



Challenges in the Process of Development and Maintenance of a Modern Bulgarian Food Composition Database: FAO's Project – Real Achievements

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/AJARR/2020/v14i430349

Editor(s):

(1) Dr. Fagbadebo Omololu Michael, Durban University of Technology, South Africa.

Reviewers:

(1) Mamta Kumari Thakur, University of Delhi, India.

(2) Oluwatoyin Bolanle Oluwole, Federal Institute of Industrial Research Oshodi Lagos, Nigeria.

(3) Hari Leela Vemula, Mahathma Gandhi Institute of Technology, India.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/63145>

Review Article

Received 02 October 2020
Accepted 07 December 2020
Published 26 December 2020

ABSTRACT

High-quality food composition data should be representative of national food habits and consumption patterns. They should be generated according to established standard international guidelines so that they are comparable and reliable. Well-designed tables and databases should include a good selection of food components and majority of commonly consumed foods. However, this is often not the case as many tables only include raw foods and a small number of nutrients while processed and fortified foods are lacking.

The aim of this review is to focus on the importance of national food composition databases; to show the current status of the problem in Bulgaria; and priorities in the development of a new modern database; in order to attract the attention of stakeholders (government institutions, universities, research institutes, manufacturers and independent specialized laboratories).

Keywords: Food composition; nutrients; database; health.

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1. INTRODUCTION

Food chemical composition data describes the food nutrients and energy content as well as bioactive components such as phytochemical compounds, antinutrients and/ toxic components. The included nutrient values are mainly from chemical analyzes performed in analytical laboratories, or evaluated from other relevant data [1].

The data reflecting foods chemical composition are of major importance for the nutritional quantitative studies and are widely utilized in various related scientific fields. The information concerning the concentration of nutrients and important dietary components are usually presented in form of tables or databases for food composition [1,2].

Each country has its own model of consumption as a result of country-specific foods and recipes. Therefore, each country has a specific need of nutritional composition data as the availability of food at a local level is different. Food composition data should be generated in accordance with international recommendations, so that they are comparable and reliable [1].

The National Center of Public Health and Analyses (NCPHA) is a partner in international projects and, being a principal executive of the scientific plan on the topic “Bulgarian Food Chemical Composition Tables”, the Center is continuously accumulating data to build-up a modern food composition database.

NCPHA was a partner in FAO project in Europe “Collection and compilation of analytical food composition data in the region of Europe and Central Asia”.

FAO (Food and Agriculture Organization of the United Nations) supports three Global Goals [3]:

- Eradication of hunger, food insecurity and malnutrition
- Elimination of poverty
- Sustainable management of natural resources

FAO’s mandate is to ensure food security and nutrition for all by making agriculture, forestry and fishery more productive and sustainable.

The second International Conference on Nutrition (ICN₂) in Rome (2014) organized by FAO and WHO, with the participation of UNESCO, UNICEF and the World Bank proceeded

under the slogan “Accurate Food Composition Data in easily accessible form allowing intelligent and confident choice and usage of food are highly necessary for eliminating malnutrition and ensuring healthy diets” [3].

FAO, together with the Food Research Institute of the National Agricultural and Food Centre of Slovakia organized a workshop, where participants from Belarus, Bulgaria, Croatia, Hungary, Kazakhstan, Moldova, Slovakia, Russia, Turkey and Ukraine were trained to collect data from analytical data sources and to compile them. The workshop took place in April 2016 at the Food Research Institute in Bratislava, Slovakia. The workshop provided training to the data collectors from the participating countries, which covered each aspect of the data collection process. The workshop was the inception element of a regional FAO project, which aims to collect and compile good quality, reliable, traceable, properly documented analytical food composition data [4].

The aim is to support countries with data that would be freely available for end users both in the selected countries and broader in the region, and could serve as a basis for the development of a fully functioning national food composition database, which is in line with international standards [4,5]. The workshop was followed by the actual data collection in participating countries between April-August 2016.

The specifications for the collected analytical data were as follows [6]:

- ▶ The data collections should cover only food composition data (FCD) generated by analytical laboratories, universities, control state authorities and published in journal articles.
- ▶ Each country should supply a minimum of 100 items (food lines) from each country.
- ▶ The data sources should be documented in Bibliography worksheet.
- ▶ The scanned original references of the collected datasets should be delivered in electronic format to the coordinator.
- ▶ Pre-specified format for presentation of the data should be agreed.

Restrictions and requirements for the collected analytical data [7]:

- ▶ Data from food labels or from unknown origin/author are not acceptable.

- ▶ Data from already published food composition tables or datasets cannot be compiled.
- ▶ Up to date food composition data, analyzed by accredited methods are preferred.
- ▶ It is recommended and requested that food composition data are collected for local foods.
- ▶ Data on foods produced by or frequently consumed in the participating country are preferred.
- ▶ FCD of foods that are raw materials, processed foods, industrial commercialized food products or traditional dishes are accepted.
- ▶ Foods with full nutritional profile (protein, amino acids, fat, fatty acids, carbohydrates, starch sugars, dietary fiber, water, alcohol, ash, minerals and vitamins) are preferred [6,8].

The intake of energy, proteins, vitamin A, iron, calcium etc. [7,9] is of particular importance for public health. With restricted financial and human resources, the priority is assigned to the provision of data on the most important foods in raw state and in the most frequently encountered forms in which they are consumed.

