

AN INTRODUCTION

This file is an attachment to a guideline on "How to calculate nutrition values of foods."

An example of recipe calculation of a selected food is given. Results are compared with data obtained by chemical analysis of this food that was performed at the Food Research Institute in Prague within the Project of the Czech Food Composition Database (<http://europepmc.org/abstract/CTX/C6068>).

The file consists of the following sheets:

Sheet	Description
RECIPE	A recipe is described. The following information has been collected: Name of food, recipe source, preparation procedure, list of ingredients, weight of ingredients (gross and ready-to-cook), raw and cooked weight of food, yield factor. Information about cooking method, cooking temperature, number of portions and edible portion is also provided.
MANDATORY	An example of a recipe calculation procedure without using retention factors is presented in practice. Individual steps of calculation are demonstrated in detail. The calculation procedure is programmed and can be used for other recipe calculations. The scope of nutrients comprise mandatory nutrients for nutrition declaration (fat, saturates, carbohydrate, sugars, protein and salt). Mandatory nutrients are highlighted in green colour. Calculation of fibre and sodium content is also demonstrated. Name of nutrients is given with so called EuroFIR nutrient thesauri codes presented in capital letters (e.g. FAT, SFA etc.) Calculation of energy value is given. Rounding of results in compliance with the Guidance* to the Regulation 1169/2011 is given. Results of calculation are compared with data obtained by chemical analysis.
VITMIN	An example of recipe calculation with retention factors is presented. Individual steps of calculation are demonstrated in detail, including use of retention factors. The calculation procedure is programmed and can be used for other recipe calculations. The scope of nutrients in this example comprises vitamins (B1, B2, C, A, E) and two minerals (sodium, calcium). Name of nutrients is given with so called EuroFIR nutrient thesauri codes presented in capital letters (e.g. THIA, RIBF, etc.) Rounding of results in compliance with the Guidance* to the Regulation 1169/2011 is given. Results of calculation are compared with data obtained by chemical analysis.
WATER	A procedure for calculation of water content is demonstrated. Individual steps are described in detail.
TOLERANCES	Comparison of calculated values with values obtained by chemical analysis is given. Simulation of a control by competent authorities is demonstrated using an example for tolerances for foods other than food supplements. Calculated values simulate values declared on a label. Values obtained by chemical analysis simulate values established in course of an official control by an authority in relation to nutrition labelling as described in EU legislation, first of all Regulation (EU) No 1169/2011. Individual steps of the simulated control are in compliance with examples given in the corresponding Guidance* document
GENERAL CHECK	The check of calculated values expressed per 100 g of edible portion is demonstrated. Content of fat, carbohydrate, fibre, protein, ash (salt) and water are summed. Preferable and acceptable ranges of the result are evaluated. General check is given also for values obtained by chemical analysis.

*http://ec.europa.eu/food/food/labellingnutrition/nutritionlabel/guidance_tolerances_december_2012.pdf

Name of food	Bramborak, pancake from raw potatoes, fried, homemade				
Recipe source	Adopted from: J. Runstuk et al. Receptury teplych pokrmu. Radek Runstuk - R plus, Hradec Kralove 2004, recipe No. 20505, p. 441				
Recipe:	Peeled potatoes are finely grated. After a short keeping, a part of liquid is removed. Milk, sieved flour, egg and garlic grinded with salt are added. Dough is spiced with marjoram and pepper and thoroughly mixed. Small pancakes are formed and fried in hot lard. (See fotogallery on http://www.nutridatabase.cz/en/food/?id=2).				
Cooking method	frying				
Frying temp.	180°C				
Time of frying	8 min				
Number of portions	5				
Edible portion	100%				
Ingredients	Comment	Gross weight (g)*	Ready-to-cook weight (g)*	Cooked weight (g)*	Yield
Potatoes, raw	537 raw potatoes are peeled, grated, a part of liquid is removed	537	382,5		
Wheat flour, fine		100	100		
Milk, 1,5% fat		50	50		
Egg	1/2 an egg (amount without shell)	20	20		
Garlic	Garlic grinded with salt	5	4,5		
Salt		5	5		
Marjoram and pepper	(1:1), Not considered in calculation	0,5	0		
Lard	Only lard absorbed during frying is considered in recipe calculation. Lard uptake was determined by a cooking test.	45	45		
Raw weight (g)			607		
Cooked weight (g)				438	
Yield factor	Cooked weight/Raw weight				0,72

*data determined by weighing during a cooking test

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Step 2: Fill in amount of ingredients in recipe.

Notice: Only amount of lard absorbed within frying is considered in this recipe calculation.

