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The Slovak national food composition database: New management system DaRiS

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ABSTRACT

DaRiS, a new food composition database management system (FCDBMS), has been developed for documentation of food composition data in Slovakia. The database organisation conforms to the existing requirements on food composition data structure, notably EuroFIR recommendations. In this first phase, the software is designated solely for collection and storage of original data. The main goal of the system is to create a tool for effective food composition data documentation with respect to source, how acquired, method, relevance and quality. In addition, the system was developed to include the existing Slovak food composition database with its former arrangement. The paper describes the new system which can be easily utilised also internationally.

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1. Introduction

Food composition databases (FCDBs) play an important role in various professional domains including food labelling, dietary guidelines, assessment of nutrient intake, formation of specific diet models, epidemiological studies, consumer choices, identifying allergens in restaurants, etc. (Bell et al., 2011; Church, 2009; Greenfield and Southgate, 2003; Williamson, 2005). There is a trend to unify the requirements for FCDBs and harmonize database structure to produce high quality, unique and internationally comparable food composition data (FCD) (Egan et al., 2007). European countries, with their long history and position among the foremost FCD producers worldwide have already taken a major step towards this goal.

Within the European Food Information Resource project "Network of Excellence" (EuroFIR NOE, 2005–2010) (Finglas et al., 2010) a complex set of rules, guidelines, and recommendations, such as requirements for FCDBs, a system of controlled vocabularies (thesauri) for FCD description and identification, standard operating procedures for data compilation, quality framework for analytical laboratories and FCDBs, communication tools and centralised web platforms for FCD, have already been created (Becker, 2010; Castanheira et al., 2009a,b; EuroFIR Thesauri, 2013; Ireland and Møller, 2010; Khokhar et al., 2009; Pakkala et al., 2010; Reinivuo et al., 2009; Westenbrink et al., 2009). The initiative has been enhanced by continuing project EuroFIR NEXUS (2011–2013), which focused on further progress in unification requirements and advancement of quality standards, certification auditing of member organisations, integration and maintenance of EuroFIR information systems – especially the internet database platform (FoodEXplorer formerly eSearch) – and food composition database management system (FCDBMS). Important achievements towards avoiding duplication of compilation work are Data and Document Repository Services (EuroFIR NEXUS, 2013).

In 2009 the non-profit association EuroFIR AISBL (Association International Sans But Lucratif) was established to develop, manage, publish FCD and promote international cooperation and harmonisation through improved data quality, data searchability and standards. Maintaining and expanding the network of FCD-compiler organisations in European countries and beyond,

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and long-term sustainability, are other activities (EuroFIR AISBL, 2013). Undoubtedly the most important accomplishment of the EuroFIR partners endeavour so far is the approval of a document describing the basis for the framework that facilitates and enables generation, compilation, dissemination and interchange of food data in a unified way by the European Committee for Standardisation (CEN). The framework was published as the standard "Food data–Structure and interchange format" (CEN, 2012).

Most European countries and databanks have already started harmonizing their FCDBs according to EuroFIR requirements and/or the CEN standard. For example, Spain set up a special FCDB network and produced a national Spanish database compiled from different local databases. The database includes FCD described using EuroFIR thesauri and is exploitable in a special communication tool designed for different end-users in the country (Martínez Burgos et al., 2009; Ros et al., 2009). The database is published on the internet as well (BEDCA, 2013). The Irish FCDB has also been compiled using EuroFIR requirements; it is available on-line and incorporated in the FoodEXplorer (Black et al., 2011). In the Czech Republic, the Centre for Food Composition Database was established through a merging cooperation of two institutes. The activities of the centre are supported by the Czech Ministry of Agriculture. Through this initiative, FCDB activities have been revived after the division of Czechoslovakia in 1993. The Czech database made progress by starting to use the Slovak database first, which it then enriched by collecting new analytical FCD. The compilers have taken also an important step towards harmonisation of the database. The database is available online as well (Machackova et al., 2010, 2013). Likewise, the Slovenian FCDB has advanced in harmonisation based on the requirements. The national FCDB was reorganised prior to the further development and documentation of new data, and foods were therefore re-indexed to be compatible for communication with different parties using the EuroFIR internet database platform (Korosec et al., 2013). Finally, the Portuguese national FCDB, in addition to the implementation of a new compilation process to comply fully with EuroFIR requirements, focuses its activities to the development and application of quality management system for the national FCDB in alignment with EuroFIR guidelines (Oliveira et al., 2010).

