Rijksinstituut voor Volksgezondheid
en Milieu
*Ministerie van Volksgezondheid,
Welzijn en Sport*

NEVO-online 2023: background information

Dutch Food Composition Database 2023

Colophon

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Introduction

The Dutch Food Composition Database (NEVO) contains data on the composition of foods consumed frequently by a large part of the Dutch population. These foods contribute significantly to the intake of energy and nutrients. Foods of importance for specific groups of the Dutch population are also included.

NEVO is owned by the Dutch Ministry of Health, Welfare and Sports, and maintained at the Netherlands Institute for Public Health and the Environment (RIVM). RIVM collaborates with the Netherlands Nutrition Centre in collecting nutritional data. Data in NEVO originate from chemical food analyses, food manufacturers, international food composition tables or (recipe)calculations. Branded food data were mainly taken from the Dutch branded food database LEDA.
Data published in NEVO-online are freely accessible and can be used to engage in scientific research (nutrition research in particular), the food industry, dietetics and nutrition counselling and/or public health education.

1 The 2023 edition of NEVO-online

Data for NEVO-online are derived from the Dutch Food Composition Database (NEVO).

NEVO-online 2023 contains data of 2323 food items. Since the previous edition (2021), information in the database has been added or revised for a large number of foods. The changes and additions mainly relate to the addition or removal of foods and the updating of nutrient levels. The most important changes and additions are listed below.

- The food group "Meat substitutes and dairy substitutes" is updated. A large number of nutrients from 33 food items, such as vegetarian burgers, vegetarian luncheon meat sausage and almond drink, are chemically analysed on behalf of NEVO. The other foods within this group are, as far as possible, supplemented with data from these analyses, LEDA or from foreign food tables.
- The naming of bread and bread products has been adapted to the amended Commodities Act Decree on Flour and Bread (2020). From 1 July 2022, it is mandatory to designate bread according to this legislation. The names now start with the most important cereal and the mention white, brown or whole grain is included if this was not already present. Example: code 2785 Bread corn, now has the name Wheat corn bread white. To accommodate users of NEVO-online, extra synonyms have been added, so that searching for the 'old' names is still possible.
- Based on the data from the Dutch Food Consumption Survey (2019-2021) and following requests from the Netherlands Nutrition Centre, frequently eaten foods are added to NEVO.
- 'Average codes' included in NEVO-online (such as vegetables, raw average) are recalculated based on consumption data from the Dutch Food Consumption Survey 2019-2021.
- Since NEVO-online 2021, a total of 142 new foods are added to NEVO-online and 26 foods are removed. The majority of the removed foods consist of foods that are no longer available on the market.
- The nutrients niacin equivalents and tryptophan are added. The body can produce niacin (vitamin B3) from the amino acid tryptophan. Approximately 60 mg of tryptophan gives 1 mg of niacin defined as 1 mg of niacin equivalent. For those foods for which both tryptophan and niacin levels are available, niacin equivalents (niacin + tryptophan/60) are displayed. See chapter 6.12.

- The nutrient ergocalciferol (vitamin D2) is added. Vitamin D consists of the addition of cholecalciferol, 25-hydroxycholecalciferol and ergocalciferol. See chapter 6.12.
- The sodium levels in bread are updated using the monitoring data of the 14th national sample of salt content in bread 2022, carried out on behalf of the Dutch Bakery Association (1).

2 NEVO

2.1 Organisation

The Dutch Food Composition Database (NEVO) is part of the Netherlands Food Information Resource (NethFIR).

NethFIR comprises several databases on food and food composition data in both generic and branded foods (nutrients, allergens and characteristics such as sustainability and portion sizes). NethFIR is a shared activity of the Netherlands Nutrition Centre and RIVM. NEVO contains extended food composition data, mainly on generic foods. The Dutch branded food database LEDA contains label data for branded foods. Databases are maintained by RIVM and the Netherlands Nutrition Centre. RIVM focuses on professional users and use of the data in nutrition and/or research whilst the Netherlands Nutrition Centre targets the public and use of the data for educational purposes.
In parallel with NEVO, the National Supplement Database (NES) and the portion size database is also maintained at RIVM as part of NethFIR.

An advisory board with scientific experts, data providers and users of NEVO data advises the NethFIR team. The aim of the management and maintenance of NEVO is to have up to date food composition data. Another important objective is promoting the use of the food composition data.

History
RIVM took responsibility for the maintenance of the NEVO database in 2007. Previously, between 1985 and 2007, Stichting Nederlands Voedingsstoffenbestand (NEVO Foundation) was responsible for the database. This Foundation arose from the committee Uniforme Codering van Voedingsenquêtes (Uniform Coding of Food Consumption Surveys, UCV), which started in 1972 to build a computerized databank containing food composition data. In 1988, a merger with the Dutch Food Composition Table resulted in one central database. The NEVO foundation was disbanded on December 31st 2010.

