The Danish Food Composition Database Version 5.0 - June 2023

Developed and operated by
The National Food Institute,
Technical University of Denmark

In collaboration with
The Danish Veterinary and
Food Administration

Ministry of Food, Agriculture and Fisheries of Denmark
Danish Veterinary and Food Administration

Documentation

1. About frida.fooddata.dk 4
1.1 Copyright 4
1.2 Disclaimer 4
2. News and changes 5
2.1 Updated foodgroups 5
2.2 New parameters 5
3. Database structure 6
3.1 Foods 6
3.2 Food tables 6
3.3 Nutrient content 6
3.4 Median, variation and number of determinations 7
3.5 Sources and references 7
3.6 Food waste 7
4. Basic information 8
4.1 Energy 8
4.2 Carbohydrates 9
4.3 Protein 10
4.4 Amino acids 11
4.5 Fat and fatty acids 11
4.6 Sterols 12
4.7 Alcohol 12
4.8 Dry matter and water 13
4.9 Ash and minerals 13
4.10 Organic acids 13
4.11 Sugar alcohols 13
4.12 Biogenic amines 13
5. Vitamins 13
5.1 Vitamin A 14
5.2 Vitamin D 14
5.3 Vitamin E 15
5.4 Vitamin K 15

5.5 Vitamin B_1 15
5.6 Niacin 16
5.7 Vitamin B_6 16
5.8 Pantothenic acid 16
5.9 Biotin 16
5.10 Folate 17
5.11 Vitamin B_{12} 17
5.12 Vitamin C 17
6. Assumptions and calculations 17
6.1 Milk and milk products 18
6.1.1 Values for fat-soluble vitamins in dairy products 18
6.1.2 The content of fatty acids in dairy products 18
6.1.3 The content of cholesterol in dairy products 19
6.2 Cereals and cereal products 19
6.2.1 Niacin in cereals and cereal products 19
6.3 Meat and meat products 19
6.3.1 General comments 19
6.3.2 Cholesterol content in meat and meat products 19
6.3.3 Vitamin D content in meat and meat products 19
6.3.4 Information on meat cuts 20
7. Sources and references 20
Appendix A - The fatty acids, their common and systematic names 22
Appendix B - The vitamins/vitamers, their structures and molecular weights 24
Appendix C - Density of the liquid food products 29
Appendix D – Data curation 30
Appendix E – Updated foods history 31
Appendix F – Updated parameters history 35

1. About frida.fooddata.dk

The database Frida Food Data (https://frida.fooddata.dk) was created and published by Team Frida at the National Food Institute, Technical University of Denmark (DTU) with the intention to facilitate public access to information about substances in the food we eat. Frida Food Data includes data on nutrient content of various foods, and the administrators strive to ensure that the database reflects the food supply in Denmark and that data are as correct and up to date as possible.

To achieve the best possible quality Frida Food Data is maintained in cooperation with industry associations and retail companies, Nordic and international colleagues, and not least the Danish Veterinary and Food Administration. Team Frida may be reached at

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1.1 Copyright

The National Food Institute publishes data on https://frida.fooddata.dk free of charge to all users.

All text and graphics on https://frida.fooddata.dk are protected by the Danish Copyright Act and the directive of the European Parliament and of the Council on copyright in the information society (EC Directive 2001/29 on Copyright in the Information Society of 22 May 2001).

Data and texts on https://frida.fooddata.dk may not be copied or otherwise reproduced without clear acknowledgement of source. Proposed source reference:

Long reference:

Frida Food Data (https://frida.fooddata.dk), version 5.0, June 2023, National Food Institute, Technical University of Denmark

Short reference:

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Version number and date will change as new versions of Frida Food Data are published.

1.2 Disclaimer

With this website, the DTU Food Institute intends to facilitate citizens' access to information about the nutrients in the food we eat. We strive to ensure that the information is as correct and up-to-date as possible. Any errors can be reported to fvdb@food.dtu.dk

It is clear that the food database will not be created by Danish efforts alone, and the financial costs for food analyzes alone are far too great, even seen over a long period of years. To a certain extent, data has therefore been obtained from other countries' food databases. Consequently, the National Food Institute cannot give guarantees about the accuracy, sequence, timeliness or completeness of the data.

The National Food Institute accepts no responsibility with regard to the data presented and the subsequent use of such data, including the use of software and links from other databases.

The information on this site is intended for general information only.

2. News and changes

Frida version 5.0 (June 2023) replaces Frida version 4.2 (June 2022). Frida version 5.0 differ from version 4.2 mainly by the addition of new foods and some older foods that have been retired or replaced.

2.1 Updated foodgroups

Reported projects on the analysis of nutrients in foods have provided data for updating the food groups mentioned in table 2.1. These projects are published as reports or scientific articles. The publications act as sources and references for data in Frida and are mentioned in the table with SourceID. The updated foods are listed in Appendix E which has a food update history since 2018.

Table 2.1: Food groups with new/updated foods

Parent Food Group	Food Group	GroupID	SourceID
Alternativer til animalske fødevarer	Plant-based beverages	168	2182
Fruit, berries and their products	Pome fruit	49	2179
Fruit, berries and their products	Stone fruit	50	2179
Fruit, berries and their products	Soft fruit*	51	2179
Fruit, berries and their products	Tropical or subtropical fruit	52	2179
Vegetables and vegetable products	Frozen vegetables	193	2183
Fruit, berries and their products	Frozen fruits and berries	192	2183
Legumes and legume products	Dried pulses	173	2184
Legumes and legume products	Frozen legumes	172	2184
Legumes and legume products	Canned legumes	174	2184
Legumes and legume products	Prepared legumes	191	2184
Vegetables and vegetable products	Root and tuber vegetables	39	2127
Vegetables and vegetable products	Leaf and stem vegetables	40	2127
Vegetables and vegetable products	Mushrooms	43	2127

SourceID 2179: Nutrient content in fruits. DTU National Food Institute, June 2023
https://www.food.dtu.dk/-/media/institutter/foedevareinstituttet/publikationer/pub-2023/rapport-naeringsstofindhold-i-frugter.pdf
SourceID 2182: Nutrient content in plant-based beverages. DTU National Food Institute, December 2022
https://www.food.dtu.dk/english/-/media/institutter/foedevareinstituttet/publikationer/pub-2023/rapport-om-plantedrikke-final_221205.pdf
SourceID 2183: Nutrient content in frozen fruits and vegetables. DTU National Food Institute, June 2023
https://www.food.dtu.dk/-/media/institutter/foedevareinstituttet/publikationer/pub-2023/rapport-naeringsstofindhold-i-frosne-frugter-og-groentsager.pdf
SourceID 2184: Nutrient content in legumes. DTU National Food Institute, June 2023
Awaiting publication
* Aronia berries imported from the Swedish food database, analyzed in 2010

2.2 New parameters

In the Danish Food Composition Database, nutrients (components) are referred to as parameters. The updated parameters are listed in Appendix F which has a parameter update history since 2018. A new fatty acid parameter has been added with this version.

3. Database structure

3.1 Foods

Food data must reflect the Danish food supply, and the database is continuously optimized to reflect the marked. The names of the foods are given in Danish and English, and where possible the scientific binomial name is also given. In addition, there are synonyms and different spellings where relevant.

The foods are divided into parent food groups and subgroups. The grouping is continuously added/changed to keep the database up to date. The grouping for the current version of Frida can be seen in the sheet "FoodGroup" in the spreadsheet that can be downloaded from Frida: https://frida.fooddata.dk/data

3.2 Food tables

Data is presented in tables with the nutrients divided into:

- Macronutrients
- Vitamins
- Minerals and inorganic
- Organic acids
- Biogenic amines
- Carbohydrates
- Saturated fatty acids
- Monounsaturated fatty acids
- Polyunsaturated fatty acids
- Fatty acids sums
- Sterols
- Amino acids
- Factors etc.

In the food tables, only data lines that contain data are shown. This means that a different number of data lines are displayed for the different foods, depending on how many ingredients there is data for. Data for the ingredients are given in 7 columns:

- Name of nutrient
- Unit per 100 grams of edible food
- Content (average value of all determinations)
- Median
- Variation (minimum and maximum values)
- Number of determinations (number of values that make up the average)
- Source/Reference
- % - the weight of the fatty acid as % of the total fatty acid content (for fatty acids only)

3.3 Nutrient content

In food composition databases, the nutrients are referred to as components or parameters in Danish. These have an associated ParameterID. The parameters in the current version of Frida can be seen in the "Parameter" sheet in the spreadsheet that can be downloaded from Frida: https://frida.fooddata.dk/data

Parameters for energy are given as integers. Parameters for macronutrients and shrinkage are given with a decimal, while remaining parameters are given with 3 digits.

All content values are specified per 100 grams edible part of the product. The stated content will normally be based on annual averages, unless otherwise stated in the name of the food.

The values in Food Data are indicated with a varying number of digits, depending on the nutrient and food.

Food data must reflect the Danish food supply as best as possible. The database must be continuously updated to maintain quality, and this is done in collaboration with the food industry and food retailers as well as with Nordic and international colleagues who work with food tables and with the Danish Veterinary and Food Administration.

