The Danish Food Composition Database Version 5.1 - November 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

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.

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Long reference:

Frida Food Data (https://frida.fooddata.dk), version 5.1, November 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. Standards

Frida is a curated and aggregated selection of an underlying database, the Danish Food Composition Database. This is hosted in Microsoft Azure (https://azure.microsoft.com/da-dk). See Appendix D on data security and backup.

The underlying database contains a lot of data that is not published in Frida. This includes metadata and other data describing foods, parameters, analysis methods, sources as well as data for managing calculations, versioning and publishing.

2.1 Guidelines for parameter definition and calculation

There may be several ways to define and calculate certain nutrients. There are e.g. no agreement among all researchers and authorities which vitamers should be included in vitamin A or which factors should be used for the calculation. Our data must be usable for food labeling. Therefore, we follow the guidelines set by the European Food Safety Authority (EFSA), which are the basis for food legislation in the EU [SourceID 2154].

The legislation emphasizes that it must be easy and cheap to determine the nutrient content of food. If we consider that there are better ways to define or calculate a nutrient, then we will have two parameters for this. In that case, the word "labeling" will be included in the name of the parameter, which will be the one calculated according to the legislation. Eg. the legislation prescribes that a nitrogen factor of 6.25 is used to calculate the protein content of all foods. Actually, this factor varies with the protein source. We therefore have several ways to calculate protein content (see sections 5 and 6 for parameter definition).

When we analyze food, we will at least analyze all the nutrients that, according to the legislation, must be stated in the nutrition declaration, as well as those mentioned in the Nordic Nutrient Recommendations [SourceID 2188].

2.2 Standards used in the Danish Food Composition Database

We strive for our data to be of the highest quality, so we follow several internationally recognized standards and formats for quality assurance and exchange of food data, which are briefly described below. We do not publish this associated data in Frida, but some of it is in the data set that can be downloaded from Frida.

FoodEx2: EFSA is behind this classification of foods. Each food has a FoodEx2 code and a FoodEx2 description (https://www.efsa.europa.eu/en/data/data-standardisation). FoodEx2 is used especially in the EU for the automatic linking of data for food, both nutrient data, microbiological data and pollution data. Parameters are linked to EFSA paramType and ParamCode.

Langual: Originally, the US Department of Agriculture was behind this very detailed and systematic description of foods (https://www.langual.org). LagguaL is mainly used for the exchange of food data, but is not so suitable for automatic coordination. LanguaL is also used by the other Nordic food databases.

FoodOn: Part of Open Biological and Biomedical Ontologies (https://foodon.org). FoodOn is a categorical classification of food that is primarily used for data integration across research areas within the life sciences.

EuroFIR Thesauri: A standard for food data defined by the European Food Information Resource (https://www.eurofir.org/our-resources/eurofir-thesauri). EuroFIR Thesauri associates one or more codes for classification and associated description of source, parameter, unit, method type, analysis method and food group. Used especially for quality control of data.

Analysis protocols: Food analysis is outsourced to Eurofins/Steins Laboratory (https://www.eurofins.dk/steins). Eurofin's analyzes are accredited by The Danish Accreditation Fund (https://danak.dk) and they use analytical methods based on standard protocols from international organizations such as the Association of Official Agricultural Chemists (AOAC), the Nordic Methodological Committee for Foodstuffs (NMKL), the International Organization for Standardization (ISO) etc.

Parameter names/numbers in external databases. The majority of our parameters are found in the most used biochemical databases and we link to the following:
Chemical Abstracts Service (CAS) https://www.cas.org
Information on Chemicals (ECHA InfoCard) https://echa.europa.eu/information-on-chemicals
European Community number (EC-Number) https://echa.europa.eu/information-on-chemicals
EU Tilsætningsstoffer (E-nummer) https://ec.europa.eu/food/food-feed-portal/screen/food-additives/search
PubChem https://pubchem.ncbi.nlm.nih.gov
Kyoto Encyclopedia of Genes and Genomes (KEGG) https://www.genome.jp/kegg
Chemical Entities of Biological Interest (ChEBI) https://www.ebi.ac.uk/chebi
Bioactive Molecules (ChEMBL) https://www.ebi.ac.uk/chembl
Human Metabolome Database (HMDB) https://hmdb.ca

3. 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.

