



## STUDY REVIEW

# Brazilian Food Composition Database: Internet Dissemination and Other Recent Developments

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A database of food composition was created by BRASILFOODS/USP to centralize the information obtained in the country and is available on the Internet (<http://www.fcf.usp.br/tabela>). This is the best device to launch this information, as it enables a dynamic data update and also provides an easier approach at reduced cost. The first version of the Web site was created in 1998 and has been changed according to the availability of new data and to the users' needs. The database was elaborated considering the aims and criteria conceived by INFOODS/LATINFOODS/SAMFOODS, targeting data validation and interchange. The main intent of the paper is to illustrate aspects related to the database evolution (content, data quality evaluation, structure and difficulties) and its dissemination on the Internet. The awareness of positive and negative aspects of the database and also the identification of the reasons which determined them, can contribute to improve the database as a whole. Based on these observations, a great number of activities is already being carried out as follows: the optimization of the search by foods, the procedure of data compilation and analyses of new foods and nutrients, and also the search for new partnerships and government financial support. © 2002 Elsevier Science Ltd. All rights reserved.

*Key Words:* food composition; database; compilation; analysis; Internet approach.

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## INTRODUCTION

A survey of the use of food composition information in Brazil by nutrition professionals revealed that they use mostly foreign tables because data on nutrient contents in the country are still scarce, incomplete, obtained with inadequate techniques and related only to raw foods. The Brazilian tables were elaborated in the 1970s based on foreign data compilation, which do not show the actual composition of foods consumed in the country, and they have not been updated. The situation is

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worse for biologically active non-nutrient compounds (Lajolo, 1995; Lajolo and Menezes, 1997a).

Based on the survey above, a national project (Food Composition Integrated Project) to compile existing data and also to analyse food items was established, based on local priorities indicated by nutrition surveys. Collaborative studies on analytical techniques were also undertaken (Filisetti, 1997). Special attention has been given to the preparation of tables for dietary fibre, carotenoids and micro-nutrients (Lajolo, 1995; Lajolo and Menezes, 1997a, b).

The Food Composition Integrated Project coordinated by the Food and Experimental Nutrition Department, University of Sao Paulo (USP) and BRASILFOODS has been carrying on activities to update food composition data, as well as improving data quality and communication among laboratories. This project involves the participation of 27 units distributed nationally (researchers from universities and private and public organizations) and its main aim has been the elaboration of the Brazilian food composition database. Besides, it has been playing an important role in the elaboration of the Latin American Food Composition Database (Masson, 2000; De Pablo, 2000; FAO and LATINFOODS, 2000).

In a first initiative of national data compilation was detected relatively low quality information (Lajolo and Menezes, 1997b). The main problem concerning food proximal composition data was related to dietary fibre analysis in vegetable products. Many authors have not analysed fibre. Others have used an inadequate methodology to quantify the dietary fibre (crude fibre or neutral detergent method). So, many reports had incomplete data that could not be used, showing the necessity of efforts towards the improvement and uniformity of analytical procedures.

Thus, the efforts of the Food Composition Integrated Project have been to analyse new foods, compile, and evaluate a considerable amount of information and also to establish the Brazilian food composition database.

Besides the necessity of reliable updated data about food composition, a great interest has been observed in several countries in finding a broad and fast way to disseminate these data. The Internet was considered the best approach and it can be verified in some examples, as the U.S. database (U.S. Department of Agriculture, USDA, 2001) and the German database (Souci-Fachmann-Kraut Online-Database, 2000).

A dynamic and clear Web site is important not only for those who generate information but also for the users. Therefore, a Web site must offer a great amount of information, attractive design and simple interfaces so that the update information can easily be retrieved.

An ideal Web site is not formed by just one Web server (Castagnetto *et al.*, 2001). It must include: (1) a way of storing data and searching them quickly as a relational database based on Structured Query Language (SQL); (2) a way of processing orders and user forms and also of creating documents with suitable information; (3) tools assuring not only the high performance and eventual bugs correction, but also the content supply despite the technological changes of hardware and software; (4) tools with minimal licence payments requirements. Currently, the greatest challenge to the group responsible for the elaboration of the Brazilian food composition database Web site is to establish and maintain a constant positive balance among these aspects.