The nutrient contents in Food data come from:

- Analyzes of Danish foods that have been analyzed at accredited laboratories
- Borrowed values from other countries' databases, industry and commerce.
- Estimated values: Where no analytical data is available, data may in some cases be transferred from foods similar to the actual food, or data may be calculated on the basis of different analytical data

A 0 (zero) in the content column means either that the natural content of the substance in question is zero or that there are traces of the substance, but that the amount is so small that it has no significance. For a given food, the theoretical value of the sum of the macronutrients (protein, available carbohydrate, dietary fiber, fat, alcohol, ash and water) will always give exactly 100 g/100 g of food. This will also apply where carbohydrate is calculated by difference based on analyzed values. For some foods, this can in certain cases lead to a negative value for carbohydrate. In order to avoid a negative carbohydrate content, the protein content is adjusted so that the calculated sum is exactly 100. This applies to a large extent to fish and meat products.

3.4 Median, variation and number of determinations

Where analysis has been carried out on each individual sample collected, the range of variation is indicated by the minimum and maximum values found.

In cases where the source shows the standard deviation of the variation of the sample results, the range of variation is shown as the mean +/- 2 standard deviations.

The aim is to use data where the number of determinations is stated. For data borrowed from the USDA, the number of samples can be 0, indicating that it is a value the USDA has calculated.

3.5 Sources and references

For each entry the source is indicated by a number in the column (SourceID). This number refers to the references on which Frida Food Data is based. By clicking on the number the source of the information in the particular data row is displayed. In case there are several sources, all sources will be shown.

Source references starting with a T (e.g. T115) indicate that the data are taken from a food with the stated number as FoodID (in this case, FoodID 115: Tea, ready to drink).

SourceID 1655 indicates that the value of the substance is either zero or that there are only insignificant traces of the substance.

SourceID 1003 indicates that the value was calculated.

3.6 Food waste

Information about how much of a food is wasted is given in the table under "Factors" as a percentage of the original product. The source value is indicated, if available. The waste percentages are indicative only.

Waste is the parts of a food that you normally do not eat, e.g. bones, heads, tails, fish fins and guts as well as the stalk and bad parts of an apple.

If there is a source value to the right of the text box “Waste”, the waste was calculated with a well- described method and documented in the reference material.

For foods in sauce, such as curry herring and mackerel in tomato, you will typically be able to eat the sauce, which is why the sauce is included in the edible part of the product. For other foods like marinated herring, mackerel in water and pickled cucumber, the brine is drained before analysis, as the brine is not normally eaten with it.

4. Basic information

4.1 Energy

The energy content is given in the units kJ (kilojoules) and kcal (kilocalories) per 100 grams and is calculated based on the food's content of alcohol, fat, dietary fibre, carbohydrates, organic acids, proteins and sugar alcohols with the factors listed in Table 4.1a. They are based on EU Regulation No. 1169/201 [SourceID 2154].

Table 4.1a: Factors for calculating Energy.

ParameterID	Parameter Name	Factor/kcal	Factor/KJ
19	Alcohol	7	29
141	Fat	9	37
168	Dietary fiber	2	8
172*	Available carbohydrate	4	17
208	Sum organic acids	3	13
218*	Protein	4	17
244	Sum sugar alcohols	2,4	10

*Energy labelling is calculated with the same parameters and factors except for protein and available carbohydrate where Protein labelling (ParameterID 318) and available carbohydrate labelling (ParameterID 317) is used, respectively.

The macronutrients available carbohydrate and protein are calculated in different ways (scientific and declaration), see sections 4.2 and 4.3. Since the energy calculation depends on this, there will be two figures for energy in kJ; "Energy, kJ" and "Energy, declaration, kJ" and analogously for energy in kcal; Energy, kcal" and "Energy, declaration, kcal" (Table 4.1b):

Table 4.1b: Parameters for Energy.

ParameterID	Parameter Name	Unit
137	Energy (kJ)	Kilojoules
356	Energy (kcal)	Kilocalories
316	Energy, labelling (kJ)	Kilojoules
359	Energy, labelling (kcal)	Kilocalories

4.2 Carbohydrates

Carbohydrates are compounds made up of sugar molecules, which include sugars, starches and dietary fibres. There are two general principles for calculating carbohydrate

- Carbohydrate determined by difference
- Carbohydrate determined by addition

Ved differencemetoden beregnes kulhydrat som det der er tilbage når man fra tørstof har fratrukket alle de andre makronæringsstoffer. Ved additionsmetoden beregnes kulhydrat som summen af de enkelte kulhydrater.

A further distinction is made between total carbohydrate and available carbohydrate. Available carbohydrate is the amount of carbohydrates that humans can digest, i.e. sugars and starch. Dietary fiber cannot be digested by the human organism, but is partially fermented by intestinal flora. Table 4.2 describes the calculated carbohydrate fractions in Frida.

Table 4.2: Calculated carbohydrate parameters in Frida

ParameterID	Name	Explanation
173*	Total carbohydrate	dry matter - (protein + fat + ash)
172*	Available carbohydrate	dry matter - (protein + fat + ash + dietary fiber)
318**	Available carbohydrate labelling	sugars + starch
243	Starch	Includes starch, dextrins and glycogen, but not resistant starch
168	Dietary fibre	Oligo - and polysaccharides of vegetable origin that are not broken down by human digestive enzymes
245	Sum sugars	The sum of mono and di-saccharides
417	Added sugar	Sugars added to the food
418	Free sugars	Natural and added sugars
191	Sum monosaccharides	Fructose + Galactose + Glucose
18	Sum disaccharides	Lactose + Maltose + Sucrose
29	Other sugars	Other sugars not measured separately

*If carbohydrate calculated by difference is negative, then the value is corrected to zero. This is common for fish, meat and other foods that contain large amounts of nitrogen that are not part of protein. Calculated from Protein [ParameterID 218].
**Available carbohydrate labelling is calculated according to the Regulation of the European Parliament and of the Council [SourceID 2154]. If data for sugars and starch are not available, the Available carbohydrate labelling is calculated analogously to [ParameterID 172] Available carbohydrate, but with Protein labellingn [ParameterID 317].

New Danish dietary fiber data from and including 2018 is based on AOAC 2011.25 where dietary fiber is calculated as the sum of the three fractions of dietary fiber: Insoluble dietary fiber [ParameterID 414]; High molecular weight soluble dietary fiber [ParameterID 415]; Low molecular weight soluble dietary fiber [ParameterID 416].

Older Danish dietary fiber values are based on AOAC 985.29 (1990). Most dietary fiber values are determined by this method.

Older English dietary fiber values are traditionally based on the Southgate method, which usually gives slightly higher values than AOAC 985.29, while newer values are based on the Englyst and AOAC methods. Older US values are based on the 'crude fiber' method, which gives slightly lower values than AOAC figures, while newer US figures are based on AOAC 985.29.

4.3 Protein

Protein content may be calculated from analyzed values for total nitrogen (nitrogen). Protein for scientific use(ParameterID 218) is calculated by multiplying the nitrogen content by a conversion factor (NCF, Nitrogen Conversion Factor, ParameterID 219), which depends on the protein composition and thus on the individual food. This method tends to overestimate protein content for product groups such as fish and meat. For this calculation, the factors in table 4.3a have been used, unless another factor is specified for the individual food. In Frida, the factor is listed in the table "Factors etc". Protein for use on food labels (ParameterID 317) must be calculated from the nitrogen content with a fixed factor of 6.25. Table 4.3b shows the formulas used for calculating parameters for protein.

Table 4.3a: Nitrogen-to-protein conversion factors (NCF)*

Protein source	Factor	Protein source	Factor	Protein source	Factor
Animal origin:		***Legumes:***		***Nuts:***	
Egg	6.25	Adzuki	6.25	Almonds	5.18
Gelatin	5.55	Castor	5.3	Brazil nuts	5.46
Meat	6.25	Jack	6.25	Butternuts	5.3
Milk	6.38	Lima	6.25	Cashews	5.3
Grains and cereals:		Mung	6.25	Chestnuts	5.3
Barley	5.83	Navy	6.25	Coconuts	5.3
Corn	6.25	Soy	5.71	Hazelnuts	5.3
Millet	5.83	Velvet	6.25	Hickory nuts	5.3
Oats	5.83	Peanuts	5.46	Pecans	5.3
Rice	5.95	***Kernels/seeds:***		Pine nuts	5.3
Rye	5.83	Melon seeds	5.3	Pistachios	5.3
Sorghum	6.25	Cottonseed	5.3	Walnuts	5.3
Wheat:		Linseed	5.3	***Other foods:***	
Whole kernels	5.83	Hemp seeds	5.3	General factor	6.25
Bran	6.31	Pumpkin	5.3		
Embryo	5.8	Sesame seeds	5.3		
Endosperm	5.7	Sunflower seeds	5.3		

*__SourceID 1267__: Jones, D.B.: Factors for Converting Percentages of Nitrogen in Foods and Feeds into Percentages of Protein. United States Department of Agriculture, Circular No. 183. Slightly revised edition 1941.

If the content of the individual amino acids is measured, protein can be calculated from the sum of these, corrected for the loss of water from polymerization. From 2018, amino acids are measured for all foods containing protein. From Frida version 4.1, a parameter "Protein from Amino acids" (ParameterID 420) is therefore included.

Table 4.3b: Parameters for protein content and formulas for calculating these.