3.1 Updated foodgroups

The updated foods are listed in Appendix E which has a food update history since 2018. There are no new or updated foods in this release.

3.2 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.

After the new Nordic Nutrition Recommendations 2023 [SourceID 2188] have included choline, we have started to analyze and publish choline data. Choline has ParameterID 116. For existing foods, we have imported choline data from the US food composition database [SourceID 2187] in cases where there is a corresponding food with choline data in it. There is choline data for 90% of the foods in Frida.

We now have data for starch (ParameterID 243) and total sugars (ParameterID 245) for 97% of the foods in Frida. The new starch and sugar data are either estimated or imported from the Norwegian, Swedish, English or American food composition databases.

Nordic Nutrition Recommendations 2023 [SourceID 2188] now recommends a β-carotene factor of 1/6 and that both β-cryptoxanthin and α-carotene be included in the vitamin A calculation, both with a factor of 1/12 (see section 6.1). EFSA recommends the same factor for β-carotene but has no official recommendation for β-cryptoxanthin and α-carotene factors.

EFSA now recommends a factor of 2.5 for both 25-hydroxy-vitamin D2 and 25-hydroxy-vitamin D3 in the calculation of vitamin D [SourceID 2191] (see section 6.2).

4. Database structure

4.1 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

4.2 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)

4.3 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.
- Data calculated on the basis of different analytical data.
- Natural zero-value if it is know that a nutrient is not found in the food.
- Borrowed values from other foods, other food composition databases, scientific literature, manufacturer or retail.
- Data calculated by recipe calculations.
- Estimated values: Where no analytical data is available, data may in some cases be estimated from foods similar to the actual food.

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.

4.4 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.

4.5 Sources and references

For each entry the source is indicated by a number in the column Source. 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: The value of the substance is either zero or that there are only insignificant traces of the substance.

SourceID 1003: The value was calculated based on analytical data. This will be the case for e.g. energy, protein, carbohydrate as well as vitamins where the activity is due to more than one vitamer where the vitamers are analyzed separately.

SourceID 1001 & 1002: The value is derived by estimate from data on a similar product.

SourceID 1004 & 1005: The value derived from a recipe calculation.

4.6 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.

5. Parameter definitions

5.1 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 5.1a. They are based on EU Regulation No. 1169/201 [SourceID 2154].

Table 5.1a: 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 5.2 and 5.3. 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 5.1b):

Table 5.1b: 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

5.2 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 5.2 describes the calculated carbohydrate fractions in Frida.

Table 5.2: 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.

5.3 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 5.3a 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 5.3b shows the formulas used for calculating parameters for protein.

Table 5.3a: 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. For foods with a low protein content, calculating protein content from amino acids will underestimate the protein content, as the content of several amino acids will be below the LOQ, and therefore not contribute to the calculation.

Table 5.3b: 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	$\Sigma AA_n - 18*\Sigma AA_n/MW_n$, AA_n=Amino acid n, MW_n=Molecular weight Amino acid n

5.4 Amino acids

From 2018, amino acids are measured for all foods containing protein. 20 amino acids are analyzed which are listed in table 5.4 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 5.4: 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

5.5 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 5.5 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 5.5 can be used.

Table 5.5: 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).

5.6 Sterols

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

5.7 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.

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

5.8 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

5.9 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.

5.10 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.

5.11 Sugar alcohols

Sugar alcohols are energy-containing carbohydrates, but less energy-rich than sugar (see section 5.1 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.

5.12 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.

6. Vitamin parameters

In general, data for vitamins follow the standard and recommendations stated in the law on food labeling [SourceID 2154] and 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. Note that for some vitamins the vitamer content is measured separately and for other vitamins all vitamers are measured in the same analysis.

6.1 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 1/6 (Table 6.1). This factor was changed from 1/12 as of version 5.1 (November 2023). β-cryptoxanthin and α-carotene contributes to vitamin A activity, but these are not measured.

Table 6.1: Parameters for calculating Vitamin A content.

