do Not Contain Egg in Product Formulation

This list indicates that the ingredient was not used in the formulation of the product. The production facilities do abide by good manufacturing practices, but the products are *NOT* represented to be hypoallergenic.* This list does not guarantee complete absence of the ingredient in the product listed under each category. The information contained in this list, although accurate at the time of publication (June 2005), may change due to product reformulation and/or different suppliers providing ingredients for the products. The most current information may be obtained by referring to product labels.

*Hypoallergenic is defined as "diminished potential for causing an allergic reaction." *Taber's Cyclopedic Medical Dictionary.* 19th ed. Philadelphia; F.A. Davis Company, 2001.

	Ross (1)	Novartis	Nestle
Adult Products Tube Feeding Formulas	AlitraQ EleCare EquaLYTE Glucerna Glucerna Select Jevity 1 Cal, 1.2 Cal, 1.5 Cal Nepro Optimental Osmolite, 1 Cal, 1.2 Cal, 1.5 Cal Oxepa Perative Pivot 1.5 Cal Promote, Promote with Fiber Pulmocare Suplena TwoCal HN Vital HN	All tube feedings are egg free.	Crucial f.a.a. Glytrol Modulen Nutren 1.0, 1.5, 2.0, Fiber NutriHep NutriRenal NutriVent Peptamen, Peptamen with PreBio1, 1.5, VHP ProBalance Renalcal Replete, Replete with Fiber
Oral Supplements	Vital HN Enlive! Ensure Ensure Fiber with FOS, Healthy Mom Shake, High Calcium, High Protein, Plus, Plus HN, Powder, Pudding Glucerna Shake Glucerna Weight Loss Shake Hi-Cal Juven NutriFocus ProSure Shake	All liquid oral supplements are egg free.	Carnation Instant Breakfast Carnation Instant Breakfast for the Carb Conscious Carnation Instant Breakfast Juice Drink Carnation Instant Breakfast Lactose Free Carnation Instant Breakfast Lactose Free Plus Carnation Instant Breakfast Lactose Free VHC NutriHeal
Modulars	Polycose ProMod	None	Additions
Pediatric Products Tube Feeding Formulas	EleCare PediaSure Enteral Formula PediaSure Enteral Formula with Fiber	All tube feeding formulas are egg free.	Nutren Junior, Nutren Junior with Fiber Peptamen Junior Peptamen Junior Powder Peptamen Junior with PreBio1
Oral Supplements Infant Formulas	PediaSure PediaSure with Fiber EleCare	All oral liquid supplements are egg free. None	Carnation Instant Breakfast Junior Goodstart Essentials Goodstart Supreme Goodstart Supreme with DHA & ARA Goodstart 2 Essentials Goodstart 2 Supreme with DHA & ARA Goodstart Supreme Soy with DHA & ARA Goodstart 2 Essentials Soy

(continued from page 65)