ParameterID	Parameter Name	Formula
218	Protein	NCF*Nitrogen, NCF variabel
317	Protein, labelling	NCF*Nitrogen, NCF=6,25
420	Protein from amino acids	ΣAA_n - 18*$\Sigma AA_n/MW_n$, AA_n=Amino acid n, MW_n=Molecular weight Amino acid n

4.4 Amino acids

From 2018, amino acids are measured for all foods containing protein. 20 amino acids are analyzed which are listed in table 4.4 with ParameterID . 17 of these are standard amino acids. The standard amino acids asparagine , glutamine and cysteine are not analyzed . Asparagine and glutamine are converted into aspartic acid and glutamic acid during the sample treatment. ParameterID 34 aspartic acid is therefore the sum of asparagine and aspartic acid . Analogously, ParameterID 150 glutamic acid is the sum of glutamine and glutamic acid . During the sample treatment, two moles of cysteine are converted into one mole of cystine, which is a dimer of cysteine connected via a sulfur bridge. Cystine content is in practice equivalent to the cysteine content, as the difference in the weight of cystine and cysteine is 0.8%

Hydroxyproline is a non-standard amino acid which is mainly found in structural proteins in connective tissue. Ornithine is another non-standard amino acid which is not incorporated into protein, but is part of the urea cycle.

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Table 4.4: Naturally occurring amino acids in foods.

ParameterID	Parameter Name	Standard
17	Alanine	Ja
31	Arginine	Ja
34	Aspartic acid	Ja
150	Glutamic acid	Ja
153	Glycine	Ja
159	Histidine	Ja
161	Isoleucine	Ja
180	Leucine	Ja
183	Lysine	Ja
189	Methionine	Ja
211	Phenylalanine	Ja
216	Proline	Ja
231	Serine	Ja
258	Threonine	Ja
262	Tryptophan	Ja
264	Tyrosine	Ja
266	Valine	Ja
X	Asparagine	Ja
X	Glutamine	Ja
X	Cysteine	Ja
400	Hydroxyproline	Nej
423	Ornithine	Nej
124	Cystine	Nej

4.5 Fat and fatty acids

The total fat content is the sum of triglycerides, phospholipids, sterols and a smaller proportion of other fat-soluble substances that are extracted in the fat fraction. Individual fatty acids are analyzed, which are divided

into the categories saturated, monounsaturated and polyunsaturated. Sums are calculated for the fatty acid categories as well as for omega-3 and omega-6 fatty acids. Appendix A list the fatty acid parameters and the sums to which they contribute (under category).

A fatty acid conversion factor (FCF) is given, which is experimentally determined based on the analyzed fat and fatty acid content. FCF is the content of fatty acids in the fat fraction. FCF depends on the food and table 4 shows the theoretical maximum fatty acid conversion factors for a number of foods. This conversion factor may be used when converting from total fat to the total fatty acid content. As a general rule, the factors shown in table 4.5 can be used.

Table 4.5: Fatty acid conversion factors*

Food	Factor	Food	Factor
Wheat, barley and rye:		***Pork:***	
- Whole kernels of wheat, barley, rye	0.72	- lean	0.91
- Flour from wheat, barley, rye	0.67	- fat	0.953
- Bran from wheat, barley, rye	0.82	Poultry	0.945
- Oats, whole kernels	0.94	***Guts:***	
- Rice, polished	0.85	- Hearts	0.789
Vegetables and fruit:	0.8	- Kidneys	0.747
- Avocado	0.956	- Liver	0.741
- Nuts	0.956	***Fish***	
Fats and oils:		- lean	0.7
- all except coconut oil	0.956	- fat	0.9
- coconut oil	0.942	***Other foods***	0.8
Beef and lamb:		Milk and milk products	0.945
- lean	0.916	Egg	0.83
- fat	0.953		

*__SourceID 1344:__ Paul, A.A. & Southgate, D.A.T. 1978. McCance and Widdowson's The composition of foods. 4th edition. London, Her Majesty's Stationery Office.

These conversion factors should be considered as indicative values. The fatty acids are stated as g/100 g edible part, as well as in percentage of the total fatty acid quantity (g fatty acid/100 g total fatty acid).

4.6 Sterols

Only cholesterol is analysed, although other sterols are found in both meat and plant-based foods.

4.7 Alcohol

The values for alcohol (ethanol) are given with the unit g/100 g. Note that this unit is different from volume percentage (vol. %) which is usually used on food packaging, and the value in vol. % is typically quite a bit higher than in the unit g/100 g. As pure alcohol has a density of 789 g/l, vol % can be converted to weight % according to the formula below, where density is the density of the food. For most alcoholic beverages the density will be close to one.

$$\text{Weight\%} = \text{Volume\%} \times 0.789 / \text{density}$$

4.8 Dry matter and water

Dry matter is the total amount of ingredients in a food exclusive of water. Dry matter is measured by (freeze) drying a sample to constant weight. Water is calculated based on the analysis value for dry matter using the formula below. Water does not contribute energy, but is nevertheless an important nutrient as it acts as the organism's solvent. It should be noted that a change in water content by e.g. evaporation can cause significant changes in the content of other nutrients in the food.

Water = 100 – Dry matter

4.9 Ash and minerals

Ash is the part of the food that remains after ashing, where all organic material is destroyed. Ash is the total mineral content and consists mainly of oxides, phosphates and sulphates of metals. The individual minerals are micronutrients, while ash is listed under macronutrients.

4.10 Organic acids

Organic acids are energy-containing nutrients. The energy content varies quite a bit. Typically, aliphatic acids have an energy content slightly less than sugar, while for aromatic acids it is often close to zero. Organic acids, total is calculated from the sum of the individual aliphatic organic acids L-lactic acid, D-lactic acid, citric acid, oxalic acid, malic acid, acetic acid, fumaric acid, sorbic acid and propionic acid.

4.11 Sugar alcohols

Sugar alcohols are energy-containing carbohydrates, but less energy-rich than sugar (see the section on energy). They may occur both naturally and as added sweeteners. Sweets and confectionery products in particular can be high in content. A sum of sugar alcohols is calculated from the individual sugar alcohols glycerol, sorbitol, mannitol, inositol, xylitol, maltitol, isomalt, 6-O-a-D-Glucopyranosyl-D-glucitol and 1-O-a-D-Glucopyranosyl-D-Mannitol.

4.12 Biogenic amines

The components histamine, tyramine, phenylethylamine, putrescine, cadaverine, spermine, spermidine and serotonin are called biogenic amines. They are natural substances that are not nutrients, but can still be of interest in some cases. The substances can cause unpleasant reactions in certain sensitive people. If a food spoils, the content of biogenic amines may increase dramatically.

5. Vitamins

In general, data for vitamins follow the standard and recommendations stated in the Nordic Nutrition Recommendations from 2012 [SourceID 2149]. Vitamers are compounds with vitamin activity. The content

of a given vitamin is a weighted sum of its vitamers. Some vitamers are more active than others and this is accounted for by the weighting factor. In most cases this factor is 1 and not shown in the formula. Vitamers are structurally related and may be interconverted by biochemical pathways. The structure, formula and molecular weight of vitamers are given in appendix B. Vitamin content is usually calculated or measured as the equivalent of the parent of its main vitamer, i.e. without salts. In the case where salts or counterions are included these are mentioned in this section together with the molecular weight.

5.1 Vitamin A

For vitamin A, values are given for retinol and ß-carotene. The total vitamin A activity is calculated in the unit retinol equivalents (RE) with a β-carotene factor of 1/12 (Table 5.1):

Table 5.1: Parameters for calculating Vitamin A content.

ParameterID	Parameter Name	Type	Derivation	Formula/Contribution
12	Vitamin A	Vitamin	Calculated	Retinol + β-carotene/12
225	Retinol	Vitamer	Measured	Contributes to Vitamin A calculation
303	β-carotene	Vitamer	Measured	Contributes to Vitamin A calculation

When converting from international units (IU), the following calculation is used

1 IU retinol = 0,3 µg retinol.

5.2 Vitamin D

For vitamin D, values for vitamin D_3, vitamin D_2, 25-hydroxyvitamin D_3 and 25-hydroxyvitamin D_2 are given, if these are available. There is no consensus on how the total vitamin D activity is calculated from the individual active vitamin D components. As of Frida v4.1, the factors for 25-hydroxy vitamin D_2 and 25-hydroxy vitamin D_3 have changed from 5 to 1 (Table 5.2):

Table 5.2: Parameters for calculating Vitamin D content.

ParameterID	Parameter Name	Type	Derivation	Formula/Contribution
126	Vitamin D	Vitamin	Calculated	Sum of all vitamers with factor 1
127	Vitamin D_2	Vitamer	Measured	Contributes to Vitamin D calculation
128	Vitamin D_3	Vitamer	Measured	Contributes to Vitamin D calculation
354	25-hydroxy Vitamin D_2	Vitamer	Measured	Contributes to Vitamin D calculation
11	25-hydroxy Vitamin D_3	Vitamer	Measured	Contributes to Vitamin D calculation

When converting from international units (IU) the following conversion factor is used

1 IU vitamin D = 0,025 µg vitamin D

5.3 Vitamin E

There is no consensus on how the total vitamin E activity is calculated from the individual vitamers. α-tocopherol is the main form of vitamin E, but the other tocopherols and tocotrienols may have some albeit much reduced vitamin E activity. While we analyse for all tocopherols and tocotrienols, only the content of α-tocopherol contributes to the total vitamin E content (Table 5.3):

Table 5.3: Vitamin E content and Vitamin E vitamers.