ParameterID	Parameter Name	Type	Derivation	Formula/Contribution
12	Vitamin A	Vitamin	Calculated	Retinol + β-carotene/6
225	Retinol	Vitamer	Measured	Contributes calculation with factor 1
303	β-carotene	Vitamer	Measured	Contributes to calculation with factor 1/6
281	β-cryptoxanthin	Vitamer	Not measured	Factor 1/12
275	α-carotene	Vitamer	Not measured	Factor 1/12

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

1 IU retinol = 0,3 µg retinol.

6.2 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 (Table 6.2). As of Frida version 5.1, the factors for 25-hydroxy vitamin D_2 and 25-hydroxy vitamin D_3 have changed from 1 to 2.5 following an EFSA reccomendation [SourceID 2191]. Note that these factors were also changed from 5 to 1 with the release of Frida version 4.1. There is no consensus on how the total vitamin D activity is calculated from the individual active vitamin D components, but it is expected that the EFSA recommendation is incorporated into EU law..

Table 6.2: Parameters for calculating Vitamin D content.

ParameterID	Parameter Name	Type	Derivation	Formula/Contribution
126	Vitamin D	Vitamin	Calculated	$D_2 + D_3 + 2{,}5*(25\text{-}OH\text{-}D_2 + 25\text{-}OH\text{-}D_3)$
127	Vitamin D_2	Vitamer	Measured	Contributes to calculation with factor 1
128	Vitamin D_3	Vitamer	Measured	Contributes to calculation with factor 1
354	25-hydroxy Vitamin D_2	Vitamer	Measured	Contributes to calculation with factor 2.5
11	25-hydroxy Vitamin D_3	Vitamer	Measured	Contributes to calculation with factor 2.5

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

1 IU vitamin D = 0,025 µg vitamin D

6.3 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 6.3):

Table 6.3: 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 calculation with factor 1
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

6.4 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 6.4: 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	

6.5 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 6.5: Parameters for determining Vitamin B_1 content.

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

6.6 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 6.6: 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 calculation with factor 1
262	Tryptophan	Vitamer	Measured	Contributes to calculation with factor 1/60

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.

6.7 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 6.7: Parameters for determining Vitamin B_6 content.

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

6.8 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.

6.9 Biotin

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

6.10 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.

6.11 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 6.11: Parameters for determining Vitamin B_{12} content.

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

6.12 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 6.12: Parameters for determining Vitamin C content.

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

7. Assumptions and calculations

From 2018 all vitamins, minerals, amino acids, fatty acids and cholesterol 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 and don't have measured values. 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 and meat products is used to calculate the content of the fat-soluble vitamins in these products (see Table 7.1.1). Similar correlations have been used for the cholesterol content in dairy and meat products.

7.1 Milk and milk products

7.1.1 Values for fat-soluble vitamins in dairy products

The content of fat-soluble vitamins (vitamin A, 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 7.1.1 are used.

Table 7.1.1: Calculation of the content of fat-soluble vitamins [SouceID 2054].

Vitamin	Unit	Calculated as
Vitamin A	µg/100g	Fat (g/100g) × 8.867 (µg Vitamin A/g fat)
Vitamin D	µg/100g	Fat (g/100g) × 0.0127 (µg vitamin D/g fat) + 0.0325 (µg vitamin D)
Vitamin E	α-TE	Fat (g/100g) × 0.0255 (mg α-tocopherol/g fat)

7.1.2 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 7.1.2 shows the average values used in the calculation of fatty acid content in the dairy products (The values come from SourceID 1227)

Table 7.1.2: 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

7.1.3 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 [SourceID 2054]:

Cholesterol = 3.24 (mg cholesterol/g fat) × fat (g/100g) + 2 (mg cholesterol)

7.2 Cereals and cereal products

7.2.1 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.

7.3 Meat and meat products

7.3.1 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.

7.3.2 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 in table 7.3.2.

Table 7.3.2: Calculation of cholesterol in meat [SouceID 2054].