Step 5: Collect data about nutrient content of input ingredients per 100 g.

Use food composition tables/databases. Values here are expressed per 100 g of edible portion.

Notice: data for SUGAR originate from <http://www.pbd-online.sk/sk>; data for other nutrients from <http://www.nutridatabase.cz>.

Nutrients marked green - mandatory for nutrition labelling.

NACL=2,5*NA

Step 1: Make a list of input ingredients.

List of ingredients	Weight of ingredients	Composition of input ingredients per 100 g							
		Fat	Saturates	Carbohydrate	Sugars	Fibre	Protein	Sodium	Salt
		FAT	SFA	CHO	SUGAR	FIBT	PROT	NA	NACL
	g	g	g	g	g	g	g	g	
Potatoes, raw	382,5	0,3	0	17,2	3	1,6	2,4	0,016	0,04
Wheat flour, fine	100	1,7	0,22	68,9	2,1	3,1	11,9	0,001	0,00
Milk, 1,5% fat	50	1,5	0,97	4,8	4,6	0	3,2	0,041	0,10
Egg	20	9,5	3,07	0,6	0,3	0	12,6	0,135	0,34
Garlic	4,5	0,4	0,06	28,9	3,2	2,8	6,3	0,013	0,03
Salt	5	0	0	0	0	0	0	38,85	97,13
Lard	45	99,5	43,69	0	0	0	0,2	0,002	0,01
Raw weight (g)	607								
Cooked weight (g)	438								
Yield factor	0,72								

Step 3: Determine raw weight. Sum weight of input ingredients

Step 4: Determine cooked weight.

Notice:

1. Value used here is based on a cooking test.

2. Calculation using a yield factor (YF) for this food is also possible:
YF = cooked weight/raw weight. YF=607/438=0,72
Calculation of cooked weight: 607g*0,72=437g.
The result obtained is slightly different because of rounding of the yield factor.
This YF can be used for calculation of cooked weight of similar foods.

Step 6: Calculate nutrition value of 100 g cooked food.

Example here: Content of nutrient (FAT) in selected ingredient (egg) in cooked food per 100 g =
Nutrient content per 100 g ingredient * Raw weight of ingredient (g)
Total cooked weight (g)
9,5*20 = 0,4
438
Apply this calculation to each ingredient.

Ingredients	Nutrients									Energy value	
	Fat	Saturates	Carbohydrate	Sugars	Fibre	Protein	Sodium	Salt	ENERC	ENERC	
	FAT	SFA	CHO	SUGAR	FIBT	PROT	NA	NACL			
	g	g	g	g	g	g	g	g	kJ	kcal	
Potatoes, raw	0,3	0,00	15,0	2,6	1,4	2,1	0,014	0,03			
Wheat flour, fine	0,4	0,05	15,7	0,5	0,7	2,7	0,000	0,00			
Milk, 1,5% fat	0,2	0,11	0,5	0,5	0,0	0,4	0,005	0,01			
Egg	0,4	0,14	0,0	0,0	0,0	0,6	0,006	0,02			
Garlic	0,0	0,00	0,3	0,0	0,0	0,1	0,000	0,00			
Salt	0,0	0,00	0,0	0,0	0,0	0,0	0,443	1,11			
Lard	10,2	4,49	0,0	0,0	0,0	0,0	0,000	0,00			
Nutrient content of cooked food per 100 g - RECIPE CALCULATION	11,5	4,79	31,6	3,7	2,1	5,8	0,469	1,17			
Nutrient content of cooked food per 100 g - RECIPE CALCULATION values rounded according to legislation	12	4,8	32	3,7	2,1	5,8	0,47	1,2	1103	263	
Nutrient content of cooked food per 100 g - CHEMICAL ANALYSIS	10	4,6	31		3,0	5,6	0,42	1,1	1016	242	

Step 9: Round values according to legislation*.

Step 10: Calculate energy value of cooked food in kJ a v kcal.

in kJ: 17*PROT + 37*FAT + 17*CHO + 8*FIBT = 17*5,8 + 37*12 + 17*32 + 8*2,1 = 1103
in kcal: 4*PROT + 9*FAT + 4*CHO + 2*FIBT = 4*5,8 + 9*12 + 4*32 + 2*2,1 = 263
Notice:
1. The range of nutrients included in calculation of energy value may vary depending on a type of food.
2. This example demonstrates calculation with four nutrients that contribute to energv value of this food

Step 6: Sum contributions of all ingredients for a selected nutrient in 100 g cooked food.

Step 9: Round values according to legislation*.