2.2 International developments

In the past decades, several international projects (e.g., INFOODS, COST99 and EuroFIR) have been instigated to improve the quality and exchange of data from national food composition databases. Standardisation of European food databases affects not only these

databases, but also impacts usage. As a result, increased comparability of food composition data between countries is achieved.

In 2009, the non-profit association EuroFIR AISBL was founded in Brussels, as the follow up of the EuroFIR project that started in 2005. RIVM is a member of this association, as are other organisations responsible for national food composition data globally. The vision of EuroFIR is the delivery of high quality, validated food composition information, which might be used to address food quality, nutrition and public health challenges in Europe, and increased awareness and understanding of the value of food composition data and its importance for consumers to make healthier dietary choices. Its mission is to be the best and only independent broker of validated food composition information in Europe, to facilitate improved data quality, storage and access, and encourage better application of food composition data/ information through harmonisation and training.
Thus, EuroFIR is an important source of knowledge for individual food database compilers. Issues of primary importance include definition and classification of food components and food items, analytical methods, recipe calculations, exchange of data with the food industry, quality assurance, education, and delivery of data to users (www.eurofir.org). Data from NEVO are provided to EuroFIR AISBL for FoodEXplorer, a tool that allows users to search information from most EU Member States as well as Australia, Canada and USA, simultaneously. RIVM uses the tool to complete food composition information for which Dutch data is not available.

3 Use of NEVO-online

Approximately once every two years information from the NEVO database is published online. NEVO-online data is available on a searchable website containing the nutritional composition data of foods. A separate English website is available, with all the information in English, except for some of the reference descriptions. It is possible to search on NEVO food code, name of the food item, synonyms or food group.

Results can be retained to compare them with new search results. It is possible to search based on all or a selection of nutrients. Details per food item including all available nutrients for that food and references per value can be seen. And, if applicable, the recipe on which the food is based is shown. Results can be exported for further use.
More information on How to use NEVO-online can be found at the website.

Background information, such as food group classification, recipes, foods removed or added, explanation of the references and a List of abbreviations and symbols can be found at the website or in the downloadable dataset.

A copy of the complete NEVO-online 2023 dataset can be downloaded after agreeing with the conditions for use.
Using this data is allowed if data are unchanged and with the correct reference, including the version number. The reference to be used is: NEVO-online version 2023/8.0, RIVM, Bilthoven.

The Netherlands Nutrition Centre uses NEVO data to produce printed publications and electronic tools. More information can be found at www.voedingscentrum.nl.

4 Explanation of NEVO-online data

4.1 Data sources for the NEVO food composition database

NEVO food composition data are collected from various sources. All data are evaluated following a standard procedure to check if the data are fit-for-purpose (2). Preferably, food composition data should come from chemical analyses by accredited laboratories. This can be commissioned by research institutes, the Dutch government or the food industry. Quality criteria apply for food identification, sampling, and methods of analysis. Due to high costs for food analysis is it impossible to (re-) analyse all foods frequently. Foreign food composition tables, scientific literature and food labels are important data sources.

Information on missing nutrients can often be obtained from similar foods, calculated from the ingredients (recipe calculation) or by (logical) deduction, for instance

- cholesterol content of plant foods is always zero
- vitamin C content of morello cherries is copied from cherries.

The source of every value in NEVO-online is known and is presented online in the details per food item. More information about the references used can be found in chapter 7.

4.2 Food industry

Because of the large, and rapidly changing, number of industrial foods on offer it's important for NEVO-online to be as up to date as possible. NEVO makes use of a branded foods database (LEDA) which is managed and maintained by the Dutch Nutrition Centre to examine as accurately as possible whether foods are still on the market or if their name or composition has changed, necessitating a revision of the data. Once it is known that a food is no longer available on the market it is excluded from NEVO-online.
Because of the generic character of most foods in NEVO, the aim is to aggregate comparable foods. For foods for which this is not possible (e.g., fortified foods and foods with no alternatives), data are published under the brand name.

The measurement or calculation method of food composition data provided by manufacturers or taken from food labels, is generally unknown. Nutrient declaration on the labels is mandatory for most foods, but usually, the number of components on food labels is limited to eight. In NEVO-online, missing components (vitamins and minerals) are added as much as possible, using additional data from

manufacturers or other sources e.g., calculations from ingredients or expert estimations. Because the source of each component is available at NEVO-online, it is possible to see if the value derives from the manufacturer or from another source.

4.3 Procedures and quality assurance

Food composition data are scrutinised for relevance (foods and nutrients) and quality (analytical method, sampling procedure et cetera). After careful consideration, decisions are taken with respect to food names, allocation of food code numbers including the merging of several tastes and brands et cetera. Selected data are entered into the NEVO database.

Information on missing nutrients is added from similar foods, recipe calculations and logical estimations. If needed, scientific experts are consulted. If multiple values of a component are available for a food, including results of several analytical protocols, a mean value or one of the single values is selected for publication. Foods that do not differ substantially from one another are combined within one NEVO food code.