Meat	Unit	Calculated as
Pork	mg/100g	Protein (g/100g) × 2.6 (µg cholesterol/g fat) + Fat (g/100g)

Beef	mg/100g	Protein (g/100g) × 2.65 (µg cholesterol/g fat) + Fat (g/100g)
Lamb	mg/100g	Protein (g/100g) × 3.25 (µg cholesterol/g fat) + Fat (g/100g)

7.3.3 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 beef and pork meat samples. Where there are no measured values, the content of vitamin D is calculated according to table 7.3.3:

Table 7.3.3: Calculation of vitamin D in pork and beef.

SourceID	Vitamin	Meat	Unit	Calculated as
2054	Vitamin D	Beef	µg/100g	Fat [g/100g] * 0.0207 (µg vitamin D/g fat) + 0.31 (µg vitamin D)
2054	Vitamin D	Pork	µg/100g	Fat [g/100g] * 0.0121 (µg vitamin D/g fat) + 0.46 (µg vitamin D)
1300	Vitamin D3	Pork	µg/100g	Fat [g/100g] * 0.0056 (µg vitamin D3/g fat) + 0.0541 (µg vitamin D3)
1300	25-OH-D3	Pork	µg/100g	Fat [g/100g] * 0.0013 (µg 25-OH-D3/g fat) + 0.0812 (µg 25-OH-D3)

7.3.4 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.

8. Analytical methods for Nutrients

All macro- and micronutrients are analyzed for which there are good commercially available analytical methods. Many different analysis methods are used for nutrients in food. What they have in common is that you measure something that correlates with the concentration of the substance you want to measure. There can be several thousand different chemicals and macromolecules in a food which will typically interfere with each other in the analysis. The substance or substances to be measured must therefore be extracted or otherwise isolated before the actual analysis. Since 2018, food analysis has been outsourced to Eurofins/Steins Laboratory (https://www.eurofins.dk). Eurofin's laboratories are accredited by The Danish Accreditation Fund (https://danak.dk) according to ISO 17025, and they use analytical methods based on standard protocols from international organisations. Before, it was the regional laboratories under the Danish Veterinary and Food Administration that were responsible for food analysis. Here, the typical analytical and purification methods are briefly discussed, with reference to the analytical protocol in parentheses.

8.1 Dry matter etc.

Dry matter, Water and Ash (NMKL 23:1991 and NMKL 173:2005)

Typically determined gravimetrically (i.e. by weighing) in the same analysis and requires no purification. Dry matter is determined by drying the sample to constant weight either with hot air or freeze drying. The water content is calculated as the difference between the weight of the sample before and after drying, provided that there is no alcohol in the sample. Ash is measured by weighing the remains of the dried and then fully ashed sample.

8.2 Fat etc.

Fat (ISO 11085:2015)

Fat is determined by first saponifying the fat by boiling the sample in hydrochloric acid. Fat is extracted with petroleum ether which is subsequently evaporated. The total fat content is determined by weighing the evaporation residue.

Fatty acids (AOCS 1f-96:2009)

All the fatty acids are separated and measured in a single gas chromatography (GC) analysis. After saponification and extraction with petroleum ether, the fatty acids are reacted with methanol, which forms easily volatile methyl esters. The individual fatty acids are separated in the GC column and detected with a flame ionization detector. The concentration of fatty acid is proportional to the voltage that the ionized fatty acids induce in the detector.

Cholesterol (BVL L 18.00-17:2014-08)

First, starch is broken down with the enzyme amylase and the fat is saponified. Cholesterol is then converted to silyl ether, which is extracted with isooctane and determined by gas chromatography.

8.3 Nitrogen and Amino acids for calculating Protein

Nitrogen (NMKL 6:2003)

Protein is calculated based on the nitrogen content, which is measured by the classic Kjeldahl method. Here, the sample is boiled with concentrated sulfuric acid and the nitrogen is released as ammonium sulphate, which is again converted to ammonia after the addition of base. The amount of ammonia is found by acid-base titration. Protein is calculated as a constant multiplied by the nitrogen content (See section 5.3).

