Hellenic Complex Systems Laboratory

Enteral Nutritional Design

Technical Report X

Theodora Chatzimichail
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Enteral Nutritional Design

Theodora Chatzimichail [a]

[a] Hellenic Complex Systems Laboratory

Search Terms: nutrition, nutrition therapy, enteral nutrition, nutrition design, nutrition formula, composition of foods, critical care, intensive care, medicine

Short Description of the Demonstration

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 dairy food, 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.
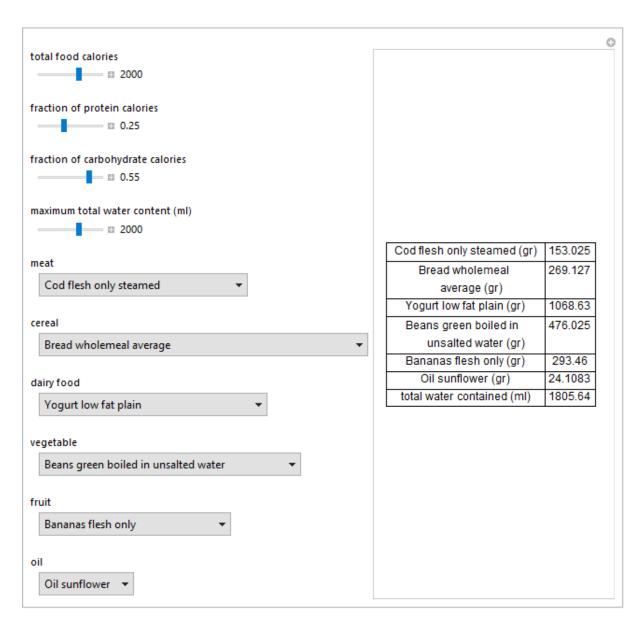
total food calories	
⊟ 2000	

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, with the settings shown at the left.*

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, with the settings shown at the left.*

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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, with the settings shown at the left.*

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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, with the settings shown at the left.*

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

Programming language: Wolfram Language
Availability: The updated source code is available at:
https://www.hcsl.com/Tools/Demonstrations/EnteralNutritionalDesign.nb

Software Requirements

Operating systems: Microsoft Windows, Linux, Apple iOS
Other software requirements: Wolfram Player®, freely available at: https://www.wolfram.com/player/ or Wolfram Mathematica®.

System Requirements

Processor: x86-64 compatible CPU.
System memory (RAM): 4GB+ recommended.

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