In the NEVO quality manual, all procedures to maintain and compile data are documented (2). The food data compilation process adheres to internationally accepted standards, as described in the EuroFIR Quality Management System, and the EuroFIR generic flow chart for food data compilation (3-5) is followed. This way, the work is standardised as far as possible and data are quality assured.

During compilation, a number of controls are performed. All data are checked for accuracy, completeness and consistency, for example:

- does total macronutrients per 100 g of food add up to 100 g?
- does the amount of mono- di- and polysaccharides not exceed the total amount of carbohydrates?

Composition of similar types of food is compared to identify errors. Members of the NethFIR Advisory Board perform an audit shortly before the release of a new version of NEVO-online.

Besides assuring the compilation process as a whole, attention is given to the quality of individual values. Therefore, additional information (meta-data) such as origin of foods or numbers of samples, sample description, status of the laboratory (NEN-ISO 17025 accreditation) and analytical methods (validated/accredited), date of analysis, calculation method, reference et cetera are documented. Using the EuroFIR criteria,

documentation of values are further standardized leading to better comparability and easier exchange of data between countries, and easier quality evaluation of data (6, 7).

4.4 Bioavailability and biological activity

Biological availability (bioavailability), which is the proportion of a component that is absorbed in the gastrointestinal tract and can be utilised by the body, is influenced by many factors including the chemical form of the nutrient, other substances present affecting the nutrient and endogenous factors (e.g., nutritional status) associated with the individual factors. Biological activity is the effect the component has in the body and is related to bioavailability.

Data for nutrients given in NEVO not corrected for bioavailability. For some nutrients, however, biological activity of the individual nutrients is considered when calculating retinol activity equivalents (RAE), retinol equivalents (RE), total vitamin E and folate equivalents.

4.5 Variability of data

Information in NEVO should be seen as the closest approximation of actual values. Foods are subject to variation in composition for various reasons. Natural variation amongst comparable foods may arise from differences in breed or variety, cultivation or breeding method, soil conditions, season, harvest time, and storage conditions.
Differences in composition may also arise in production although these processes are subject to stringent quality requirements. The use of different ingredients by the industry or at home is another potential source of variation.

For dishes based on recipes, NEVO uses standard recipes described in the cookbook: ‘Het Nieuwe Kookboek’ (8) as a starting point. In daily practice, however, deviations will be the rule rather than the exception. This may result in a generic food composition, that will often deviate from what is actually consumed.

4.6 Potential pitfalls in the use of food composition tables

Data in food composition tables are intended to reflect reality as closely as possible. These data are frequently used in software for nutritional calculation, and for retrieving and comparing the composition of food items. However, whilst compilers must demonstrate adequate quality control and timely revision of data, users should be aware of the limitations of these tables (9).

Missing values
NEVO-online does not include all foods on the Dutch market. Equally, not all components are available for every food item included. Macronutrients (i.e. protein, carbohydrates, fat and water) are complete for the majority, but some individual fatty acids, dietary fibre, mineral and vitamin values are missing.
An overview of the coverage rate of each food component is available on the website.
Users of NEVO-online are advised to determine how to deal with missing data and to take this into account when interpreting the results of any nutritional calculation.

Comparison with other food composition tables
When working with food composition data it is sometimes necessary to consult several food composition tables. These can be former editions of the national food composition table, foreign food composition tables or food composition tables with a specific scope (e.g., branded data). An important aspect of these comparisons is the identification of the food. Detailed descriptions are needed to be sure the food composition data refer to the same food. Difficulties in translating the name and the fact some foods are country-specific make comparisons between countries difficult. For example in some countries iodized salt in used in bread, but not in other countries. And sometimes foods that look alike, can in different countries be produced by using varying recipes, resulting in different food composition even within one brand.

Another important issue is the definition and name used for components that can easily vary between data sources. For example in some databases, vitamin A is expressed as retinol equivalents (RE), as retinol activity equivalents (RAE) or as retinol in other databases. Another example is carbohydrates which might be presented including or excluding dietary fibre. It is therefore important to carefully read background information for each of the food composition tables used. Furthermore, several analytical methods may have been used, making a direct comparison difficult; see for example Chapter 6.2 on energy calculation.

Differences between NEVO and food labels
Packaged foods declare their nutritional values on the labels. Such information can also be found on the manufacturers' or retailers' websites. Comparison of label information with information in NEVO-online might reveal differences. These may be attributable to the values in NEVO being average values based on data from several references

and therefore not exactly representing a specific brand food item. Furthermore, differences may be explained by using another unit, for example information may be given per 100 ml on the label and be converted to per 100 g in NEVO-online. For more information see chapter 5.2. In addition, changes in the recipes used, can be introduced by the producer between publication of NEVO-online and at the point of sale.