Amino acids (ISO 13903:2005)

Amino acids are released from protein by acid hydrolysis and separated by liquid chromatography on an ion-exchange column. Here they are reacted with ninhydrin, whereby an amino acid derivative is formed whose light adsorbance is proportional to the concentration. All amino acids with the exception of methionine, cysteine and tryptophan are determined in one analysis. It should be noted that asparagine and glutamine are converted to aspartic acid and glutamic acid respectively during preparation. The measured content of aspartic acid therefore corresponds to the sample's content of both asparagine and aspartic acid and the content of glutamic acid corresponds to the sum of glutamine and glutamic acid. In the analysis for methionine and cysteine, the amino acids are oxidized first, while the analysis for tryptophan uses basic hydrolysis and ordinary high-pressure liquid chromatography (HPLC).

8.4 Carbohydrates

There are no analysis methods for total carbohydrate and available carbohydrate, which are calculated based on the content of the other macronutrients.

Dietary fiber (AOAC 2011.25)

Dietary fiber is an expensive and complicated analysis. First, the sample is treated with the enzymes pancreatic alpha-amylase and amyloglucosidase, which hydrolyze non-resistant starch but not dietary fiber. The protein is then hydrolysed with a protease. Finally, non-hydrolyzed carbohydrate is filtered and extracted into three fractions: Insoluble dietary fiber, High molecular weight soluble dietary fiber and Low molecular weight soluble dietary fiber. The latter is determined by liquid chromatography while the other two fractions are dried and weighed.

Sugars (J. Chromatogr. A Vol 897, p195-204)

All sugars are separated and measured in one analysis. First, they are extracted with water and the extract is purified. The sugars are separated by HPLC or on an ion-exchange column. The concentration of the individual sugars is measured either by their absorption of light at a wavelength in the infrared part of the spectrum or amperometrically, i.e. that the ionized sugar induces a current in a detector.

Starch (r-Biopharm)

Starch is typically measured in an enzymatic assay where the starch is hydrolysed with amyloglucosidase. Then there are several different methods in which the formed glucose undergoes one or more reactions (which can also be enzyme-catalyzed) that result in the formation of a substance that absorbs light proportionally to its concentration.

8.5 Minerals

Sodium, Potassium, Calcium, Magnesium, Iron, Copper, Zinc, Phosphorus (ISO 11885:2009), Manganese, Chromium, Molybdenum, Nickel, Selenium (ISO 17294-2:2016), Iodine (EN 15111:2007), Mercury, Arsenic, Cadmium, Lead (EN 15763:2010)

All the minerals that are of greatest importance to human nutrition are analysed. That is the metallic elements sodium, potassium, calcium, magnesium, iron, copper, zinc manganese, chromium, molybdenum and nickel and the non-metals phosphorus, selenium and iodine. The sample is ashed and the ash is dissolved in strong acid. The solution is then injected into a gas that is heated electrically, whereby a plasma flame is formed which is maintained in a magnetic field. In the plasma, the atoms are ionized and the minerals can be determined with two different methods. Emission spectrometry measures the emission of light whose wavelength and intensity are unique to and proportional to the concentration of the individual minerals (ICP-OES). With mass spectroscopy, a current is measured in the detector which is proportional to the ratio between the weight and the charge of the individual ions (ICP-MS). Selected foods are analyzed for mercury, arsenic, cadmium and lead, which are not nutrients.

8.6 Vitamins

Vitamins by chromatography: Vitamin A (EN 12823-1:2014 and EN 12823-2:2000), Vitamin B1 (EN 14122:2014), Vitamin B2 (EN 14152:2003), Niacin (EN 15652:2009), Vitamin B6 (EN 14164:2014), Pantothenic acid (AOAC 2012.16), Vitamin B12 (J. AOAC, Vol. 91, 2008, p786–793), Vitamin C (Food Chem., Vol. 94, p626-631), Vitamin D (EN 12821:2009), Vitamin E (EN 12822:2014), Vitamin K1 (EN 14148:2003)

Most vitamins or vitamers are measured by HPLC after extraction with organic solvents or water phase. Several vitamins are bound to phosphate or other substances and these are first released by hydrolysis. Most vitamins are quantified by optical detection. Some vitamins absorb light at specific wavelengths, other vitamins are first reacted with a chemical where the product absorbs light and others are detected fluorimetrically (ie the product is illuminated at one wavelength and then light is emitted at another wavelength). For some vitamins, the vitamin activity is due to several vitamers which are either determined in the same measurement (vitamin B1, vitamin B6, vitamin B12, vitamin C) or separately (vitamin A, vitamin D, vitamin E, Niacin equivalent). In cases where the vitamin activity is due to several vitamers which are measured separately, this is calculated as the sum of the vitamer content (See section 6).