ParameterID	Parameter Name	Type	Derivation	Formula/Contribution
135	Vitamin E	Vitamin	Calculated	α-tocopherol
276	α-tocopherol	Vitamer	Measured	Contributes to Vitamin E calculation
279	β-tocopherol	Vitamer	Measured	No contribution to Vitamin E calculation
286	γ-tocopherol	Vitamer	Measured	No contribution to Vitamin E calculation
282	δ-tocopherol	Vitamer	Measured	No contribution to Vitamin E calculation
277	α-tocotrienol	Vitamer	Measured	No contribution to Vitamin E calculation
280	β-tocotrienol	Vitamer	Measured	No contribution to Vitamin E calculation
287	γ-tocotrienol	Vitamer	Measured	No contribution to Vitamin E calculation
283	δ-tocotrienol	Vitamer	Measured	No contribution to Vitamin E calculation

5.4 Vitamin K

For vitamin K, only values are given for phylloquinone (vitamin K_1). We point out that the other vitamers menaquinones (vitamin K_2) and menadione (vitamin K_3) also have vitamin K activity. Work is ongoing for an assay to measure the other vitamers.

Table 5.4: Parameters for determining Vitamin K content.

ParameterID	Parameter Name	Type	Derivation	Formula/Contribution
-	Vitamin K	Vitamin	Not calculated	
164	Phylloquinone	Vitamer K_1	Measured	Given as Vitamin K_1
-	Menaquinones	Vitamer K_2	Not measured	
-	Menadione	Vitamer K_3	Not measured	

5.5 Vitamin B_1

Vitamin B_1 activity is derived from the vitamers thiamine and 2-(1-hydroxyethyl)thiamine as well as phosphate esters thereof.. Vitamin B_1 is expressed as thiamine chloride (molecular weight 300.81). The B_1 vitamers are not measured separaetely.

Table 5.5: Parameters for determining Vitamin B_1 content.

ParameterID	Parameter Name	Type	Derivation	Formula/Contribution
37	Vitamin B_1	Vitamin	Measured	Thiamin + 2-(1-EtOH)-thiamin
37	Thiamin	Vitamer	Not measured	
157	2-(1-EtOH)-thiamin	Vitamer	Not measured	

5.6 Niacin

Nicotinic acid, nicotinamide and tryptophan contributes to niacin activity. The content of niacin is the sum of nicotinamide and nicotinic acid which is measured in the same assay. Niacin is expressed as nicotinic acid equivalent (molecular weight 123.11). Niacin activity is given in niacin equivalents (NE):

Table 5.6: Parameters for calculating Niacin content.

ParameterID	Parameter Name	Type	Derivation	Formula/Contribution
203	Niacin equivalent	Vitamin	Calculated	Niacin + Tryptophan/60
294	Niacin	Vitamer	Measured	Contributes to Niacin equivalent calculation
262	Tryptophan	Vitamer	Measured	Contributes to Niacin equivalent calculation

When calculating niacin activity in cereals and cereal products, only the contribution of tryptophan is included, as niacin in these products is probably not available.

5.7 Vitamin B_6

The vitamin B6 activity i.e. pyridoxine, pyridoxal and pyridoxamine and their phosphate esters are expressed as pyridoxine, and calculated as pyridoxine hydrochloride (molecular weight 205.64). The vitamers are measured in the same assay.

Table 5.7: Parameters for determining Vitamin B_6 content.

ParameterID	Parameter Name	Type	Derivation	Formula/Contribution
40	Vitamin B_6	Vitamin	Measured	Pyridoxine + Pyridoxal + Pyridoxamine
298	Pyridoxine	Vitamer	Not measured	
296	Pyridoxal	Vitamer	Not measured	
297	Pyridoxamine	Vitamer	Not measured	

5.8 Pantothenic acid

Pantothenic acid is also known as vitamin B_5. This vitamin only has one vitamer so the vitamin content is the pantothenic acid content.

5.9 Biotin

Biotin is also known as vitamin B_7. This vitamin only has one vitamer so the vitamin content is the biotin content.

5.10 Folate

Folate is also known as vitamin B_9. Content of folate is given as folic acid equivalent. The assay measures all folate active substances.

5.11 Vitamin B_{12}

Vitamin B_{12} is naturally occurring as methyl-, hydroxyl-, and 5'-deoxyadenosyl cobalamin. Cyanocobalamin is synthetic and bioconverted to one of its naturally occurring forms when ingested. The vitamin B_{12} activity is given as cyanocobalamin equivalent (molecular weight 1355.38). The assay measures the sum of all B_{12} vitamers.

Table 5.11: Parameters for determining Vitamin B_{12} content.

ParameterID	Parameter Name	Type	Derivation	Formula/Contribution
38	Vitamin B_{12}	Vitamin	Measured	Sum of B_{12} vitamers
-	Cyanocobalamin	Vitamer	Not measured	
-	Methylcobalamin	Vitamer	Not measured	
-	Hydroxycobalamin	Vitamer	Not measured	
-	5'-deoxyadenosylcobalamin	Vitamer	Not measured	

5.12 Vitamin C

Vitamin C is expressed as the sum of the vitamers ascorbic acid and dehydroascorbic acid. Dehydroascorbic acid is usually the minor component of vitamin C. Vitamin C is given as ascorbic acid equivalent. Our current assay measure both vitamers. Prior to 2018 the vitamers were measured separately and the vitamin C content were calculated as the sum of both vitamers with weighting factor 1.

Table 5.12: Parameters for determining Vitamin C content.

ParameterID	Parameter Name	Type	Derivation	Formula/Contribution
47	Vitamin C	Vitamin	Measured	Ascorbic acid + Dehydroascorbic acid
175	Ascorbic acid	Vitamer	Not measured	
177	Dehydroascorbic acid	Vitamer	Not measured	

6. Assumptions and calculations

From 2018 all vitamins, minerals, amino acids and fatty acids are measured where relevant. Previously some of these were calculated for certain food groups and these calculated data will be shown for foods that have not recently been updated. For these foods, there is a direct correlation between the content of two or more substances. The relationship between the fat content and fat-soluble vitamins in milk products is used to calculate the content of the fat-soluble vitamins (see Table 6.1.1). Similar correlations have been used for the cholesterol content in dairy products and meat products.

6.1 Milk and milk products

6.1.1 Values for fat-soluble vitamins in dairy products

The content of fat-soluble vitamins (retinol, β-carotene, vitamin D and vitamin E) in dairy products is calculated on the basis of the products' milk fat content, as the content of fat-soluble vitamins follows the products' milk fat content, and the processing of the individual products does not give rise to demonstrable loss of these vitamins.

It should be noted that the content of fat-soluble vitamins in milk fat shows a distinct seasonal variation. However, only annual averages are shown in the tables. When calculating the content of fat-soluble vitamins in milk products, the values in table 6.1.1 are used.

Table 6.1.1: Calculation of the content of fat-soluble vitamins.

Vitamin	Unit	Calculated as
Retinol	µg/100g	Fat (g/100g) × 8.5 (µg retinol/g fat)
β-carotene	µg/100g	Fat (g/100g) × 4.4 (µg β-carotene/g fat)
Vitamin D	µg/100g	Fat (g/100g) × 0.0086 (µg vitamin D/g fat) + Water (g/100g) × 0.0008 (µg vitamin D/g water)
Vitamin E	α-TE	Fat (g/100g) × 0.0255 (mg α-tocopherol/g fat)

6.1.2 The content of fatty acids in dairy products

The fatty acid content is calculated in a similar way for the milk products where specific analysis results are missing. The fatty acid content is assumed to show a constant and equal distribution.

This assumption of a constant fatty acid distribution is not entirely correct, as the fatty acid content shows a clear seasonal variation depending on feed and breed of cattle.

Table 6.1.2 shows the average values used in the calculation of fatty acid content in the dairy products (The values come from SourceID 1227)

Table 6.1.2: Average fatty acid distribution in milk fat per 100g milk fat

Fedtsyre	Fedtsyreindhold (g)
C 4:0	3,4
C 6:0	2,2
C 8:0	1,4
C 10:0	3,1
C 12:0	3,9
C 14:0	11
C 16:0	29,6
C 18:0	10,1
C 14:1	1,4
C 16:1	2,2
C 18:1	22,2
C 18:2	2,1

C 18:3	0,8
C 20:1	1,2

6.1.3 The content of cholesterol in dairy products

The content of cholesterol in milk products also correlates with the content of milk fat, although the production method must be taken into account. Products that have undergone separation (skimmed milk) thus contain a proportionally greater amount of cholesterol than 'unseparated' products. On the basis of studies carried out in the USA (SourceID 1342), the following correlation has been found between the content of milk fat and cholesterol in milk products:

Cholesterol = 3.24 * Fat + 2

where the unit for cholesterol is mg/100g and for fat is g/100g.

6.2 Cereals and cereal products

6.2.1 Niacin in cereals and cereal products

For cereals, the niacin equivalent value is calculated based on the tryptophan content alone, as niacin is considered not bioavailable in this group of foods due to binding of the niacin present.