*http://ec.europa.eu/food/food/labellingnutrition/nutritionlabel/guidance_tolerances_december_2012.pdf - page 15

Food:

Method:

Bramborak, pancake from raw potatoes, fried, homemade

Calculation WITH retention factors

Step 2: Fill in amount of ingredients in recipe.

Notice: Only amount of lard absorbed within frying is considered in recipe calculation.

Step 5: Collect data about nutrient content of input ingredients per 100 g.

Use food composition tables/databases. Values here are expressed per 100 g of edible portion.

Notice: data originate from <http://www.nutridatabase.cz>

Step 1: Make a list of input ingredients

List of ingredients	Weight of ingredients g	Composition of input ingredients per 100 g						
		Vitamin B1 THIA	Vitamin B2 RIBF	Vitamin C VITC	Vitamin A VITA	Vitamin E VITE	Sodium NA	Calcium CA
		mg	mg	mg	µg	mg	g	mg
Potatoes, raw	382,5	0,11	0,04	19,2	0	0,1	0,016	11
Wheat flour, fine	100	0,18	0,04	0	0	0,43	0,001	21
Milk, 1,5% fat	50	0,04	0,14	1,1	14	0,04	0,041	124
Egg	20	0,08	0,42	0	160	1,05	0,135	54
Garlic	4,5	0,18	0,09	17	0	0,01	0,013	38
Salt	5	0	0	0	0	0	38,85	0
Lard	45	0	0	0	0	1,26	0,002	2
Raw weight (g)	607							
Cooked weight (g)	438							
Yield factor	0,72							

Step 3: Determine raw weight. Sum weight of input ingredients

Step 4: Determine cooked weight.

1. Value used here is based on a cooking test.

2. Calculation using a yield factor (YF) for this food is also possible:
YF = cooked weight/raw weight. YF=607/438=0,72
Calculation of cooked weight: 607g*0,72=437g.
The result obtained is slightly different because of rounding of the yield factor.
This YF can be used for calculation of cooked weight of similar foods.

Step 7: Collect data about retention factors for vitamins and minerals. Consider the involved cooking procedure.

Notice:

1.For this recipe, the cooking procedure is frying. Group of factors "Cooked with fat or oil" are to be considered.

2.Retention factors are based on EuroFIR tables http://www.eurofir.org/?page_id=2695.

Ingredients	Cooking procedure	Retention factors						
		THIA	RIBF	VITC	VITA	VITE	NA	CA
Potatoes, raw	frying	0,86	0,96	0,9	0,95	1	1	1
Wheat flour, fine	frying	0,9	0,9	0,85	0,9	0,9	1	1
Milk, 1,5% fat	frying	1	0,9	0,5	0,9	0,8	1	1
Egg	frying	0,83	0,83	0,8	0,95	0,95	1	1
Garlic	frying	0,9	0,95	0,85	0,9	1	1	1
Salt	frying	1	1	1	1	1	1	1
Lard	frying	1	1	1	0,5	0,2	1	1

Step 8: Calculate nutrition value of 100 g cooked food.

Example here: Content of nutrient (VITA) in selected ingredience (egg) in cooked food per 100 g = **Nutrient content per 100 g ingredient * Raw weight of ingredient (g) * retention factor**

Total cooked weight (g)

160*20 *0,95= 6,94

438

Apply this calculation to each ingredient

Nutrients Ingredients	Vitamin B1 THIA	Vitamin B2 RIBF	Vitamin C VITC	Vitamin A VITA	Vitamin E VITE	Sodium NA	Calcium CA
	mg	mg	mg	µg	mg	g	mg
	Potatoes, raw	0,08	0,03	15,09	0,00	0,09	0,014
Wheat flour, fine	0,04	0,01	0,00	0,00	0,09	0,000	4,8
Milk, 1,5% fat	0,00	0,01	0,06	1,44	0,00	0,005	14,2
Egg	0,00	0,02	0,00	6,94	0,05	0,006	2,5
Garlic	0,00	0,00	0,15	0,00	0,00	0,000	0,4
Salt	0,00	0,00	0,00	0,00	0,00	0,443	0,0
Lard	0,00	0,00	0,00	0,00	0,03	0,000	0,2
Nutrient content of cooked food per 100 g - RECIPE CALCULATION							
Nutrient content of cooked food per 100 g -RECIPE CALCULATION values rounded according to legislation							
Nutrient content of cooked food per 100 g - CHEMICAL ANALYSIS							
	0,13	0,08	3,9	6	0,24	0,42	29

Step 6: Sum contributions of all ingredients for a selected nutrient in 100 g cooked food.

