

Hellenic Complex Systems Laboratory

Enteral Nutrition Design

Technical Report X

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Abstract

Enteral feeding refers to the delivery of nutrition directly into the gastrointestinal tract, thereby providing part or all of a patient's caloric and nutritional requirements. To design an enteral nutrition formula, the respective quantities of up to six selected foods (a meat, a cereal, a vegetable, a fruit and an oil) are calculated. It is desired that their combination comply with user-defined specifications: total required calories (10–3000), fraction of protein calories (0.15–0.40), fraction of carbohydrate calories (0.15–0.40) and maximum total water content of the foods (1–3000 ml). The specifications are set using the sliders. The foods are selected using their respective menus. Each menu includes a "None" option.

total food calories

2000

fraction of protein calories

0.25

fraction of carbohydrate calories

0.55

maximum total water content (ml)

2000

meat

Cod flesh only steamed

cereal

Bread wholemeal average

dairy food

Yogurt low fat plain

vegetable

Beans green boiled in unsalted water

fruit

Bananas flesh only

oil

Oil sunflower

Cod flesh only steamed (gr)	153.025
Bread wholemeal average (gr)	269.127
Yogurt low fat plain (gr)	1068.63
Beans green boiled in unsalted water (gr)	476.025
Bananas flesh only (gr)	293.46
Oil sunflower (gr)	24.1083
total water contained (ml)	1805.64

Figure 1: Enteric nutrition formula, including cod flesh only steamed, bread wholemeal average, yogurt low fat plain, beans green boiled in unsalted water, bananas flesh only, and oil sunflower. Total required calories: 2000, required fraction of protein calories: 0.25, required fraction of carbohydrate calories: 0.55, maximum total water content: 2000 ml.

total food calories

2000

fraction of protein calories

0.22

fraction of carbohydrate calories

0.46

maximum total water content (ml)

2200.

meat

Trout rainbow flesh only baked

cereal

Pasta wholewheat spaghetti dried boiled in unsalted water

dairy food

Yogurt low fat plain

vegetable

Carrots old boiled in unsalted water

fruit

Plums average raw flesh and skin

oil

Oil olive

Trout rainbow flesh only baked (gr)	160.963
Pasta wholewheat spaghetti dried boiled in unsalted water (gr)	317.619
Yogurt low fat plain (gr)	1053.25
Carrots old boiled in unsalted water (gr)	542.74
Plums average raw flesh and skin (gr)	317.464
Oil olive (gr)	44.2791
total water contained (ml)	1988.41

Figure 2: Enteric nutrition formula, including trout rainbow flesh only baked, pasta wholewheat spaghetti dried boiled in unsalted water, yogurt low fat plain, carrots old boiled in unsalted water, plums average raw flesh and skin, and oil olive. Total required calories: 2000, required fraction of protein calories: 0.22, required fraction of carbohydrate calories: 0.46, maximum total water content: 2200 ml.

total food calories

2000

fraction of protein calories

0.24

fraction of carbohydrate calories

0.5

maximum total water content (ml)

2000

meat

Trout rainbow flesh only baked

cereal

Oatcakes plain retail

dairy food

Yogurt low fat plain

vegetable

Broccoli green boiled in unsalted water

fruit

Pears raw flesh and skin

oil

None

Trout rainbow flesh only baked (gr)	188.691
Oatcakes plain retail (gr)	172.997
Yogurt low fat plain (gr)	891.285
Broccoli green boiled in unsalted water (gr)	441.953
Pears raw flesh and skin (gr)	545.53
total water contained (ml)	1782.65

Figure 3: Enteric nutrition formula, including trout rainbow flesh only baked, oatcakes plain retail, yogurt low fat plain, broccoli green boiled in unsalted water, and pears raw flesh and skin. Total required calories: 2000, required fraction of protein calories: 0.24, required fraction of carbohydrate calories: 0.50, maximum total water content: 2000 ml.

total food calories

2000

fraction of protein calories

0.3

fraction of carbohydrate calories

0.44

maximum total water content (ml)

1600.

meat

Veal mince stewed

cereal

Beans broad whole boiled in unsalted water

dairy food

Yogurt whole milk plain

vegetable

Tomato puree

fruit

Apricots raw flesh and skin

oil

Oil corn

Veal mince stewed (gr)	245.245
Beans broad whole boiled in unsalted water (gr)	208.718
Yogurt whole milk plain (gr)	148.209
Tomato puree (gr)	1500.06
Apricots raw flesh and skin (gr)	45.0481
Oil corn (gr)	21.4159
total water contained (ml)	1577.25

Figure 4: Enteric nutrition formula, including veal mince stewed, beans broad whole boiled in unsalted water, yogurt whole milk plain, tomato puree, apricots raw flesh and skin, and oil corn. Total required calories: 2000, required fraction of protein calories: 0.30, required fraction of carbohydrate calories: 0.44, maximum total water content: 1600 ml.

Details

This Demonstration shows a method for the design of enteral nutrition [1]. It includes the respective data of all the foods of the 2015 version of the Composition of Foods Integrated Dataset (CoFID), published by Public Health England (PHE) [2].

Therefore, the menus of the Manipulate function can be redefined to include any of the foods of the dataset.

The Demonstration is dedicated to the loving memory of George Koutsidis.

References

[1] R. Bankhead, J. Boullata, S. Brantley, M. Corkins, P. Guenter, J. Krenitsky, B. Lyman, N. A. Metheny, C. Mueller, S. Robbins, J. Wessel and the A.S.P.E.N. Board of Directors. A.S.P.E.N. Enteral Nutrition Practice Recommendations. *Journal of Parenteral and Enteral Nutrition*, **33**(2), 2009 pp. 122–167. doi:10.1177/0148607108330314.

[2] P. M. Finglas, M. A. Roe, H. M. Pinchen, R. Berry, S. M. Church, S. K. Dodhia, M. Farron-Wilson and G. Swan, McCance and Widdowson's The Composition of Foods. 7th summary ed., Cambridge, UK: The Royal Society of Chemistry, 2015.

Source Code

The updated Wolfram Mathematica® source code is available at:

<https://www.hcsl.com/Tools/EnteralNutritionalDesign-author.nb>

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<http://demonstrations.wolfram.com/EnteralNutritionalDesign/>

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