6.3 Meat and meat products

6.3.1 General comments

For raw cuts of meat, there is a direct correlation between the macronutrients and the content of vitamins and minerals/trace elements. The following describes how the values are calculated.

6.3.2 Cholesterol content in meat and meat products

For the pure cuts of meat, there is a direct correlation between the content of protein, fat and cholesterol. The cholesterol content of these cuts of meat can therefore be calculated on the basis of the content of fat and protein.

Where there are no specific measured values, the cholesterol content is calculated on the basis of the formula below (SourceID 1342).

Cholesterol = Protein * Factor + Fat

where the factor is 2.6 for pork, 2.65 for beef and 3.25 for lamb and sheep. The unit for cholesterol is mg/100g and for fat and protein it is g/100g.

6.3.3 Vitamin D content in meat and meat products

For cuts of meat, the vitamin D content is found to correlate with the fat content. The calculation method is based on analysis results of similar beef and pork meat samples (derived from SourceID 1300). Where there are no measured values, the content of vitamin D is calculated:

- Beef: Vitamin D [µg/100g] = Fat [g/100g] * 0,0207 + 0,3108
- Pork: Vitamin D3 [µg/100g] = Fat [g/100g] * 0,0056 + 0,0541
- Pork: 25-hydroxy vitamin D3 [µg/100g] = Fat [g/100g] * 0,0013 + 0,0812

6.3.4 Information on meat cuts

The type of meat cuts on the market varies over time depending on consumer demands, trade, tradition etc.). Over the past several decades there has been a trend towads decreased fat-content of meat cuts, especially for pork. This may change the nutrient content of fat and fat soluble micronutrients. The names of the meat cuts may also change over time.

When using data for cuts of meat, you should be aware that the fat content of the product in question corresponds to the stated fat content in food data. If, for example, a specific product is judged to be leaner than stated in the food data, the information for another similar meat product with a lower fat content, corresponding to the specific cut may be used for nutrient calculations.

7. Sources and references

SourceID 1227: Steen, K.: Seasonal variations in the composition of Danish butterfat. Mælkeritidende, Vol. 87 (1974) p569-580.

SourceID 1267: Jones, D.B.: Factors for Converting Percentages of Nitrogen in Foods and Feeds into Percentages of Protein. United States Department of Agriculture, Circular No. 183. (1941) Revised edition 1941.

SourceID 1300: Jakobsen, J; Saxholt, E.: Calculating vitamin D in meat products from the fat content using a linear regression. Danish Veterinary and Food Administration (2003).

SourceID 1342: Watt, B.K.: USDA Table for Standard Reference. US Government Printing Office (1976)

SourceID 1344: Paul, A.A.; Southgate, D.A.T.: McCance and Widdowson's The composition of foods. 4th edition. (1978) London, Her Majesty's Stationery Office.

SourceID 2026: Charrondiere, U.R.; Haytowitz, D.; Stadlmayr, B.: FAO/INFOODS Density Database Version 2.0, 2012. http://www.fao.org/3/ap815e/ap815e.pdf

SourceID 2133: Wanselius, J.; Axelsson, C.; Moraeus, L.; Berg, C.; Mattisson, I.; Larsson, C.: Procedure to Estimate Added and Free Sugars in Food Items from the Swedish Food Composition Database Used in the National Dietary Survey Riksmaten Adolescents 2016-17. Nutrients, Vol. 11 (2019) p1342, https://doi.org/10.3390/nu11061342

SourceID 2149: Nordic Nutrition Recommendations NNR 2012 - integrating nutrition and physical activity. Nordisk Råd (2014) ISBN 978-92-893-2670-4. https://www.norden.org/en/theme/nordic-nutrition-recommendation/nordic-nutrition-recommendations-2012

SourceID 2154: Regulation (EU) No 1169/2011 of the European Parliament and of the Council of 25 October 2011, https://eur-lex.europa.eu/eli/reg/2011/1169/oj

SourceID 2179: Jakobsen, J.; Danielsen, M.; Langwagen, M.; Poulsen, A.; Trolle, E.: Nutrient content in fruits. DTU National Food Institute, June 2023 https://www.food.dtu.dk/-/media/institutter/foedevareinstituttet/publikationer/pub-2023/rapport-naeringsstofindhold-i-frugter.pdf

SourceID 2182: Jakobsen, J.; Danielsen, M.; Langwagen, M.; Švarc, P. L.; Poulsen, A.; Trolle, E.: Nutrient content in plant-based beverages. DTU National Food Institute, December 2022 https://www.food.dtu.dk/english/-/media/institutter/foedevareinstituttet/publikationer/pub-2023/rapport-om-plantedrikke-final_221205.pdf

SourceID 2183: Jakobsen, J.; Danielsen, M.; Poulsen, A.; Trolle, E.: Nutrient content in frozen fruits and vegetables. DTU National Food Institute, June 2023

https://www.food.dtu.dk/-/media/institutter/foedevareinstituttet/publikationer/pub-2023/rapport-naeringsstofindhold-i-frosne-frugter-og-groentsager.pdf

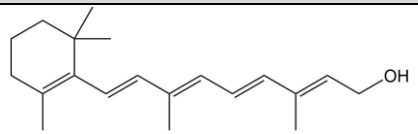
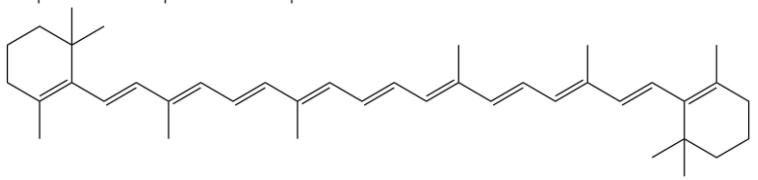
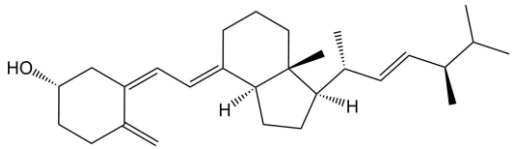
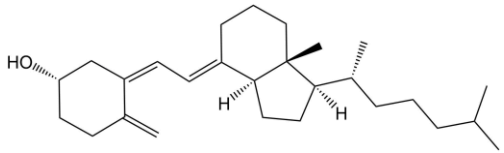
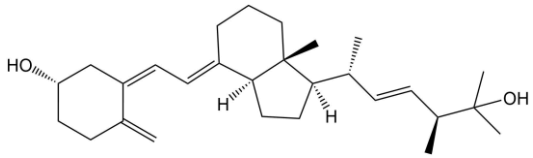
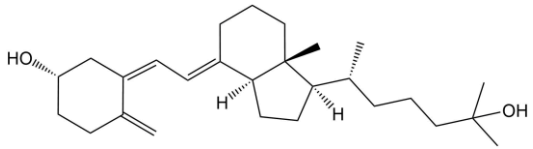
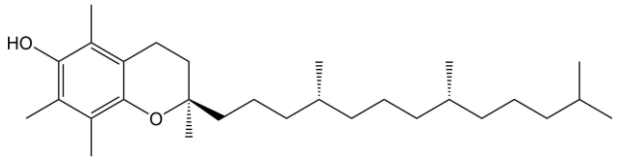
SourceID 2184: Jakobsen, J.; Danielsen, M.; Langwagen, M.; Poulsen, A.; Trolle, E.: Nutrient content in legumes. DTU National Food Institute, June 2023
Awaiting publication

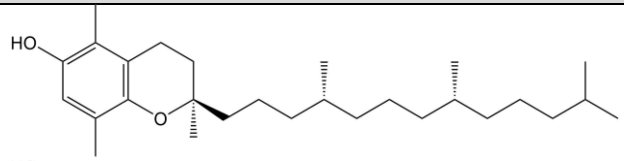
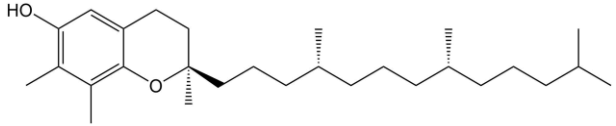
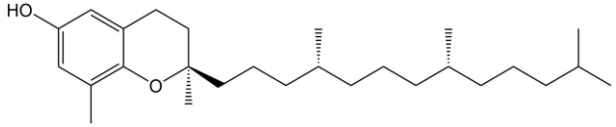
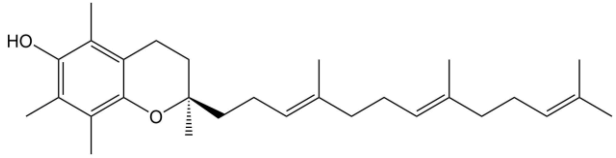
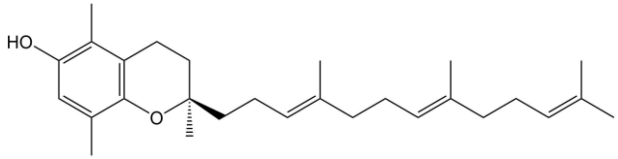
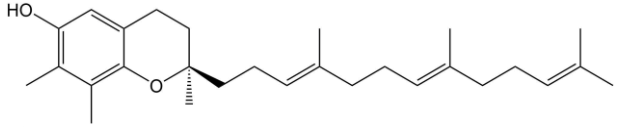
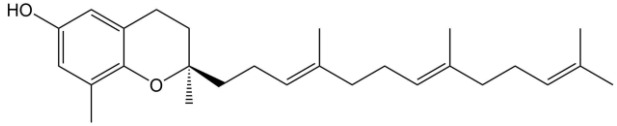
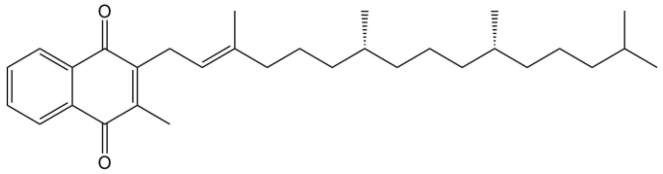
Appendix A - The fatty acids, their common and systematic names