5 Foods

5.1 Description of foods

Names of foods are chosen to describe the food items as appropriately as possible. Sometimes, long descriptions are needed to identify a food and abbreviations may be used in the name. A list with abbreviations and symbols used (English and Dutch) is available. In NEVO-online 2019 synonyms are added to the search options, to get better search results (in Dutch only). Proprietary brands are mentioned only when needed to identify the food item and if the information appertains exclusively to that specific brand.

After clicking on the name of the selected food, additional information about this food item will be shown. This information may appertain to the brands on which the average nutritional value is based, the use of specific cooking fats/oils used for preparing the food, a recipe or whether a food is fortified. In case of a fortified food, the information about the nutrients added by the manufacturer is included here. Brands included in the calculated mean value are mentioned by name if it concerns a limited number of brands. In case of a large number of brands in the calculated mean this is described as ‘Gebaseerd op diverse merken’, meaning ‘based on multiple brands’. It is possible that a food brand which is no longer on the market is still mentioned. This is because an update of the value in the NEVO database was not done since the withdrawal of this particular brand.

5.2 Unit

The composition of foods is expressed per 100 g of the edible part (i.e. meat without bones, vegetables without waste). For foods like fish, vegetables and fruit canned or in glass the value refers to the product after it’s drained out. Foods such as oil and ice cream, which have a density different from water, are often presented per 100 ml on the label. Users should be aware of this difference when comparing label information with NEVO-online data. Values used from the label are recalculated to 100 g by use of a density factor before entering the data in NEVO. In certain cases, the composition of liquid foods for specific dietary uses may be displayed per 100 ml, if the manufacturer has provided such data. When the food composition is not per 100 g of food, this is indicated in the description of the food.

5.3 Recipes and average foods

When insufficient information is available on nutritional composition, this can be calculated as a ‘recipe’ using ingredients. However, recipes vary

widely between regions and may change over time. Standard recipes from a general cook book are used (8). Several recipes are derived from ingredients on the label, to estimate micronutrient values in addition to the macronutrients and salt from the labels.
When a recipe is used to calculate nutritional composition, the details of the recipe are shown with the details per food item (after clicking on the name of the food). Moreover, one of the worksheets in the download file of NEVO-online gives the full overview of recipes.
Averaged foods are included in the same document. Such foods include, for example, ‘boiled vegetables averaged’, ‘sausages without liver products averaged’, ‘raw beef with <5 g fat averaged’, et cetera. The selection of ingredients for these averaged foods was derived from the Dutch National Food Consumption Surveys (DNFCS) 2019-2021 to account for the number of users and quantities consumed. For some averaged foods data on market shares (based on marketing research data or data from manufactures and trade organisations) is used.

5.4 Fortified foods

Many fortified varieties of food items are available on the market. Fortified and non-fortified foods cannot be merged in averaged foods, because of the differing amounts of micronutrients. Furthermore, several brands of the same type of fortified foods cannot be averaged due to fortification with different nutrients and/or with different amounts. This results into more foods published under specific brand names.
A food is considered fortified in NEVO if the nutrient is included in the ingredient declaration of that food, and the content is higher than comparable unfortified products. If several products have a similar enrichment, they can coincide in one NEVO code.

The quantities given in NEVO-online are total amounts including both naturally occurring and added micronutrients. For folate equivalents the higher biological activity of added folic acid is also taken into account (see chapter 6.12). In some foods, the micronutrients are higher due to the addition of additives, e.g. beta-carotene as colouring agent. The content of some nutrients, for instance vitamins, decreases over time. Manufacturers take this into account by adding a larger amount and indicating on the label the amount that will remain at the expiration date.
If a fortified food is chemically analysed for NEVO, several foods have been mixed in an analytical sample. The contents may then differ from an individual brand product.

By clicking at the name of the selected food in NEVO-online, it is shown if the food is fortified and which nutrients were added. Fortification for the food group ‘Foods for special nutritional use’ is not shown, as all vitamins and minerals are usually added to these foods.

Derived components, e.g., folate equivalents or vitamin D, are also marked as fortified if any of the contributing components is fortified. For example when folic acid is added, calculated folate equivalents are also marked as fortified.

5.5 Margarine, low-fat margarine product and other cooking fats

The names ‘margarine product’, ‘low-fat margarine product’ and ‘butter product’ are used for foods that strongly resemble margarine, low-fat margarine or butter, but do not meet the requirements of the Netherlands Food and Commodities Act.

Detailed fatty acid composition of margarines, low fat margarines, cooking and frying fats are not published in NEVO-online, due to lack of reliable and up to date information. This also accounts for recipes containing these fat products as ingredient.
For NEVO-online 2023, it’s decided to use label data to estimate the ingredients of the type of margarine that is most often used in the recipes in NEVO. Fatty acid data are available for these ingredients (oil/fats), so that the fatty acid composition can be calculated. The old type of margarine (code 2063) has been replaced in all recipes by a new NEVO code 5562: "Margarine 80% fat >24 g sat fatty acids salted in NEVO recipes". As a result, the extensive fatty acid composition is now available for many recipes such as biscuits and pastries.