Step 9: Round values according to legislation*.

* http://ec.europa.eu/food/food/labellingnutrition/nutritionlabel/guidance_tolerances_december_2012.pdf - page 15

	A	B	C	D	E	F	G
1	Food:		Bramborak, pancake from raw potatoes, fried, homemade				
2	Attachment:		Calculation of water content				
3							
4							
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8				Weight of	Content of water per	Content of water in	Content of
9				ingredients	100 g of an	input ingredients	water in
10			Ingredients	g	g	g	g
11			Potatoes, raw	382,5	79,8	305	
12			Wheat flour, fine	100	13,2	13	
13			Milk, 1,5% fat	50	90,1	45	
14			Egg	20	74,3	15	
15			Garlic	4,5	61,3	2,8	
16			Salt	5	0,5	0	
17			Lard	45	0,2	0,1	
18			Raw weight	607			
19			Cooked weight (A)	438			
20			Weight change on cooking -(C)	169			
21			Total content of water in input ingredients (B)			381	
22			Content of water in cooked food per 100 g - RECIPE CALCULATION [(A-C)/B]*100				48

	A	B	C	D	E	F	G
23			Content of water in cooked food per 100 g - CHEMICAL ANALYSIS				49

Food: Bramborak, pancake from raw potatoes, fried, homemade

Control of compliance of values obtained by recipe calculation with tolerances for nutrition declaration on foods other than supplements.

According to the GUIDANCE DOCUMENT FOR COMPETENT AUTHORITIES FOR THE CONTROL OF COMPLIANCE WITH EU LEGISLATION with regard to the setting of tolerances for nutrient values declared on a label. http://ec.europa.eu/food/food/labellingnutrition/nutritionlabel/guidance_tolerances_december_2012.pdf

Values obtained by recipe calculation were compared with values obtained by chemical analysis (<http://www.nutridatabase.cz/en/food/?id=2>)

Calculated values simulate values declared on a food label.

Values obtained by chemical analysis simulate values established in course of an official control by an authority in relation to nutrition labelling as described in EU legislation, first of all Regulation (EU) No 1169/2011

Nutrients	Energy value		Fat	Saturates	Carbohydr	Sugars	Fibre	Protein	Sodium	Salt	Vitamin B1	Vitamin B2	Vitamin C	Vitamin A	Vitamin E	Calcium
	ENERG kJ	ENERG kcal	FAT g	SFA g	CHO g	SUGAR g	FIBT g	PROT g	NA g	NACL g	THIA mg	RIBF mg	VITC mg	VITA ug	VITE mg	CA mg
Compliance control steps																
Nutrient content of cooked food per 100 g RECIPE CALCULATION - rounded according to legislation	1103	263	12	4,8	32	3,7	2,1	5,8	0,47	1,2	0,13	0,073	15	8,38	0,25	31,6
Limit of value interval in g per 100 g			10-40	≥4	10-40	<10	<10	<10	<0,5	<1,25						
Rounding - lower value			11,5	4,75	31,5	3,65	2,05	5,75	0,465	1,15	0,125	0,0725	14,5	8,375	0,25	31,55
Rounding -upper value			12,4	4,84	32,4	3,74	2,14	5,84	0,474	1,24	0,134	0,0734	15,4	8,384	0,25	31,64
Lower tolerance			20%	20%	20%	2	2	2	0,15	0,375	35%	35%	35%	35%	35%	35%
Upper tolerance			20%	20%	20%	2	2	2	0,15	0,375	50%	50%	50%	50%	50%	45%
Lower tolerance value			9,2	3,8	25,2	1,65	0,05	3,75	0,315	0,775	0,081	0,047	9,43	5,444	0,159	20,51
Upper tolerance value			14,9	5,81	38,9	5,74	4,14	7,84	0,624	1,615	1,701	0,110	23,1	12,576	0,381	45,88
Lower bound tolerance - after rounding			9	3,8	25	1,7	0	3,8	0,32	0,78	0,081	0,047	9,4	5,44	0,16	20,5
Upper bound tolerance - after rounding			15	5,8	39	5,7	4,1	7,8	0,62	1,6	1,7	0,11	23	12,6	0,38	45,9
Nutrient content of cooked food per 100 g - CHEMICAL ANALYSIS	1016	242	10	4,6	31		3	5,6	0,42	1,1	0,13	0,08	3,9	6	0,24	29
Value based on RECIPE CALCULATION within the tolerance range?			Y	Y	Y		Y	Y	Y	Y	Y	Y	N	Y	Y	Y