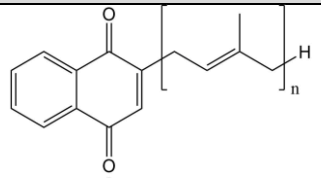
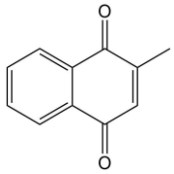
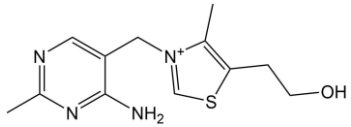
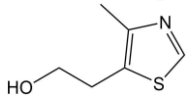
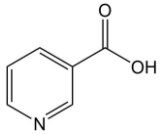
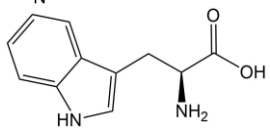
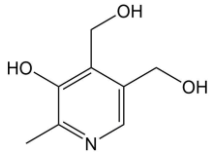
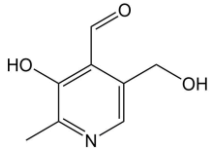
ParameterID	Parameter name	Common name	Abbreviation	Systematic name	Category
103	C4:0	Butyric acid		Butanoic acid	Saturated
104	C6:0	Caproic acid		Hexanoic acid	Saturated
105	C8:0	Caprylic acid		Octanoic acid	Saturated
48	C10:0	Capric acid		Decanoic acid	Saturated
49	C12:0	Lauric acid		Dodecanoic acid	Saturated
401	C12:1,n-1	Lauroleic acid		cis-11-Dodecenoic acid	Monounsaturated
50	C13:0	Tridecyl acid		Tridecylic acid	Saturated
51	C14:0	Myristic acid		Tetradecanoic acid	Saturated
52	C14:1,n-5	Myristoleic acid		cis-9-Tetradecenoic acid	Monounsaturated
53	C14:1,n-5,trans	Myristelaidic acid		trans-9-Tetradecenoic acid	Trans
56	C15:0	Pentadecyl acid		Pentadecanoic acid	Saturated
57	C15:1,n-5			Pentadecenoic acid	Monounsaturated
58	C16:0	Palmitic acid		Hexadecanoic acid	Saturated
59	C16:1,n-7	Palmitoleic acid		cis-9-Hexadecenoic acid	Monounsaturated
60	C16:1,n-7,trans	Palmitelaidic acid		trans-9-Hexadecenoic acid	Trans
63	C17:0	Margaric acid		Heptadecanoic acid	Saturated
64	C17:1,n-7			cis-10-Heptadecenoic acid	Monounsaturated
65	C18:0	Stearic acid		Octadecanoic acid	Saturated
66	C18:1,n-7	cis-Vaccine acid		cis-11-Octacenoic acid	Monounsaturated
67	C18:1,n-9	Oleic acid		cis-9-Octadecenoic acid	Monounsaturated
425	C18:1,n-12	Petroselinic acid		cis-6-Octadecenoic acid	Monounsaturated
70	C18:1, trans	Elaidic acid		trans-Octadecenoic acid	Trans
71	C18:2,n-6	Linoleic acid		cis-9,12-Octadecadienoic acid	Polyunsaturated; Ω-6
72	C18:2,conjugated	conjugated linoleic acid	CLA	Conjugated linoleic acids	Conjugated
73	C18:2, trans			trans-Octadecadienoic acids	Trans

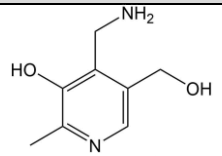
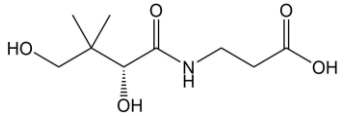
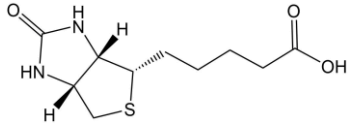
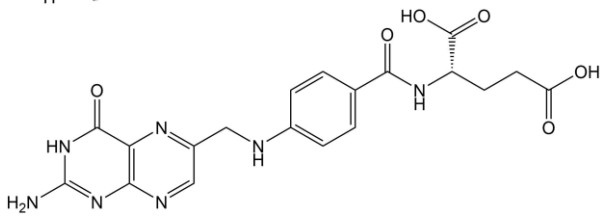
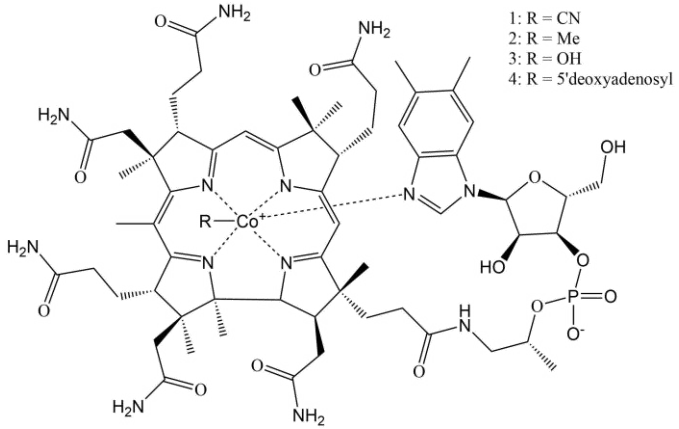
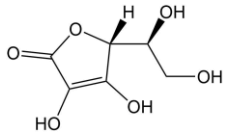
ParameterID	Parameter name	Common name	Abbreviation	Systematic name	Category
74	C18:3,n-3	α-Linolenic acid		cis-9,12,15-Octadecatrienoic acid	Polyunsaturated; Ω-3
75	C18:3,n-6	γ-Linolenic acid		cis-6,9,12-Octadecatrienoic acid	Polyunsaturated; Ω-6
76	C18:4,n-3	Steridonic acid		cis-6,9,12,15-Octadecatetraenoic acid	Polyunsaturated; Ω-3
77	C20:0	Arachinic acid		Eicosanoic acid	Saturated
347	C20:1,n-9	Gondoic acid		cis-11-Eicosenoic acid	Monounsaturated
78	C20:1,n-11	Gadoleic acid		cis-9-Eicosenoic acid	Monounsaturated
424	C20:1,n-15	Eicosenoic acid		cis-5-Eicosenoic acid	Monounsaturated
79	C20:1, trans	Transgondoic acid		trans-11-Eicosenoic acid	Trans
80	C20:2,n-6	Homo-gamma- linolenic acid		cis-11,14-Eicosadienoic acid	Polyunsaturated; Ω-6
82	C20:3,n-3	Dihomo-alpha-linolenic acid		cis-11,14,17-Eicosatrienoic acid	Polyunsaturated; Ω-3
85	C20:3,n-6	Dihomo -γ- linolenic acid	DGLA	cis-8,11,14-Eicosatrienoic acid	Polyunsaturated; Ω-6
349	C20:4,n-3	n-3 Arachidonic acid		cis-8,11,14,17-Eicosatetraenoic acid	Polyunsaturated; Ω-3
86	C20:4,n-6	arachidonic acid		cis 5,8,11,14-Eicosatetraenoic acid	Polyunsaturated; Ω-6
87	C20:5,n-3	timnodonic acid	EPA	cis-5,8,11,14,17-Eicosapentaenoic acid	Polyunsaturated; Ω-3
409	C21:0	Heneicosyl acid		Heneicosanoic acid	Saturated
428	C21:5,n-3			Heneicosapentaenoic acid	Polyunsaturated; Ω-3
89	C22:0	Behenic acid		Docosanoic acid	Saturated
92	C22:1,n-9	Erucic acid		cis-13-Docosenoic acid	Monounsaturated
90	C22:1,n-11	Cetoleic acid		cis-11-Docosenoic acid	Monounsaturated
93	C22:1, trans	Brassic acid		trans-13-Docosenoic acid	Trans
410	C22:2,n-6			cis-13,16-Docosadienoic acid	Polyunsaturated; Ω-6
426	C22:3,n-3			cis-13,16,19-Docosatrienoic acid	Polyunsaturated; Ω-3
411	C22:4,n-6	Adrenic acid		cis-7,10,13,16-Docosatetraenoic acid	Polyunsaturated; Ω-6
98	C22:5,n-3	Clupanodonic acid	DPA	cis-7,10,13,16,19-Docosapentaenoic acid	Polyunsaturated; Ω-3
412	C22:5,n-6	Osbond acid		cis-4,7,10,13,16-Docosapentaenoic acid	Polyunsaturated; Ω-6
99	C22:6,n-3	Cervonic acid	DHA	cis-4,7,10,13,16,19-Docosahexaenoic acid	Polyunsaturated; Ω-3
100	C24:0	Lignoceric acid		Tetracosanoic acid	Saturated
101	C24:1,n-9	Nervonic acid		cis-15-Tetracosenoic acid	Monounsaturated