Vitamins by microbial assay: Folate (NMKL 111:1985) and Biotin (Pharmacopea Nordica, Vol. IV, 1960, p101)

Folate and biotin are typically measured in a microbiological assay. Here, a microorganism is used that cannot form the analyzed substance itself, typically a Lactobacillus. This is grown in a medium that does not contain the analyzed substance. The sample is added to the medium and growth is measured by the medium's turbidity, which is proportional to the vitamin content in the sample.

8.7 Analytical methods for other nutrients

Choline (AOAC Vol 91,p130, 2008)

Choline and choline esters are extracted with methanol and water. The extract is hydrolysed with base so that choline esters are converted to free choline. Choline is measured with liquid chromatography and mass spectroscopy (LC-MS/MS).

9. 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 2054: Erling Saxholt: Calculation of nutrient content in foods based on empirical correlations within groups of food products, 2014, National Food Institute, Technical University of Denmark.

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 2135: Livsmedelsdatabasen, Version 2017-12-15, Livsmedelsverket, Box 622, SE - 751 26 Uppsala: http://www7.slv.se/SokNaringsinnehall

SourceID 2141: Food Databanks National Capability extended dataset based on PHE's McCance and Widdowson's Composition of Foods Integrated Dataset, 2020, Quadram Institute: https://quadram.ac.uk/Ukfoodcomposition

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. See also Danish guidance on food labeling regulation, VEJ nr 9582 af 12/07/2023: https://www.retsinformation.dk/eli/retsinfo/2023/9582

SourceID 2187: FoodData Central. Agricultural Research Service, US Department of Agriculture (April 2023): https://fdc.nal.usda.gov

SourceID 2188: Nordic Nutrition Recommendations 2023: Integrating Environmental Aspects. Nordisk Råd (2023) ISBN 978-92-893-7533-7: http://dx.doi.org/10.6027/nord2023-003

SourceID 2190: Matvaretabellen 2022, Norwegian Food Safety Authority, The Norwegian Directorate of Health and University of Oslo: https://www.matvaretabellen.no

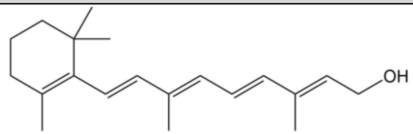
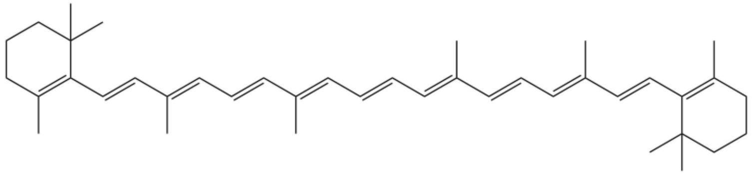
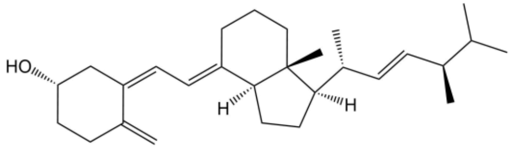
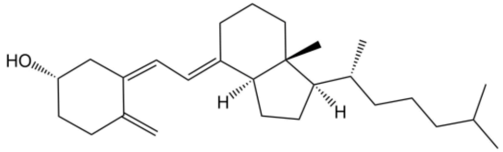
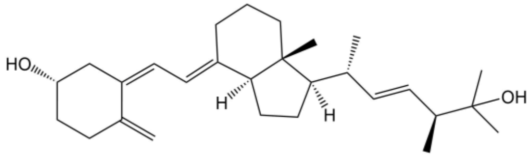
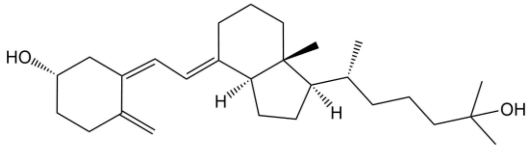
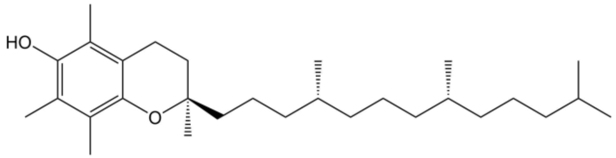
SourceID 2191: Scientific opinion on the tolerable upper intake level for vitamin D, including the derivation of a conversion factor for calcidiol monohydrate, EFSA Journal, Vol. 21 (2023) p8145. https://www.efsa.europa.eu/en/efsajournal/pub/8145