Table 15

Formulas/Modulars	That Do Not	Contain Gluten	in Product	Formulation
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	Ross (1)	Novartis	Nestle
Adult Products			
Tube Feeding Formulas	AlitraQ	All tube feeding formulas are	Crucial
	EleCare	gluten free EXCEPT Boost	f.a.a.
	EquaLYTE (3)	chocolate malt flavor.	Glytrol
	,	chocolate mait havor.	5
	Glucerna		Modulen
	Glucerna Select (3)		Nutren 1.0, 1.5, 2.0
	Jevity 1 Cal		Nutren Fiber
	Jevity 1.2, 1.5 Cal (1,2,3)		NutriHep
	Nepro (3)		NutriRenal
	Optimental (3)		NutriVent
	Osmolite, 1, 1.2, 1.5 Cal		Peptamen, VHP, with PreBio1, 1.5
	Охера		ProBalance
	Perative (3)		Renalcal
	Pivot 1.5 Cal (3)		Replete
	Promote		Replete with Fiber
	Promote with Fiber (2)		
	Pulmocare		
	Suplena		
	TwoCal HN (3)		
	Vital HN		
Oral Supplemente	Enlive!	All liquid and aupplements are	Carnation Instant Breakfast Juice Drink
Oral Supplements		All liquid oral supplements are	
	Ensure	gluten free EXCEPT Boost	Carnation Instant Breakfast Lactose Free
	Ensure Fiber with FOS (2,3),	chocolate malt flavor.	Carnation Instant Breakfast Lactose Free Plus
	Healthy Mom Shake, High Calcium,		Carnation Instant Breakfast Lactose Free VHC
	High Protein, Plus, Plus HN, Powder,		NutriHeal
	Pudding (3)		
	Glucerna Shake (3), Weight Loss Shake (3)		
	Hi-Cal		
	Juven		
	NutriFocus (1,2,3)		
	ProSure Shake (3)		
Modulars	Polycose	Benefiber (EXCEPT tablet form)	Additions
	ProMod	, , , , , , , , , , , , , , , , , , , ,	
Pediatric Products			
Tube Feeding Formulas	EleCare	All tube feeding formulas	Nutren Junior
	PediaSure Enteral Formula	are gluten free.	Nutren Junior with Fiber
	PediaSure Enteral Formula with Fiber		Peptamen Junior (liquid and powder)
	(1,2,3)		Peptamen Junior with PreBio1
Oral Supplements	PediaSure	All liquid oral supplements	None
	PediaSure with Fiber	are gluten free.	
Infant Formulas	EleCare	None	Goodstart Essentials
			Goodstart Supreme
			Goodstart Supreme with DHA & ARA
			Goodstart 2 Essentials
			Goodstart 2 Supreme with DHA & ARA
			Goodstart Supreme Soy with DHA& ARA
			Goodstart 2 Essentials Soy
			GUUUSIALI Z ESSELIUAIS SOV

(1) The patented fiber blend includes oat fiber, soy fiber, carboxymethylcellulose and gum arabic. U.S. Patent 5,085,883.

(2) The oat fiber in Ross products meets the standards for gluten-free ingredients established by the Codex Alimentarius Commission. (Joint FAO/WHO Food Standards Programme, Codex Alimentarius Commission: Codex Standards for Gluten-Free Foods, in Codex Alimentarius, vol IX, ed 1, 1981; pp. 9-12.)
 (3) NutraFlora® brand FOS are produced by the action of the enzyme isolated from Aspergillus niger on sucrose. Ross has exclusive rights for the use of NutraFlora® brand

(3) NutraFlora® brand FOS are produced by the action of the enzyme isolated from Aspergillus niger on sucrose. Ross has exclusive rights for the use of NutraFlora® brand FOS in adult and pediatric medical nutritional products.

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Table 16

Blenderized Tube Feeding (each recipe is for the whole day)

	Calories ⁶									
Ingredients	800	1000	1200	1500	1800	2000	2200	2400	2600	3000
Baby Rice Cereal (Heinz) (dry) Baby Beef	¼ cup	¼ cup	¼ cup	¼ cup	½ cup	½ cup	½ cup	½ cup	⅔ cup	¾ cup
(Heinz) 2.5 oz Baby Carrots	2 Jars	2 Jars	2 Jars	2 Jars	2 Jars	2 Jars	3 Jars	3 Jars	3 Jars	3 Jars
(Heinz) 4 oz. Baby Green Beans	1 Jar	1 Jar	1 Jar	1 Jar	1 Jar	1 Jar	1 Jar	1 Jar	1 Jar	1 Jar
(Heinz) 4 oz Baby Applesauce	—	—	—	1 Jar	1 Jar	1 Jar	1 Jar	1 Jar	1 Jar	1 Jar
(Heinz) 4 oz Baby Chicken	1 Jar	1 Jar	1 Jar	1 Jar	1 Jar	2 Jars	2 Jars	2 Jars	2 Jars	2 Jars
(Heinz) 2.5 oz Orange Juice Whole Milk ¹ Cream, Half-and-Half Egg—Cooked ² Vegetable oil ³ Karo Syrup ⁴ Cost/kcal level ⁵		— 2 Cups 2 Cups 4 Cup 1 2 tsp 1 Tbsp. \$3.41	1 Jar ½ Cup 2 Cups ½ Cup 1 1 Tbsp 2 Tbsp. \$4.25	1 Jar 1 Cup 2 Cups ¾ Cup 1 1 Tbsp 3 Tbsp. \$5.11	1 Jar 1 Cup 2¼ Cups 1¼ Cups 1 1 Tbsp. 3 Tbsp. \$5.55	1 Jar 1 Cup 2¼ Cups 1½ Cups 2 1 Tbsp. 3 Tbsp. \$5.59	1 Jar 1 Cup 3 Cups 1¼ Cups 2 2 Tbsp. 3 Tbsp. \$6.85	1 Jar 1½ Cups 3 Cups 1½ Cups 2 2 Tbsp. 4 Tbsp. \$7.15	1 Jar 1½ Cups 3 Cups 1¾ Cups 2 2 Tbsp. 5 Tbsp. \$7.45	2 Jars 2 Cups 3 Cups 2 Cups 2 3 Tbsp. 5 Tbsp. \$8.56