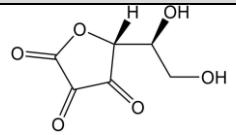
Appendix B - The vitamins/vitamers, their structures and molecular weights

ParameterID	Parameter name	Molecular Weight	Formula	Structure
225	Retinol	286,452	C20H30O	
303	β-carotene	536,888	C40H56	
127	Vitamin D_2	396,650	C28H44O	
128	Vitamin D_3	384,640	C27H44O	
354	25-hydroxy Vitamin D_2	412,648	C28H44O2	
11	25-hydroxy Vitamin D_3	400,640	C27H44O2	
276	α-tocopherol	430,710	C29H50O2	

ParameterID	Parameter name	Molecular Weight	Formula	Structure
279	β-tocopherol	416,680	C28H48O2	
286	γ-tocopherol	416,680	C28H48O2	
282	δ-tocopherol	402,650	C27H46O2	
277	α-tocotrienol	424,660	C29H44O2	
280	β-tocotrienol	410,642	C28H42O2	
287	γ-tocotrienol	410,632	C28H42O2	
283	δ-tocotrienol	396,605	C27H40O2	
164	Phylloquinone (K1)	450,696	C31H46O2	

ParameterID	Parameter name	Molecular Weight	Formula	Structure
-	Menaquinones (K2)	172,183+n68,119	C11H8O2+nC5H8	
-	Menadione (K3)	172,183	C11H8O2	
37	Thiamine	265,350	C12H17N4OS+	
157	2-(1-EtOH)-thiamine	309,407	C14H21N4O2S+	
294	Niacin	192,120	C6H5NO2	
262	Tryptophan	204,229	C11H12N2O2	
298	Pyridoxine	169,180	C8H11NO3	
296	Pyridoxal	167,160	C8H9NO3	

ParameterID	Parameter name	Molecular Weight	Formula	Structure
297	Pyridoxamine	168,196	C8H12N2O2	
210	Pantothenic acid	219,237	C9H17NO5	
42	Biotin	244,310	C10H16N2O3S	
143	Folate	441,404	C19H19N7O6	
38	Vitamin B12	1: 1344.405 2: 1344.405 3: 1346.377 4: 1579.608	1: C63H88CoN14O14P 2: C63H91CoN13O14P 3: C62H89CoN13O15P 4: C72H100CoN18O17P	
175	Ascorbic acid	176,124	C6H8O6	

ParameterID	Parameter name	Molecular Weight	Formula	Structure
177	Dehydroascorbic acid	174,108	C6H6O6	

Appendix C - Density of the liquid food products

Density of liquid foods. Based on Density Database Version 2.0. FAO/INFOODS [SourceID 2026]	
Food	**Density g/cm3**
Dairy products:	
Skimmed milk	1.036
Partially skimmed milk	1.034
Whole milk	1.031
Cream 9%	1.017
Cream 13%	1.013
Cream 38%	0.984
Cocoa skimmed milk	1.056
Creme Fraiche 18%	1.005
Creme Fraiche 38%	0.978
Buttermilk	1.022
Natural yogurt	1.031
Yoghurt with fruit	1.03 – 1.06
Edible oils:	
Palm oil	0.89
Other edible oils	0.88-0.93
Water/Beverage:	
Water	1.00
Softdrink, sweetened	1.02 – 1.070
Cola	1.04
Tea/Coffee	1.00
Fruit juice	1.03-1.06
Beer:	
Lager/Pilsner	1.007
Light lager	1.00
Strong beer	1.108
Stout/Porter	1,014
Wine and spirits:	
Spirits 75%	0.873
Spirits 70%	0.885
Spirits 45%	0.993
Spirits 40%	0.950
Liqueur, all kinds	1.030 – 1.150
Table wines	0.99-1.01
Sweet table wine/Fortified wine	1.01-1.04

Appendix D – Data curation

Data are preserved and documented with all available details, ensuring that it is always possible to study the original data at the most detailed level. Data curation makes it possible to use data also in future on updated IT platforms.

All data collected are archived in full, including full documentation. Data that no longer contribute to the current user tables are retained in full and old data are not deleted but inactivated. This ensures that old data may be studied, and any interesting developments in the content of nutrients may be tracked.

It is ensured that data and the underlying documentation remain accessible and viable in subsequent technological environments.

Data curation is essential for a research institution like DTU because it offers two vital services: 1) data are not only stored but also retained to overcome technical obsolescence inherent in any storage system, and 2) data are documented in such a way that they can be referred to in scientific publications.

The staff at DTU, the Danish Veterinary and Food Administration and other scientific institutions regularly produce significant data on our foods. These data sets must be stored, analysed and preserved as they represent part of the intellectual capital of the university and they must be made available to future researchers, students, food producers and citizens, who use these data in many different ways.

Today's interdisciplinary research problems cannot be solved without the ability to combine data from different disciplines. Researchers must have access to all relevant data and knowledge on how to retrieve them so they can be used and combined in new and old ways, and analysed using the latest tools.

To avoid an unintended and unforeseen loss of data a backup of all the data is regularly done and stored physically and organisationally separated from DTU.

Appendix E – Updated foods history since 2018

Version	FoodID	Food Name	Update/Replaces*
5.0 June 23	1178	Beverages, soy, commercially prepared, unfortified	New data
5.0 June 23	1690	Oat drink, unfortified	New data
5.0 June 23	1691	Rice drink, unfortified	New data
5.0 June 23	1692	Almond drink, unfortified	New data
5.0 June 23	1694	Galia melon, raw	New data
5.0 June 23	1700	Rice drink, with added calcium	New data
5.0 June 23	1701	Oat drink, with added calcium	New data
5.0 June 23	1702	Soy drink, with added calcium	New data
5.0 June 23	1796	Aronia berries**	New food
5.0 June 23	1797	Oatmilk, with added calcium and vitamins	New food
5.0 June 23	1798	Almondmilk, with added calcium	New food
5.0 June 23	1799	Lentils, red, dried, raw	FoodID:755
5.0 June 23	1800	Lentils, green, dried, raw	New food
5.0 June 23	1801	Beans, white, dried, raw	FoodID:568
5.0 June 23	1802	Beans, red kidney, dried, raw	FoodID:19
5.0 June 23	1803	Chickpeas, dry, raw	FoodID:741
5.0 June 23	1804	Le Puy green lentil, dried, raw	New food
5.0 June 23	1805	Lentils, beluga, dried, raw	New food
5.0 June 23	1806	Edamame beans (Soy beans), shelled, frozen	New food
5.0 June 23	1807	Lentils, green, boiled, canned	New food
5.0 June 23	1808	Baked beans (white beans in tomato sauce)	FoodID:1263
5.0 June 23	1809	Chili beans (red kidney beans in chilisauce)	New food
5.0 June 23	1810	Beans, red kidney, boiled, canned	New food
5.0 June 23	1811	Beans, red kidney, cooked, ready to eat	New food
5.0 June 23	1812	Chickpeas, boiled, canned	New food
5.0 June 23	1813	Chickpeas, steamed, ready to eat	New food
5.0 June 23	1814	Beans, black, boiled, canned	New food
5.0 June 23	1815	White beans, dried and boiled	New food
5.0 June 23	1816	Beans, red kidney, dried and boiled	New food
5.0 June 23	1817	Blueberries, frozen	New food
5.0 June 23	1818	Raspberries, frozen	FoodID:931
5.0 June 23	1819	Strawberries, frozen	FoodID:336
5.0 June 23	1820	Sweet corn kernels, frozen	FoodID:1219
5.0 June 23	1821	Peas, green, frozen	FoodID:1310
5.0 June 23	1822	Green beans (haricots verts), frozen	FoodID:822
5.0 June 23	1823	Cauliflower, frozen	FoodID:782
5.0 June 23	1824	Broccoli, frozen	FoodID:947
5.0 June 23	1825	Brussel sprouts, frozen	FoodID:1073
5.0 June 23	1826	Soup vegetables, frozen	New food
5.0 June 23	1827	Root vegetables, frozen	New food