5.6 Sweeteners

The amount of high-intensity sweeteners (e.g., aspartame, acesulfame-K, cyclamate et cetera) in foods is not included in NEVO. The content of energy providing sweeteners sugar alcohols (polyols), e.g., sorbitol, xylitol et cetera, is included; see chapter 6.4

6 Energy and nutrients

6.1 Introduction

The List of components 2023 ' shows the nutrients published in NEVO-online 2023, including international coding according to the EuroFIR thesaurus. Definitions of several nutrients in NEVO are described in this chapter.

Units
Nutrient content is expressed in units used by the Dutch Health Council's Committee on Dietary Reference Values for recommended daily intake (10-12). For macronutrients, the unit is gram (g) whilst for vitamins and minerals it is milligram (mg) or microgram (μg).

Missing nutrient values
If no information is available about a nutrient, the space for the value remains empty.
When nutrient values are missing for one or more ingredients of a calculated recipe, this results in an underestimation of the content of that component in the recipe. Due to this sometimes values do not seem accurate, e.g., the sum of the individual tocopherols is lower than the total amount of vitamin E. As far as possible, missing data have been imputed based on values derived from comparable foods (using NEVO data or other food composition tables), or estimated by recipe calculation based on the ingredients.

Very low nutrient values
In cases where the level is too low to be adequately quantified, the indication 'trace (TR)' is used, which is found in the details per food item after clicking on the food name. For the nutrient value a zero is assigned to allow calculations.

6.2 Energy

Energy available to the body for metabolism, heat production and labour (metabolizable energy) is expressed both in kilojoules (kJ) and in kilocalories (kcal).

The energy content of all foods in NEVO is calculated in kJ and in kcal on the basis of the energy-providing nutrients present in NEVO with the following factors:

- 17 kJ (4 kcal) per gram for protein
- 17 kJ (4 kcal) per gram for carbohydrates (excluding dietary fibre and polyols)

- 8 kJ (2 kcal) per gram for dietary fibre
- 10 kJ (2,4 kcal) per gram for polyols
- 37 kJ (9 kcal) per gram for fat
- 29 kJ (7 kcal) per gram for alcohol
- 13 kJ (3 kcal) per gram for organic acids

This energy calculation complies with EU regulation 1169/2011 on the provision of food information to consumers, for nutritional value labelling of food items (13). In this way, a standardised algorithm for energy calculation is used to yield comparable data.
To calculate energy from carbohydrates, the polyol contents is subtracted and calculated separately, since the energy from polyols is lower than from other carbohydrates.
The EU regulation indicates that the amount of energy derived from dietary fibre is, on average, 8 kJ (2 kcal) per gram of fibre. Similarly, according to EU guidelines, an average of 13 kJ (3 kcal) is provided per gram of organic acid, regardless of the type (13).

6.3 Protein

For analytical values, the protein content is calculated from the amount of nitrogen (gram) * 6.25. For dairy foods, a factor of 6.38 is used.
In addition to total protein, the amount of vegetable and animal protein is published. For composite foods, the distribution of animal and vegetable protein is estimated based on the ingredients. If known, the nitrogen content is also published.

6.4 Carbohydrates

Carbohydrates in NEVO are the available or glycaemic carbohydrates. According to the internationally accepted definition of available carbohydrates (EFSA, labelling legislation EU1169/2011, EuroFIR). According to this definition available carbohydrates comprise mono and disaccharides, polysaccharides and polyols.

Carbohydrates in NEVO consist of:

- Monosaccharides: glucose, fructose and galactose
- Disaccharides (2 monosaccharide molecules): sucrose, lactose and maltose
- Oligosaccharides (>2-<10 monosaccharide molecules): malto oligosaccharides, maltodextrins
- Polysaccharides (≥10 monosaccharides molecules): starch, dextrin, glycogen
- Polyols: sorbitol, xylitol, mannitol, maltitol, isomalt and lactitol

Oligosaccharides are found in minute quantities in foods and, hence, are not included in NEVO-online. Available oligosaccharides should be taken into account in total available carbohydrates, although from the data provided it is not always clear if this was done correctly.

NEVO-online lists: carbohydrates, mono-, di- and polysaccharides and polyols. When analytical values on individual mono-, di- and polysaccharides and polyols are available, the amount of available carbohydrates is calculated from these values. Available carbohydrates can also be calculated by subtracting the content of water, protein, fat, dietary fibre, alcohol, organic acids and ash from 100 gram using the 'by difference' method.

When using carbohydrate values from multiple food composition tables, carbohydrate definitions need to be checked for comparability. The main difference may be found in including or excluding dietary fibre in the carbohydrate values.