¹ Substitute lactaid milk if needed

² Pasteurized liquid whole egg can also be used

³ Suggest either: Sunflower, Corn or Soybean Oil (High essential fatty acid content and readily available)

⁴ Polycose liquid (Ross), can be substituted if necessary; available at www.rosstore.com

⁵ All items were priced at Super Wal-Mart using Gerber products

⁶ Makes 1525 mL total volume

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the adult population, which makes it likely that a subset of patients receiving enteral feeding will have food allergies. Allergy to cow's milk, eggs, wheat and soy is more common in infants and young children while seafood, peanuts and tree nuts are the more common causes of food allergy in adult life. In January 2006, a new law (The Food Allergen Labeling and Consumer Protection Act of 2004—Public Law 108–282, August 2, 2004) will go into effect requiring food labels to identify if the product contains any of the 8 major food allergens—crustaceans, egg, fish, milk, peanut, soy, tree nuts, and wheat. All food labels must be in compliance by January 1, 2006. See Table 9 for more resources on food allergies.

Although not an allergy, but an autoimmune process, patients with celiac disease need to avoid

gluten-containing foods, including enteral formulas should they be necessary. Tables 10–15 provides a listing of enteral products that may be considered for use in patients with allergy to corn, casein, soy, whey, egg, and gluten intolerance.

HOMEMADE/BLENDERIZED ENTERAL FEEDINGS

Most nutrition support clinicians discourage the use of homemade formulas for several reasons. Blenderized formulas increase the chance of food borne illness, a heightened concern in immuno-compromised patients. In addition, there is an increased work burden on the patient or caregiver as blenderized formulas can be very time consuming. Perhaps most important, blenderized formulas must be carefully made to ensure

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Table 16

Blenderized Tube Feeding (each recipe is for the whole day) (Continued)

	Calorie Levels ³										
Nutrients	DRIs ¹	800	1000	1200	1500	1800	2000	2200	2400	2600	3000
Kcals	_	799	989	1205	1478	1784	1986	2216	2408	2600	3002
Protein (g)	—	40	48	58	63	71	79	93	96	99	112
Total Fat (g)	—	35	47	60	72	89	102	118	126	133	160
Saturated Fat (g)	—	16	21	25	32	42	48	51	57	61	68
Monounsaturated (g)	—	11	15	19	22	27	31	36	38	40	48
Polyunsaturated (g)	—	5	8	12	13	14	15	23	23	24	34
Carbohydrate (g)	—	84	95	112	151	181	197	202	234	263	289
Sugar (g)	—	35	46	57	79	82	83	91	114	124	137
Fiber (g)	—	4	4	4	7	7	9	9	9	9	9
Calcium (mg)	1200	673	965	1032	1195	1636	1729	1889	1965	2150	2391
Iron (mg)	10.5	17	17	18	19	33	34	35	35	42	50
Magnesium (mg)	370	154	187	199	250	329	344	374	394	430	488
Sodium (mg)	1500 ⁴	400	520	586	656	744	833	955	1006	1060	1124
Potassium (mg)	4700	1472	1842	1969	2516	2874	3096	3451	3767	3901	4370
Phosphorus (mg)	700	703	930	1019	1152	1491	1643	1815	1887	2029	2252
Zinc (mg)	9.5	6.1	7.0	8.0	8.8	10.1	11	13	14	14	16
Vitamin A (RE)	800	1565	1640	1673	1842	1991	2142	2148	2223	2288	2374
Vitamin C (mg)	82	97	100	101	149	151	195	198	239	240	283
Thiamin (mg)	1.1	1.1	1.2	1.2	1.4	2.2	2.3	2.4	2.5	2.9	3.5
Riboflavin (mg)	1.2	1.7	2.1	2.2	2.5	3.4	3.8	4.1	4.2	4.6	5.2
Niacin (mg)	15	14	14	17	17	26	27	29	29	34	41
Pantothenic Acid (mg)	5	2.8	3.5	4.1	4.8	5.3	6.3	7.0	7.4	7.6	8.5
Folate (mcg)	400	92	104	112	176	189	215	227	251	256	290
Vitamin B6 (mg)	1.5	0.7	0.8	1.0	1.1	1.3	1.4	1.6	1.7	1.8	2.1
Vitamin B12 (mcg)	2.4	3.6	4.5	4.9	5.2	5.8	6.6	8.0	8.2	8.4	8.9
Vitamin D (mcg)	10	133	230	234	250	294	330	394	403	413	423
Vitamin E (mg)	15	6.8	10.8	15	16	16	17	29	29	30	42
Vitamin K (mcg)	105	39	49	49	52	54	80	87	91	91	93
Water % ²	—	64	62	64	64	64	64	64	64	64	64