Version	FoodID	Food Name	Update/Replaces*
5.0 June 23	1828	Mango, frozen	New food
5.0 June 23	1829	Pomegranate seeds, frozen	New food
5.0 June 23	1830	Pineapple, frozen	New food
5.0 June 23	1831	Mixed berries. frozen	New food
5.0 June 23	1832	Baby carrots, frozen	New food
5.0 June 23	1833	Leek, frozen	New food
5.0 June 23	1834	Avocado, frozen	New food
5.0 June 23	1835	Wok mix, organic, frozen	New food
5.0 June 23	1836	Wok mix, frozen	New food
5.0 June 23	1837	Pearl onion. frozen	New food
5.0 June 23	1838	Bean mix, frozen	New food
5.0 June 23	1839	Root fruit fritters, frozen	New food
5.0 June 23	1840	Sweet potato fries, frozen	New food
5.0 June 23	1841	Potato wedges, frozen	New food
5.0 June 23	1842	Halved potatoes, frozen	New food
5.0 June 23	1843	Curly fries, frozen	New food
5.0 June 23	1844	Potato rösti, frozen	New food
5.0 June 23	1845	Potato croquettes, frozen	New food
5.0 June 23	1846	Steak fries (thick fries with skin), frozen	New food
5.0 June 23	1847	French fries, crinkle-cut, frozen	New food
5.0 June 23	1848	Blueberries, raw	FoodID:16
5.0 June 23	1849	Blackberry, raw	FoodID:18
5.0 June 23	1850	Raspberry, raw	FoodID:5
5.0 June 23	1851	Apricot, raw	FoodID:524
5.0 June 23	1852	Plum, raw	FoodID:15
5.0 June 23	1853	Peach, raw	FoodID:609
5.0 June 23	1854	Cherry, raw	FoodID:29
5.0 June 23	1855	Pineapple, raw	FoodID:485
5.0 June 23	1856	Grapefruit, raw	FoodID:552
5.0 June 23	1857	Melon, honeydew, raw	FoodID:397
5.0 June 23	1858	Kiwi fruit, raw	FoodID:723
5.0 June 23	1859	Mango, raw	FoodID:545
4.1 June 22	56	Squash, raw	New data
4.1 June 22	69	Aubergine, raw	New data
4.1 June 22	73	Cheese, semihard, Feta, 40 % fidm	New data
4.1 June 22	98	Cheese, processed, 45 % fidm.	New data
4.1 June 22	272	Tofu, soy bean curd	New data
4.1 June 22	559	Carrot, raw	New data
4.1 June 22	606	Carrot, raw, imported	New data
4.1 June 22	616	Avocado, raw	New data
4.1 June 22	698	Liver, calf, raw	New food
4.1 June 22	770	Beef, topside, cap off, raw	New data
4.1 June 22	799	Cauliflower, Danish, raw	New data

Version	FoodID	Food Name	Update/Replaces*
4.1 June 22	805	Beef, rumpsteak, cap off, raw	New data
4.1 June 22	819	Beef, thick flank, cap off, raw	New data
4.1 June 22	831	Beef, tenderloin, defatted, raw	New data
4.1 June 22	888	Kale, frozen	New data
4.1 June 22	961	Mushroom, raw	New data
4.1 June 22	986	Blended spread, 80% fat	New data
4.1 June 22	1018	Plant margarine, 80%, fry/bake	New data
4.1 June 22	1019	Beef, chuck, raw	New data
4.1 June 22	1040	Beef, brisket, anterior part, raw	New data
4.1 June 22	1064	Beef, top, end of rump, raw	New data
4.1 June 22	1082	Beef, sirloin, raw	New data
4.1 June 22	1100	Cantherelle, raw	New data
4.1 June 22	1109	Beef, striploin "cap on", raw	New data
4.1 June 22	1202	Cheese, processed, 20 % fidm.	New data
4.1 June 22	1390	Beet, red, danish, raw	New food
4.1 June 22	1391	Kale, Danish, raw	New food
4.1 June 22	1394	Lettuce, iceberg (incl. crisphead types), danish, raw	New food
4.1 June 22	1413	Lettuce, iceberg (incl. crisphead types), imported, raw	New food
4.1 June 22	1440	Oil, coconut	New food
4.1 June 22	1485	Celeriac, celery root, danish, raw	New food
4.1 June 22	1492	Arugula, rocket, raw	New food
4.1 June 22	1712	Veal, rump, raw	New food
4.1 June 22	1731	Oil margarine	New food
4.1 June 22	1732	Oil margarine, fortified with A- and D-vitamin	New food
4.1 June 22	1733	Plant margarine, 80%, fry/bake, enriched	New food
4.1 June 22	1734	Plant margarine, 80%, fry/bake, enriched	FoodID:1030;1033
4.1 June 22	1735	Plant margarine, 75%, fry/bake, fortified with A-vitamin	New food
4.1 June 22	1736	Plant margarine, 60%, enriched with A-vitamin	New food
4.1 June 22	1737	Margarine, 40%, enriched with A- and D-vitamin	FoodID:1168;1183
4.1 June 22	1739	Beef, mince, 8-12% fat, raw	New food
4.1 June 22	1740	Chicken, mince, 3-10% fat, raw	New food
4.1 June 22	1741	Baby spinach, raw	New food
4.1 June 22	1743	Salad, romaine, raw	New food
4.1 June 22	1744	Squash, red kuri, Danish, raw	New food
4.1 June 22	1745	Butternut squash, raw	New food
4.1 June 22	1746	Energy drink, Red Bull**	New food
4.1 June 22	1747	Whey protein powder**	New food
4.1 June 22	1748	Rice cake/cracker, puffed brown rice, plain**	New food
4.1 June 22	1749	Spinach, whole leaf, frozen	FoodID:1443
4.1 June 22	1750	Cabbage, red, Danish, raw	New food
4.1 June 22	1751	Cabbage, pointed, Danish, raw	New food
4.1 June 22	1752	Parsnip, Danish, raw	New food
4.1 June 22	1753	Veal, top round, raw	New food

Version	FoodID	Food Name	Update/Replaces*
4.1 June 22	1754	Veal, topside, trimmed, raw	New food
4.1 June 22	1755	Veal, heart of rump, trimmed, raw	New food
4.1 June 22	1756	Veal, shortloin, raw	New food
4.1 June 22	1757	Beef, shoulder, raw	New food
4.1 June 22	1758	Beef, bottom round, raw	New food
4.1 June 22	1759	Beef, flank steak, raw	New food
4.1 June 22	1760	Carrots, imported, without peel, raw	FoodID:1411
4.1 June 22	1761	Carrots, Danish, without peel, raw	FoodID:1411
4.1 June 22	1762	Parsnips, imported, raw	New food
4.1 June 22	1763	Celery, root, imported, raw	New food
4.1 June 22	1764	Cream yoghurt, plain, 10% fat (Greek/Turkey style)	New food
4.1 June 22	1765	Cream yoghurt, plain, 2% fat (Greek/Turkey style)	New food
4.1 June 22	1766	Milk, acidophilus cultured semiskimmed milk, 1.5% fat	New food
4.1 June 22	1767	Milk, acidophilus cultured skimmed milk, 0.5% fat	New food
4.1 June 22	1768	Pizza topping (Grated cheese, Mozzarella)	New food
4.1 June 22	1769	Skinkeost 30+ (Processed cheese with ham)	New food
4.1 June 22	1770	Rejeost, light, 8% fat, (Processed cheese with shrimp)	New food
4.1 June 22	1771	Feta, 5% (Salad cheese)	New food
4.1 June 22	1772	Cheese, Cream, 30-40 % fidm.	New food
4.1 June 22	1773	Cheese, Cream, 45-55 % fidm.	New food
4.1 June 22	1774	Cheese, Brie, 11%	New food
4.1 June 22	1775	Goat cheese, soft, 45-55% fidm.	New food
4.1 June 22	1776	Goat cheese, in brine, 20-25%	New food
4.1 June 22	1777	Goat cheese, hard, 45% fidm.	New food
4.1 June 22	1778	Cheese, firm, 6%/10% fidm.	FoodID:1267
4.1 June 22	1779	Cheese, firm, 45% fidm., Danish	New food
4.1 June 22	1780	Cheese, firm, 50% fidm., Danish	FoodID:186;196
4.1 June 22	1781	Veal, brisket, raw	New food
4.1 June 22	1782	Beef, brisket, boneless, raw	New food
4.1 June 22	1783	Cold cuts, with wheat protein	New food
4.1 June 22	1784	Seitan	New food
4.1 June 22	1785	Mince, with mycoprotein	New food
4.1 June 22	1786	Mince, with soy protein	New food
4.1 June 22	1787	Mince balls, with soy protein	New food
4.1 June 22	1788	Pieces, with soy protein	New food
4.1 June 22	1789	Cold cuts, with soy and pea protein	New food
4.1 June 22	1790	Mince, with pea protein	New food
4.1 June 22	1791	Sausage, with pea protein	New food
4.1 June 22	1792	Cold cuts, with eggwhite	New food
4.1 June 22	1793	Pieces, with mycoprotein	New food
4.1 June 22	1794	Sausage, with soy protein	New food
4.1 June 22	1795	Beef, entrecote/rib eye, raw	New food

* A FoodID indicates that it is a new food that replaces the food with FoodID. ** Imported from other food composition database

Appendix F – Updated parameters history since 2018

Version	ParameterID	Parameter Name	Update
5.0 June 23	428	C21:5,n-3	New parameter
4.1 June 22	126	Vitamin D	25-OH factors changed from 5 to 1
4.1 June 22	327	Salt labelling	Calculated as 2,5*Sodium
4.1 June 22	417	Added Sugar	New parameter
4.1 June 22	418	Free Sugars	New parameter
4.1 June 22	420	Protein from Amino Acids	New parameter
4.1 June 22	422	Sum biogenic amines	New parameter
4.1 June 22	423	Ornithine	New parameter
4.1 June 22	424	C20:1,n-15	New parameter
4.1 June 22	425	C18:1,n-12	New parameter
4.1 June 22	426	C22:3,n-3	New parameter
4.1 June 22	427	Sum fatty acids below the detection limit	New parameter