The Internet also provides lower costs when compared with other printed dissemination. An important source of dietary fibre and resistant starch data from Iberian-American countries was concluded and published. It was quickly used up as it was a unique updated publication. In order to keep the dissemination of these

data, the Internet was chosen as the most suitable device (Menezes and Lajolo, 2000).

The paper provides a description of the recent developments in the compilation and Internet dissemination of the Brazilian food composition database.

## PROCEDURE

The database was elaborated from chemical analyses and a survey of information on national food composition from publications, dissertations, internal information of governmental and private laboratories, groups of research and food industries, and further compilation of the data involving a careful evaluation of the information. In parallel to this, certain components were analysed at Sao Paulo University in order to complete the information. The dietary fibre can be mentioned as an example of components analysed to enrich information. A great part of the dietary fibre data was analysed through specific methodology (enzymatic-gravimetric) so that the carbohydrates and energy values could be calculated in a more precise way. Also, the carotenoid content of *in natura* and processed foods were analysed at Campinas State University (Rodriguez-Amaya, 1997).

The compilation of the food composition data involved a careful evaluation of information in which several factors were considered, such as the number of samples, sampling plan, sample handling procedures, analytical method, analytical quality control, detailed identification of nutrients and foods, etc.

A previously elaborated form was used to facilitate the compilation of food composition data (Menezes *et al.*, 1997). The first part contains information about the food identification. A second part contains information about the nutrients (average rate, variation, standard deviation, units, methodology, edible part, conversion factor for protein, etc.) (Greenfield and Southgate, 1992; Klensin *et al.*, 1989; Burlingame, 1998). The last part is related to the quality of the data, providing consistent and objective information for evaluation of published data on nutrient composition. This information is critical for planning future analytical studies and for effective use of data. The system used here reflects the basic concepts described by Holden *et al.* (1987), Holden (1997) and Mangels *et al.* (1993).

The nutrients in the database were expressed according to INFOODS tagnames (Klensin *et al.*, 1989; Burlingame, 1998). Tagnames identify a food component unambiguously, specify a method of analysis, and include the unit of measure. The main tagnames used in the Brazilian food composition database, are listed in Table 1.

For food identification, the INFOODS guidelines (Truswell *et al.*, 1991) and the topics in agreement with LATINFOODS (FAO, 1985) were adopted to describe foods. This approach is a broad and multifaceted mechanism using a series of descriptors. Some changes and adaptations had to be introduced according to the kind of food, mainly for the manufactured ones. In some situations, it was also necessary to enlarge the number of fields up to four for some descriptors. Furthermore, the following descriptors were adopted for food identification: generic, kind I, kind II, kind III, kind IV, part, maturity, process I, process II, process III, commercial name, scientific name, variety/strain, source, and reference. Table 2 shows examples of the food identification used in the database.

The utilization of international rules proposed by INFOODS to the nutrients and nomenclature targeted the integration and validation of Brazilian database in both national contexts, and also worldwide.