6.5 Dietary fibre

Dietary fibre consists of those constituents of plant cells that cannot be decomposed by enzymes in the human stomach and small intestine, e.g., lignin, cellulose, hemi cellulose and pectin. Dietary fibre content depends strongly on the method of analysis used. As far as possible, NEVO contains values for dietary fibre that have been analysed using AOAC985.29 or AOAC991.43 methods, which are currently common in food composition databases. These methods, however, do not take into account the presence of low molecular dietary fibre (e.g., inulin and oligosaccharides) or resistant starch, which are included in the latest definition of dietary fibre (13, 14). The newer AOAC2009.01 method (or modifications, like AOAC2017.16) measures a large part of the low molecular dietary fibre and resistant starch present. In the recent analyses of meat and dairy replacers, legumes and dairy desserts this method is used for the analysis of dietary fibre. Dietary fibre values for other foods are not yet available with this method in NEVO. In NEVO-online dietary fibre is indicated as fibre.

6.6 Fat and fatty acids

In NEVO-online the total fat content is given as well as the following fatty acid clusters: saturated (SFA), trans (TFA), monounsaturated (cis) (MUFA), polyunsaturated (PUFA) and n-3 and n-6 fatty acids. All clusters are published in g/100g of food. The n-3 and n-6 fatty acid clusters are also included within the polyunsaturated fatty acids cluster, and hence should not be added onto the other fatty acid clusters to calculate total

fatty acid content.

The polyunsaturated fatty acid cluster might contain minute quantities of trans fatty acids, as some cis-trans configurations are included, whilst the trans fatty acid cluster contains only trans-trans configurations. The individual fatty acids used to calculate the fatty acid clusters can be found in Composition of fatty acid clusters in NEVO-online 2023.
In addition to the fatty acid clusters mentioned above, NEVO-online also includes individual fatty acids in g/100 g food.

Sum of fatty acid clusters does not equal total fat
A conversion factor is used to calculate fatty acid content from total fat content, because fat contains compounds other than fatty acids, such as glycerol, sterols and phospholipids (15). For most foods, this conversion factor (FACF) is between 0.80 and 0.96. Foods with a high content of phospholipids and sterols (e.g., egg and offal) have a lower FACF and contain less fatty acids. For this reason, and because foods may contain unidentified fatty acids, the sum of the fatty acid clusters (SFA, MUFA, PUFA and TFA) often does not add up to total fat content.

Analytical data individual fatty acids
Because analytical data from several research projects and different periods may have been used, the fatty acids reported may vary. New and more advanced analytical methods allow for the quantification of more individual fatty acids. For some foods, older and more recent data are combined to calculate mean values, which is why the sum of calculated fatty acid clusters is not always equal to the sum of the individual fatty acids.

Fatty acid component patterns
Individual fatty acid data are not analysed for all foods. As the fatty acids component pattern from some types of foods are considered similar, these component pattern can be used to complete missing fatty acid data, e.g. the fatty acid component pattern of full fat milk is used for several dairy products.
The composition of fatty acids in foods consisting of multiple fat containing ingredients is calculated from these ingredients and their relative fat contribution. Due to insufficient available data on the type and amount of fat in margarine, low fat margarine, cooking and frying fats, it is not possible to use this method for these foods. In this case, individual fatty acids are not published (see chapter 5.5).

6.7 Sterols

Cholesterol

The fatty substance cholesterol is found in foods of animal origin. By definition, vegetable foods have a cholesterol content of zero mg per 100 g of food.

Plant sterols

In some foods plant sterols are added for their cholesterol-lowering effect. Their presence and, if known, the amount added is mentioned under ‘Remark’ in the details per food item in NEVO-online.

6.8 Alcohol

Values for alcohol are expressed in grams per 100 g of the food. On labels, alcohol content is often described as alcohol by volume (e.g. 15% alc/vol), which can cause discrepancies.

6.9 Organic acids

Organic acids include compounds such as acetic, lactic, oxalic, citric, malic and tartaric acids. These compounds are naturally occurring in a limited number of foods and are sometimes added to foods for their technological function. When information is available the amount of organic acids is shown in NEVO-online.

6.10 Water

Water is an important compound to establish the nature of a food item and to compare foods. However, many analytical data and most label information do not include water. Where the water content is not known it is calculated by subtracting carbohydrate, protein, fat, dietary fibre, alcohol, organic acids and ash from 100 gram (‘by difference method’).

6.11 Minerals and trace elements

Sodium

All home cooked foods such as boiled vegetables, potatoes, legumes, cereals (rice, pasta, et cetera), prepared meat and fish are reported without added salt unless otherwise stated. The indication ‘prepared without salt’ is not used in the food names.
The wording ‘low sodium’ in the name of a food is used to indicate it is a low-sodium or sodium-restricted food. For a limited number of foods, both the variety with and without added salt is included when both types are available (e.g., salted and unsalted nuts).