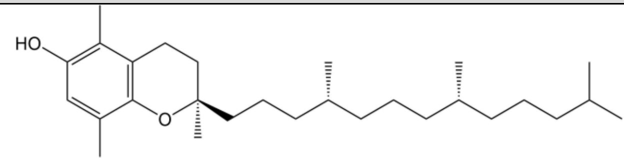
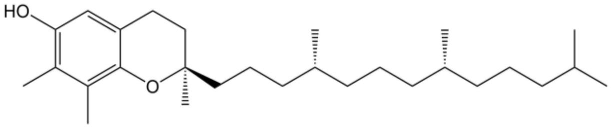
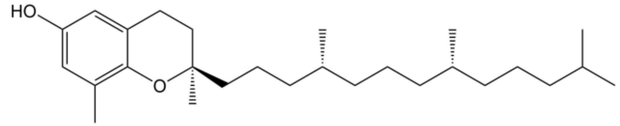
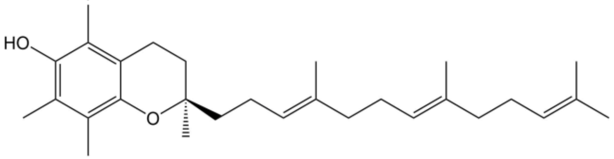
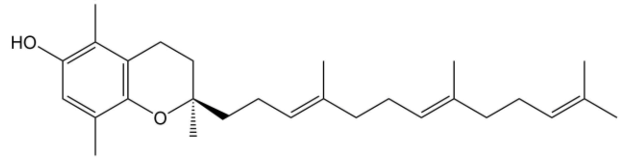
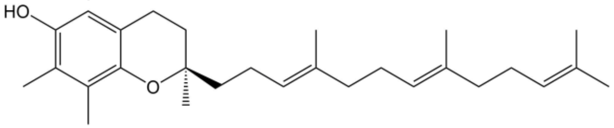
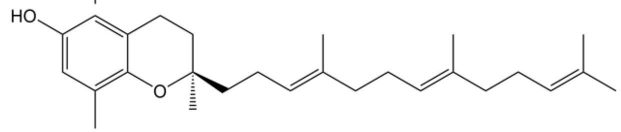
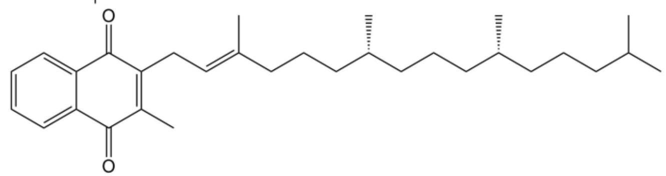
Appendix A - The fatty acids, their common and systematic names

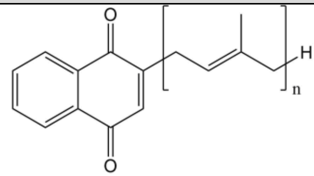
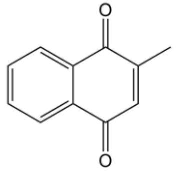
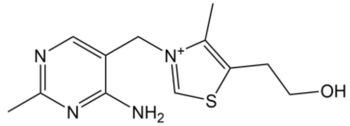
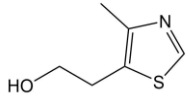
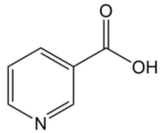
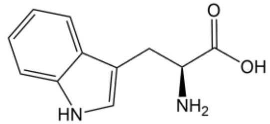
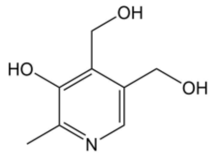
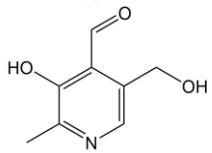
ParameterID	Parameter name	Common name	Abbreviation	Systematic name	Category
103	C4:0	Butyric acid		Butanoic acid	Saturated
104	C6:0	Caproic acid		Hexanoic acid	Saturated
105	C8:0	Caprylic acid		Octanoic acid	Saturated
48	C10:0	Capric acid		Decanoic acid	Saturated
49	C12:0	Lauric acid		Dodecanoic acid	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