Among other outputs, specialised datasets of FCD for selected ethnic and traditional foods consumed in a group of European countries have been produced by harmonised EuroFIR procedures and published. Information about ethnic foods is essential for accurate advice and information to targeted consumers to reduce the risk of diseases. On the other hand, traditional foods are the key elements of differentiation of culture and dietary patterns, thus it is essential for each country to identify their own distinctive foods, record recipes, produce relevant FCD and document the information. By implementing sound procedures for producing high-quality FCD it is possible to generate new, reliable and comparable data all over Europe (Costa et al., 2010; Khokhar et al., 2010).

The progress in FCDB improvement has been observed in all EuroFIR members, and this was confirmed also at the second annual EuroFIR Nexus meeting in March 2013 in Ljubljana, Slovenia. Harmonisation usually proceeds systematically, starting with an inventory of the existing FCDB, continuing with identification of weak/strong points, setting priorities for future needs and defining particular tasks to meet the goal, i.e. to produce a comprehensive high quality FCDB. However, the undertaking of individual harmonisation steps may differ from country to country based on the FCD quality, relevance of the information comprised in the FCDB, technical advancement, staff qualification, etc. In general, adoption of the requirements concerns the three main elements: FCD and related meta-information (e.g. data documentation and identification, non-nutrient data), procedures (quality management system, e.g. standard operation procedures for compilation, guidelines on analytical method evaluation) and computerised system (tools for data handling, dissemination and communication with users).

The Slovak Food Composition Data Bank (SFCDB) has been following this direction as well, conforming its structure and methodology to the harmonized requirements. Many problems have been identified in the SFCDB which prevented proper use and were to an obstacle to abiding by the current European FCDB methodology. One of the most serious flaws of the SFCDB was an inappropriate computerised tool for data collection and documentation. The existing software stores limited information about particular nutrients and foods (Holčíková et al., 1996; Porubská et al., 2004; Vargic, 1998), and thus FCD in the software could not be documented in compliance with the EuroFIR requirements or other recognised recommendations.

Sufficient data documentation is in fact crucial and basic for proper comprehension of food composition. Currently, it is required that as much non-nutrient information as possible (sources, references, descriptors, methods, links, notes, etc.) be recorded into the database for each datum, if available (Becker, 2010). Precise documentation makes it possible to avoid collecting identical data apparently originating from different sources: this improvement fundamentally increases the credibility of a database. At the same time, data are comparable internationally.

The user should be able to trace back each piece of data either to the source document or, in the case of analytic data, to a laboratory reference; or, if it is estimated, it should be possible to ascertain just how this was done and from what other data. Moreover, it is important to maintain older data as part of the system. In case the foods are no longer available on the market, data should be retained for comparison purposes in the FCDB (Rand et al., 1987). Unlike printed tables with FCD, modern computerised data systems can accommodate non-nutrient data and generate a variety of tables and files with a specific subset of numeric, descriptive and graphical information (Greenfield and Southgate, 2003).

This paper describes a new computerised FCDBMS recently developed for the Slovak food composition compilers, which follows European recommendations and can be easily utilised internationally as well.

2. Materials and methods

2.1. Initial steps and analysis

At first, based on an inventory of the existing Slovak FCDBMS and procedures (Holčíková et al., 1996; Strmiska et al., 1977; Vargic, 1998) and considering EuroFIR requirements (Becker et al., 2007, 2008; EuroFIR Thesauri, 2013; LanguaL, 2012; Reinivuo and Laitinen, 2007; Vásquez-Caicedo et al., 2008; Westenbrink et al., 2009) a testing Excel spreadsheet file for documentation factoring in local specificities was designed at SFCDB. The spreadsheet consisted of tables with mutual relations (Fig. 1). Its structure improved as the compilers in data documentation gained training and knowledge. This approach helped compilers to analyse the existing FCDB system, identify weak points, train themselves on data documentation, and thus deal with limited financial resources. Only after the structure had been approved by compilers and a set of data had been documented was the spreadsheet provided to a programmer. Following the structure and relations in the spreadsheet and based on the compilers' experience, the programmer elaborated software requirement specifications for a new FCDBMS. The creation of the software methodology covered three aspects: integrated development and database environment, standardised database structure and adaptability of the existing

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