Recipes are calculated without added salt where possible. If salt is indispensable for the dish (such as soup) or a food is usually bought

ready-to-eat, salt is taken into account. Recipes for cookies and pastries are calculated with iodine-fortified salt (not bakers' salt).
To estimate the sodium content of foods prepared with salt, reference is made to Dutch Nutrition Council advice 'reduce the use of table salt' (16). To include sodium intake from added salt (during cooking or eating), the following quantities of salt per 100 g can be applied. These figures exclude the sodium naturally present as indicated in NEVO-online.

Per 100 g of food prepared with salt	Estimated amount of added salt in g/100g*
Potatoes, rice and pasta A	0,375
Mashed potatoes	0,625
Vegetables	0,625
Meat, fish, game, poultry, egg, tofu	1,250
Composite dishes	1,000
Gravy	0,750

*1 gram of salt contains 0.4 g of sodium

Foods contain naturally occurring sodium, sodium from added salt, and sodium bound to other compounds (several additives). Analytical values in NEVO are determined by measuring total sodium. For label data it is not always clear if sodium values are produced by chemical analyses or recipe calculation and if sources other than salt (NaCl) are included (such as food additives). In case salt values, mentioned on a food label, are used in NEVO and no sodium value is available, the salt content is converted into sodium content (e.g., 1 g of salt * 0.4 * 1000 = 400 mg of sodium). Sodium content of foods can also be calculated based on the analysis of chloride, assuming all chloride occurs as sodium chloride. However, in NEVO, values derived in this way are only used if there are no values based on the analyses of total sodium content available.

Iron
The iron in foods is present as haem [Fe^{2+}] and non-haem iron [Fe^{3+}]. Plant foods contain exclusively non-haem iron whilst animal foods contain both haem and non-haem iron. In NEVO, the percentage of haem iron is estimated from available literature for all raw and cooked animal foods. These percentages are used to calculate haem and non-haem iron contents for foods in NEVO (17). For composite foods with animal and plant ingredients, the ratio between haem and non-haem iron is estimated as accurately as possible or calculated by using a recipe. In case iron is added to a food it is assumed this is done with

non-haem iron.

Iodine
In the Netherlands, bread is supplemented with iodine by using bakers' salt. Iodine content of a limited number of frequently eaten types of bread is analysed. For most types of bread in NEVO-online, the iodine content is calculated based on the sodium content.

Dutch legislation states that the maximum iodine content allowed is 65 mg/kg bakers' salt. In daily practice, this varies between 50 and 65 mg/kg. For modelling studies and for recipe calculations in NEVO, RIVM applies the iodine content of bakers' salt as defined at 58 mg/kg of salt (18). This iodine level was defined in collaboration with salt producing industry and the Nederlands Bakkerij Centrum (Dutch Bakery Centre) (19). When bakers' salt was used, the iodine content was calculated by: Iodine = g salt (sodium in mg *0.0025) * 58 µg iodine / g bakers' salt. For example: a bread contains 380 mg sodium per 100 g. This is 380 * 0.0025 = 0.95 g of salt. The iodine content will then be 0.95 * 58 = 55.1 µg iodine/100 g of bread.

Where food composition of cookies and pastry is calculated as a NEVO recipe, the iodine content was calculated from retail salt with iodine (21 mg iodine/kg). The iodine content of this salt is in between the content of non-iodised salt (0.44 mg iodine/kg) and baker' s salt. For other industrial foods, it is assumed non-iodised salt was used, unless otherwise specified by the manufacturer.

6.12 Vitamins

Fat soluble vitamins

Vitamin A
Vitamin A in foods is expressed as retinol activity equivalents (RAE) and as retinol equivalents (RE) (20).
RAE is calculated as:
µg retinol + µg beta-carotene/12 + µg alpha-carotene/24 + µg beta-cryptoxanthin/24.
RE is calculated as:
µg retinol + µg beta-carotene/6 + µg alpha-carotene/12 + µg beta-cryptoxanthin/12.

The components retinol and carotenoids beta-carotene, alpha-carotene, beta-cryptoxanthin, lycopene, lutein en zeaxanthin are also shown in NEVO-online.
Lycopene, lutein and zeaxanthin have no vitamin A activity. Other pro

vitamin A carotenoids, gamma carotene and vitamin A2 (dehydroretinol) are not available in the NEVO database and are not included in the calculations of RE and RAE.

Vitamin D

Vitamin D consists of the summation of Vitamin D3 (cholecalciferol), 25-OH-Vitamin D3 (25-hydroxycholecalciferol) and Vitamin D2 (ergocalciferol).

Vitamin D is mainly present in animal foods, mainly as cholecalciferol and 25-hydroxycholecalciferol. Ergocalciferol is formed in some mushrooms and fungi and is also added by manufacturers to, mostly plant-based, foods. Ergocalciferol is included in NEVO-online since 2023. Before 2023, it was mostly assumed in NEVO-online that vitamin D is added to foods as vitamin D3. This was not always correct, it sometimes involved vitamin D2. This has now been adjusted for the foods for which the added nutrient is known.