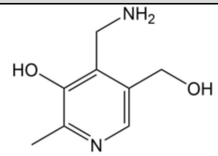
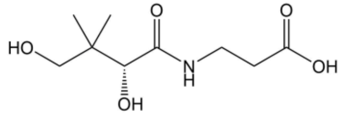
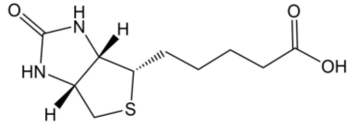
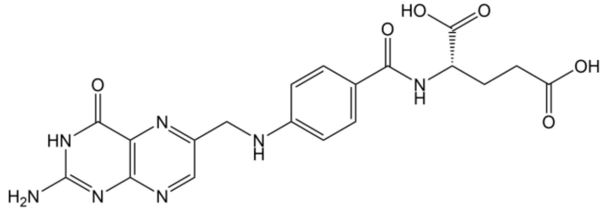
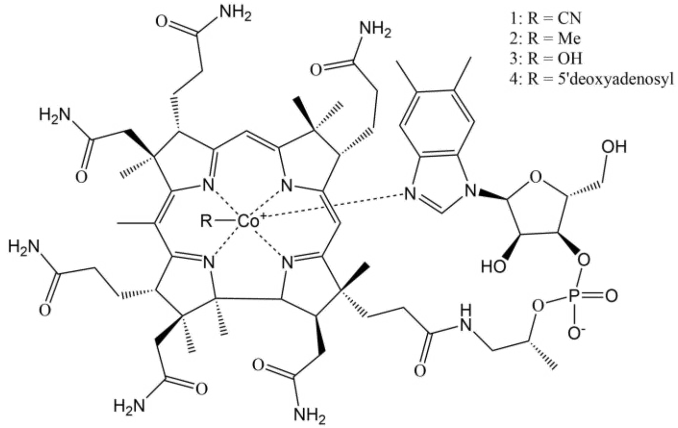
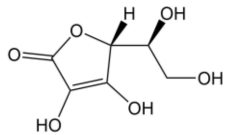
ParameterID	Parameter name	Common name	Abbreviation	Systematic name	Category
74	C18:3,n-3	α-Linolenic acid		cis-9,12,15-Octadecatrienoic acid	Polyunsaturated; Ω-3
75	C18:3,n-6	γ-Linolenic acid		cis-6,9,12-Octadecatrienoic acid	Polyunsaturated; Ω-6
76	C18:4,n-3	Steridonic acid		cis-6,9,12,15-Octadecatetraenoic 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

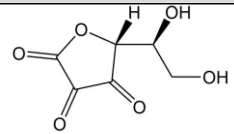
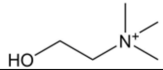
Appendix B - The vitamins/vitamers, their structures and molecular weights

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	
116	Cholin	104,170	C5H14NO+	

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
5.1 Nov 23	243	Starch/Glycogen	New data estimated or imported from SourceID 2135, 2141, 2187 & 2190
5.1 Nov 23	245	Sum sugars	New data estimated or imported from SourceID 2135, 2141, 2187 & 2190
5.1 Nov 23	12	Vitamin A	B-caroten factor changed from 1/12 to 1/6
5.1 Nov 23	126	Vitamin D	25-OH factors changed from 1 to 2,5
5.1 Nov 23	116	Choline	New parameter, data imported from SourceID 2187
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 (replaces ParameterID 259), data estimated using SourceID 2133
4.1 June 22	418	Free Sugars	New parameter, data estimated using model from SourceID 2133
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