

TABLE I-continued

Nutrient per 100 ml	Range
Vitamin E (IU)	.5-2.5
Vitamin K (umg)	7.5-12.5
Vitamin C (mg)	5-30
Vitamin B1 (mg)	0.15-0.25
Vitamin B2 (mg)	0.13-0.21
Vitamin B6 (mg)	0.14-0.24
Vitamin B12 (ug)	0.38-0.63
Niacin (mg)	2.1-3.5
Folic Acid (ug)	30-50
Biotin (ug)	22.5-37.5
Pantothenic Acid (mg)	0.3-0.5

## EXAMPLE II—COMPARATIVE

The experiment was conducted to demonstrate that the use of a whey protein isolate is critical for attaining the goals of this invention. 3396 g of water was heated to 80° F. (27° C.) and 223 g of whey protein concentrate from New Zealand Milk Products, Inc. was added and mixed to form a slurry. Phosphoric acid was added to the slurry to reduce the pH to 3.6 and the mixture was heated to 175° F. (80° C.). 213 g of sucrose and 674 g of maltodextrin with a DE of 20 was then added and the mixture was stirred. The product was further processed in a usual manner. The resulting finished product was cloudy and yellow in color. The experiment demonstrates that use of a whey protein concentrate which contains fat and lactose is not suitable for the production of a clear beverage.

## EXAMPLE III—COMPARATIVE

This experiment was conducted to demonstrate that a pH of 2.8 to 3.3 is critical for obtaining the goals of this invention. 3117 g of water was heated to 125° F. (52° C.) and 184 g of whey protein isolate (Proyon) was added and mixed until clear. The pH of the protein solution was adjusted by (1) adding 50% phosphoric acid to reduce the pH to 4.5 and then (2) 50% malic/citric acid was added to reduce the pH to 4.0. The mixture was heated to 165° F. (74° C.) and 178 g of sucrose and 878 g of maltodextrin was added and stirred. Vitamins, trace minerals and ultra-trace minerals were then added and the mixture was then processed in a usual manner. The resulting product was milky white in appearance and possessed a very thick texture or mouth feel. This experiment demonstrates that a pH of less than 4.0 is required to achieve the goals of this invention.

## EXAMPLE IV—COMPARATIVE

This experiment was conducted to demonstrate that acidification of the protein slurry prior to mixing with the carbohydrate slurry is critical to obtaining the goals of this invention. More specifically, this experiment shows that acidification of a protein/carbohydrate slurry results in an unacceptable product.

1397 g of water was heated to 125° F. (52° C.) and 184 g of whey protein isolate (Provon) was added and stirred until clear. In a separate vessel 857 g of water was heated to 175° F. (80° C.) and 275 g of sucrose and 868 g of maltodextrin and trace minerals and ultra-trace minerals were added and stirred until clear. The protein and carbohydrate slurries were then combined and stirred for 5 minutes. 121 g of malic acid and 12 g of citric acid were added to 50 g of water. The acid solution was then added to the protein/carbohydrate slurry. 13 g of 37% hydrochloric

acid was then added to the protein/carbohydrate slurry. The mixture was then processed in a usual manner. The resulting product was cloudy and possessed a slightly thick texture.

This experiment demonstrates that acidification of the protein slurry prior to combination with the carbohydrate slurry is required to achieve a clear beverage that possesses a thin texture.

Although the products may be fortified with additional major minerals or macro-nutrients (Ca, Mg, Cl, P, K, Na), it has been found that the addition of these minerals has an adverse effect on the product's textural and appearance properties. Accordingly, the products in the preferred embodiment of the present invention contain only those amounts of major minerals inherent to the raw materials used, (such as through the protein, carbohydrate and ingredient water). The products of the present invention may be fortified with trace and/or ultratrace minerals and/or vitamins without detrimental impact to the textural and appearance properties of the product.

The nutritional supplement beverage of the present invention can be made in ready to consume form, in the form of a concentrate, a frozen sorbet or powder form and may be flavored with natural and/or artificial flavors and/or fruit juice concentrates. The beverage of this invention may also be carbonated. The nutritional beverage of the present invention, due to its thinness and clarity, was found to produce a refreshing, tart juice-like mouth feel at a significantly high caloric density (greater than 1.00 kcal/ml at 3-5% protein by wt.).

The nutritional supplement beverage of the present invention may be packaged in accordance with materials and methods used in the packaging art.

## Industrial Applicability

Some patients in need of nutritional supplementation simply do not like or cannot tolerate milky supplements. These patients may also suffer from taste fatigue which can hinder compliance. The product of this invention will offer malnourished patients a new variety of supplement that will improve intake and thereby improve nutritional status. The product of this invention provides a high level of energy and protein in a clear, juice-type supplement which will be found useful in the medical community.

The product of this invention is intended to be used as a necessary nutritional supplement for patients with the following conditions: disease related malnutrition, short bowel syndrome; proven inflammatory bowel disease; bowel fistulae; pre-operative preparation of patients who are malnourished; treatment following total gastrectomy; dysphagia; and intractable malabsorption.

In accordance with the foregoing disclosure, it will be within the ability of one skilled in the relevant arts to make modifications to the present invention, such as through the substitution of equivalent materials and/or their amounts, without departing from the spirit of the invention as reflected in the appended claims.

What is claimed is:

1. A substantially clear liquid nutritional supplement comprising:

- (1) water;
- (2) from about 1% to about 10% by weight whey protein isolate;
- (3) at least one source of carbohydrate, said carbohydrate having a DE of at least 10;
- (4) vitamins, trace minerals and ultra trace minerals;