Sometimes a factor for the activity of 25-hydroxycholecalciferol is used when calculating total vitamin D. 25-hydroxycholecalciferol is then multiplied with factor 5, before making the summation to total vitamin D. From the literature, there is no consensus whether a factor for the activity of 25-hydroxycholecalciferolshould be used or not. Therefore, no factor is applied to 25-hydroxycholecalciferol in NEVO-online.

Cholecalciferol, 25-hydroxycholecalciferol, ergocalciferol and total vitamin D are all published in NEVO-online, which allows the users to apply a factor and recalculate total vitamin D if required.

Vitamin E

Vitamin E consists of several tocopherols and tocotrienols, which vary in activity. Vitamin E is available in NEVO-online as mg α-tocopherol equivalents based on:

*mg alpha-tocopherol + mg beta-tocopherol*0.40 + mg gamma-tocopherol*0.10 + mg delta-tocopherol*0.01.*

Whenever possible the amount of Vitamin E is calculated from contributing tocopherols. In the absence of such data, derivations or estimations of total vitamin E content are used.

In other data sources vitamin E can be presented as mg alpha-tocopherol. In NEVO-online not only total vitamin E but also the individual tocopherols are published. This way NEVO-online users can chose to use only alpha-tocopherol as a measure for vitamin E. Note that alpha-tocopherol value are missing for a considerable part of the foods in NEVO-online. Therefor calculations with alpha-tocopherol as vitamin E give a underestimation of the real value. Data on tocotrienols are not available in NEVO.

Vitamin K
Vitamin K is available in NEVO-online as vitamin K total, vitamin K1 (fylochinon) and vitamin K2 (menachinon). Vitamin K total is the sum of vitamin K1 and vitamin K2. Vitamin K2 is the sum of several types of menachinon, ranging from menachinon-4 (MK-4) to menachinon-10 (MK-10).

Water soluble vitamins
Vitamin B1
Analytical values for vitamin B1 (thiamin), produced in Dutch laboratories, are determined as thiamin (chloride) hydrochloride (thiaminCl.HCl). This is also the preferred analytical method when using data from other sources.

Niacin and niacin equivalents
In NEVO niacin (vitamin B3) comprises nicotinamide and nicotinic acid. In foods and dietary supplements niacin is mainly present as nicotinamide.
The human body can form niacin from the amino acid tryptophan. 1 mg of niacin is formed from approximately 60 mg of tryptophan and defined as 1 mg niacin equivalent. If values for both niacin and tryptophan are present niacin equivalents (niacin + tryptophan/60) are available in NEVO-online.

Folate equivalents
NEVO-online contains data on folate (present in food by nature), folic acid (added to food items) and total dietary folate equivalents.

Total dietary folate equivalents are calculated as follows (10, 21):
*µg naturally present folate + µg synthetic folic acid from fortified foods * 1.7 + (µg folic acid from food supplements * 2.0)*
NEVO does not include food supplements. Thus, the part of the formula in parenthesis is not applicable to total dietary folate equivalents given in NEVO-online.

Folate values for NEVO-online are analysed microbiologically, which is the most frequently used analytical method for laboratories in the Netherlands and abroad. When values are used from foreign food composition databases, preferably values measured by microbiological method are used, if available.

Producers usually calculate total folate by summing absolute quantities of naturally present folate and folic acid. In NEVO, calculations of folate

activity use * 1.7 for folic acid. Consequently, values for fortified foods may be higher in NEVO-online than values given on food labels.

Vitamin B12
Vitamin B12 (cyanocobalamin) is found exclusively in animal foods. Kelp (seaweed) is an exception to this rule, but vitamin B12 in kelp is present in a biologically inactive form and hence is 0 µg/100 g in NEVO.

Vitamin C
Total vitamin C content is the sum of active forms ascorbic acid and dehydro-ascorbic acid.

7 Background information

References

For each nutrient value in NEVO-online a reference is available. The reference details can be found after clicking on the name of a food item in NEVO-online. Not all reference descriptions are available in English. A complete overview of references is available after downloading the NEVO-online dataset.

Next to the reference for each value, the NEVO database contains additional information, in particular for analytical values. This information is used to assess the quality of data and to determine if older values are to be kept or discarded should new values become available. NEVO-online does not report this additional information.

More background information

On the NEVO website more information can be found on e.g., the NEVO food group classification, components published in NEVO, foods added or removed since 2019, and composition of fatty acid clusters. An overview of abbreviations and symbols used is also available.

8 Acknowledgements and members of the NethFIR Advisory board

Acknowledgements
We would like to thank our database managers Ido Toxopeus and Zohreh Ghameshlou for their support in all IT issues. We would also like to thank the Netherlands Nutrition Centre for their cooperation in collecting and exchanging data. In addition, we are grateful for the advice and support of the NethFIR Advisory Board during the production of this new NEVO-online version.

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