Table 4: Rounding guidelines for the nutrient declaration in nutrition labelling of foods

Nutritional element	Amount	Rounding
Energy		to nearest 1 kJ/kcal (no decimals)
Fat*, Carbohydrate*, sugars*, Protein*, fibre*, polyols*, starch*	≥10 g per 100 g or ml <10 g and > 0.5 g per 100 g or ml no detectable amounts is present or concentration is ≤ 0.5 g per 100 g or ml	to nearest 1 g (no decimals) to nearest 0.1 g "0 g" or "<0.5 g" may be declared
Saturates*, Mono-unsaturates*, Polyunsaturates*	≥10 g per 100 g or ml <10 and > 0.1 g per 100 g or ml no detectable amounts is present or concentration is ≤ 0.1 g per 100 g or ml	to nearest 1 g (no decimals) to nearest 0.1 g "0 g" or "<0.1 g" may be declared
Sodium	≥1 g per 100 g or ml <1 g and > 0.005 g per 100 g or ml no detectable amounts is present or concentration is ≤ 0.005 g per 100 g or ml	to nearest 0.1 g to nearest 0.01 g "0 g" or "<0.005 g" may be declared
Salt	≥1 g per 100 g or ml <1 g and > 0.0125 g per 100 g or ml no detectable amounts is present or concentration is ≤ 0.0125 g per 100 g or ml	to nearest 0.1 g to nearest 0.01 g "0 g" or "<0.01 g" may be declared
Vitamins and minerals	vitamin A, folic acid, chloride, calcium, phosphorus, magnesium, iodine, potassium All other vitamins and minerals	3 significant figures 2 significant figures

*Not applicable to sub-categories

Example 1:

- A food product with a nutrition declaration of sugars of 8.5 g and no claim made about its sugar content
- According to the rounding guidelines of section 6 this equals to 8.45 to 8.54 g sugars /100 g
- Lower tolerance: lower value (8.45) minus lower tolerance for sugars from section 3 which is 2 g: 8.45 – 2 = 6.45 g/100 g; according to the rounding guidelines of section 6 the lower bound tolerance will be 6.5 g/100 g
- Upper tolerance: upper value (8.54) plus the upper tolerance for sugars from section 3 which is 2 g: 8.54 + 2 = 10.54 g/100 g; according to the rounding guidelines of section 6 the upper bound tolerance will be 11 g/100 g
- If official control finds a sugar content:
 - within the range of 6.5 to 11 g/100 g this product is found to be within the tolerance range according to the criteria laid down in section 3;
 - between the declared value (8.5 g) and the upper tolerance limit, control of compliance with section 2.3 should be considered

- that is outside the range of 6.5 to 11 g/100 g, section 2.4 should be considered which gives examples of aspects to be taken into account when the measured value is outside the tolerance for the declared value

Table 1: tolerances for foods other than food supplements including measurement uncertainty

	Tolerances for foods (includes uncertainty of measurement)	
Vitamins	+50%**	-35%
Minerals	+45%	-35%
Carbohydrate, Sugars, Protein, Fibre	<10 g per 100 g: 10-40 g per 100 g: >40 g per 100 g:	±2 g ±20% ±8 g
Fat	<10 g per 100 g: 10-40 g per 100 g: >40 g per 100 g:	±1.5 g ±20% ±8 g
Saturates, Mono-unsaturates, Polyunsaturates	<4 g per 100 g: ≥4g per 100 g:	±0.8 g ±20%
Sodium	<0.5 g per 100 g: ≥0.5 g per 100 g:	±0.15 g ±20%
Salt	<1.25 g per 100 g: ≥1.25 g per 100 g:	±0.375 g ±20%

** for vitamin C in liquids, higher upper tolerance values could be accepted

Food: Bramborak, pancake from raw potatoes, fried, homemade

General check for sum of content of fat, carbohydrate, fibre, protein, ash (salt) and water

(applicable for data expressed per edible portion)

Preferable range: 97-103 g

Acceptable range: 95-105 g

Nutrients Method of data generation	Fat	Carbohydrate	Fibre	Protein	Salt	Water	SUM	In a preferable range?	In an acceptable range ?
	FAT	CHO	FIBT	PROT	NACL	WATER			
	g	g	g	g	g	g	g		
Nutrient content of cooked food per 100 g RECIPE CALCULATION - rounded according to legislation	12	32	2,1	5,8	1,2	48	101,5	YES	YES
Nutrient content of cooked food per 100 g - CHEMICAL ANALYSIS	10	31	3,0	5,6	1,1	49	99,3	YES	YES