¹ The average recommended value for a healthy male or female adult. For more information: http://www.nal.usda.gov/fnic/etext/000105.html

² Water may need to be added to thin down the formula; furthermore, separate water bolus' will be needed to meet hydration needs.

³ Numbers shaded and in bold print highlight those nutrients that fall below the average DRI's for adults - a Centrum vitamin/mineral supplement (or equivalent) can be crushed and flushed 4-7 days per week as needed to ensure nutrient adequacy of tube feeding. ⁴ In some circumstances, additional sodium may need to be added to these mixtures.

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nutritional adequacy, a challenging task for the caregiver. Although there is one commercially prepared blenderized product on the market (Compleat), it is significantly more expensive than standard enteral products.

Nevertheless, some patients or caregivers have a strong desire to provide "home-made" nutrition. Table 16 provides recipes adapted from the "olden days" (circa 1980) for such cases. Ideally, should patients/families want to use this guide as their sole source of nutrition, clinicians can suggest varying foods somewhat within the food categories to increase variety in the diet. Another way to address the desire to provide homemade formula is to suggest the family make an occasional "homemade meal" vs formula for the entire day on a regular basis.

A few of the lower calorie levels do not provide 100% of the RDI's; a liquid therapeutic vitamin/mineral (or tab crushed and flushed) can be supplemented to ensure nutrient adequacy. Routine monitoring of a patient's nutritional status with serial weights and lab values as appropriate, should continue as long as the patient requires enteral feeding.

CONCLUSION

Enteral formula selection can be challenging and is not always guided by clinical evidence or clinical practicality. The growth of formula availability has resulted in a large number of specialized products marketed for improving specific disease states or conditions. It is important to critically evaluate these products in conjunction with the available supporting clinical evidence. Until clinical evidence guides us otherwise, standard formula should be the product of choice for the majority of patients requiring enteral feeding. For manufacturer contact information about enteral products discussed in this article, see Table 17.

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Table 17

Enteral Product Manufacturer Contact Information

Nestle Clinical Nutrition

Nestlé InfoLink Product and Nutrition Information Services 1-800-422-2752 Monday–Friday 8:30 AM–5 PM CST www.nestleclinicalnutrition.com

Novartis Nutrition

Novartis Medical Nutrition Consumer and Product Support 1-800-333-3785 (choose Option 3) Monday–Friday 9:00 AM – 6:00 PM EST http://www.novartisnutrition.com/us/home

Ross Products Division, Abbott Laboratories Ross Consumer Relations 1-800-227-5767 Monday–Friday 8:30 AM–5:00 PM EST

www.ross.com

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For further details on rates or to place an order: *Practical Gastroenterology* Shugar Publishing 99B Main Street Westhampton Beach, NY 11978 Phone: 631-288-4404 Fax: 631-288-4435 2 enteral nutrition formulas (low carbohydrate-high monounsaturated fat vs high carbohydrate. *J Parenter Enteral Nutr*, 2005;29:21-29.

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