After the data collection, the analytical FCD filled in the FAO/INFOODS Compilation Tool was sent – together with original references in electronic format – to the Slovak Food Research Institute, where the compilation of datasets was started. The datasets were checked and submitted to FAO INFOODS platform by 31 December 2016 [8].

Specifics of the analytical data that are to be collected:

- ▶ Food name – mandatory for correct identification of food:
 - National food name
 - Food name in English
 - Scientific food name (if relevant, recommended for interchange of data) [10]
- ▶ Food code – each food needs an individual food code
- ▶ Food group – helps putting together foods with similar composition.

There were some advices for creating food name [11,12,13]. Food name has to be pertinent (fitting).

- The name should be narrow rather than broad.

- Two or three words may be needed.
- The composition data are normally presented per 100 g edible portion on fresh weight basis.

The food name shall contain following information (if relevant):

- Origin (beef, sheep etc)
- Type/Variety/Sort
- Cooking method (boiled, grilled, steamed)
- Preservation method (UHT, dried, fermented)
- Part of animal or plant (leaf, pulp, chop)
- Color (green, red)
- Amount of component (whole fat, 3,5% fat, reduced fat)
- Fortification/enrichment
- Brand name /Producer [11,12,13].

The food items were listed within the food groups in alphabetical order. It was recommended that similar food were listed close to one another. Some countries may add specific food groups because of their high numbers of foods in a group or due to the importance of specific foods in their diet. Table 1 presents the classification system used for the Project purposes [4,13].

Table 1. Classification system

Food group code	Food group name
01	Cereals and their products
02	Starchy roots, tubers and their products
03	Legumes and their products
04	Vegetables and their products
05	Fruits and their products
06	Nuts, seeds and their products
07	Meat, poultry and their products
08	Eggs and their products
09	Fish and their products
10	Milk and dairy products
11	Fat and oils
12	Beverages
13	Miscellaneous

Each food must have a food code and it must be unique. The Food code cannot be changed or deleted. The national food coding system can be

used for identification of the food in the Compilation Tool and in case of unavailable national coding system the code structure could be used:

Country code - food group code – xxx, while xxx is an ordinary number within the food group [4,13].

Examples:

BG01001	Biscuits “Zakuska”, cocoa
BG02001	Sugar beet, raw
BG07003	Chicken fillet, roasted

Currently finalized project activities:

1. The chemical composition of 140 foods has been documented, as follows:

- ▶ Individual code for each food;
- ▶ Food name (in Bulgarian and in English);
- ▶ Food description (where applicable);
- ▶ Number of independent analytical samples;
- ▶ Number of repeated tests per sample;
- ▶ Values of 32 nutrients;
- ▶ 94 original references.

2. Energy values (kcal (kJ)) have been documented; as well as values of humidity; protein; fats by Soxhlet; saturated; monounsaturated and polyunsaturated fatty acids (FA); available carbohydrates by difference and total carbohydrates by difference; sugars; sucrose, glucose and fructose; dietary fibers; ash; vitamin A (as all-trans retinol); β -carotene; vitamin E (as alpha - tocopherol); vitamin B₂; vitamin C (as L-ascorbic acid); Ca; Fe; Mg; P; K; Na; Zn; Cu; Mn; sodium chloride and dry matter [4].

3. The nutrient profile of 38 bread types has been presented as well as of: 4 types of biscuits; 6 types of croissants; 2 types of flour; 3 types of layered pies and strudel; 1 type of sugar beet and 5 types of fruits; 6 types of pepper relish and sterilized salads; 13 types of nuts; 17 types of wafers and candies; 13 types of juices; 14 types of meat and meat products; 18 types of milk and dairy products [4].

4. Analytical data from 94 original references have been used: 92 laboratory protocols; 1 poster presentation at a Congress; 1 scientific publication; 1 paper with Bulgarian standards with the used methods for food analysis.

The National Center of Public Health and Analyses has built-up the so called Archival Database containing analytical data of 140 foods and has laid the foundation of the establishment of an up-to-date Database for Chemical Composition of Bulgarian Foods [14]. The published data from Tables for the Composition of Bulgarian food products, printed some 40 years ago, are outdated and do not reflect the occurred changes in recipes, technology and current food production. The chemical composition of the input materials has been modified.

Disadvantages of the developed so far Tables:

- Analytical data is limited;
- The origin of the nutrient values for most foods is unknown;
- Lack of traceability;
- Different formats of presented information;

Future priorities:

- It is necessary to consider for which foods the values need to be updated; Taken into account the changes in the pattern of food consumption; And the potential changes in food production, agro-food processing, food processing, trade and storage, and include:
- Missing foods in the existing national database as well as novel foods and novel processed food products (1).

2. CONCLUSION

To date, the existing "Archival database" includes 222 foods and macro- and micronutrient composition thereof should be supplemented and extended.

It should be recognized that food composition data are not simple numbers; a great deal of knowledge is needed to generate, compile, update and use these data adequately. Adequate training in food composition data generation and application should therefore be included in universities and other formal training of nutritionists, dieticians, food processors especially the industrialists and other users [15].

Further studies of the macro- and micronutrient composition are needed for the implementation of an up-to-date chemical composition database. It is also crucial to provide public funds or engage external sponsorship for the development of a comprehensive National Programme for Food Composition.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
<http://www.sdiarticle4.com/review-history/63145>