TABLE 1  
Main tagnames used in the database

Nutrient description	Units	INFOODS tagnames
Protein, total	g	<PROCNT> Total protein calculated from total nitrogen. FAO/73 conversion factors (Greenfield and Southgate, 1992)
Lipid, total (fat)	g	<FAT> Total lipid <FATCE> Total fat derived by analysis using continuous extraction (Soxhlet methods)
Fibre, total dietary	g	<FIBTG> Total dietary fibre determined by enzymatic-gravimetric or non-enzymatic-gravimetric methods (for fruits with little starch) of AOAC (Cho <i>et al.</i> , 1997; Li and Cardozo, 1992)
Fibre, insoluble dietary	g	<FIBINS> Insoluble dietary fibre determined by enzymatic-gravimetric methods of AOAC
Fibre, soluble dietary	g	<FIBSOL> Soluble dietary fibre determined by enzymatic-gravimetric methods of AOAC
Moisture	g	<Water>
Ash	g	<ASH> Ash
Carbohydrate, total	g	<CHOCDF> Total carbohydrate calculated by difference (100 g – total grams of water, protein, lipids and ash)
Energy	kcal	<ENERC_KCAL> Total energy calculated from energy-producing food. Standard conversion factors originally derived by Atwater: kcal = (4 × g total protein) + (4 × g carbohydrate (total carbohydrate – dietary fibre)) + (9 × g total lipids) + (7 × g ethanol)
Resistant starch	g	<STARES> Resistant starch determined by the method proposed by Goñi (Goñi <i>et al.</i> , 1996)
Vitamin A	µg	<VITA> Vitamin A calculated by summation of vitamin A activities of retinol and the active carotenoids. Total vitamin A activity = µg retinol + 1/6 µg β-carotene + 1/12 µg other provitamin A carotenoids
Fatty acids, total saturated	g	<FASAT> Total saturated fatty acids
Fatty acids, total monounsaturated	g	<FAMS> Total monounsaturated fatty acids
Fatty acids, total polyunsaturated	g	<FAPU> Total polyunsaturated fatty acids
Cholesterol	mg	<CHOLE> Cholesterol

In relation to the Internet environment description for data retrieval, several tools were used. Personal Home Page Hypertext Preprocessor (PHP), version 4.1.1 was used as the pre-processor served for scripts montage beside the server. Some external modules with open source code and free distribution such as XML (eXtended Markup Language) of James Clark, Zlib, PDF (Portable Document Format), GD of Tomas Boutell, Aspell and Mind Flash were activated. Some of these modules were used as GD Library for image edition, and others, like the XML server, were activated for future use (Castagnetto *et al.*, 2001). The Microsoft® Windows 2000 has been used as platform and the Microsoft® Internet Information Server 5.0 (IIS 5) as Web server. The database was created in Microsoft® Access 2000 and has been accessed by Application Program Interface Open Database Connectivity (API

TABLE 2  
Examples of food identification

Code	Food name	Generic	Kind I	Kind II	Kind III
A 515	Biscuit, sweet, chocolate, with coconut cream, "Break-up"	Biscuit	Sweet	Chocolate	Coconut cream
A 506	Corn, popcorn, for microwaves, bacon, raw, "Hikari"	Corn	Popcorn	For microwaves	Bacon
A 105	Bread, oat, loaf, with fibre, diet	Bread	Oat	Loaf	With fibre
A 98	Bread, wheat, loaf, with fibre, diet, "Diet Bread"	Bread	Wheat	Loaf	With fibre
A 92	Bread, wheat, loaf, whole, classic	Bread	Wheat	Loaf	Whole
B 317	Squash, pumpkin, ripe, raw, <i>Cucurbita moschata</i> , Menina Verde	Squash	Pumpkin		
B 319	Squash, pumpkin, ripe, fried/ 10', <i>Cucurbita moschata</i> , Menina Verde	Squash	Pumpkin		
B 241	Broccoli, boiled/10', <i>Brassica oleracea</i> L., Hamanore	Broccoli			
B 243	Broccoli, microwaves/ 6' HP <i>Brassica oleracea</i> L., Hamanore	Broccoli			
C 203	Mango, ripe, <i>Mangifera indica</i> L., Golden	Mango			
C 200	Mango, unripe, <i>Mangifera indica</i> L., Haden	Mango			
G 198	Drink milk, creamy, plum, with yoghurt, light, "Corpus"	Drink milk	Creamy	Plum	With yoghurt
G 214	Yoghurt, fruit pulp, strawberry, with jam strawberry, "Danfrut"	Yoghurt	Fruit pulp	Strawberry	Jam strawberry
G 173	Milk, cow, omega 3, partially-skimmed, UHT, "Vigor"	Milk	Cow	Omega 3	

  

CODE	Kind IV	Maturity	Process I	Process II	Commercial name	Scientific name	Variety	Source
A 515					"Break-up"			Danone
A 506			Raw		"Hikari"			Hikari
A 105			Diet					
A 98			Diet		"Diet Bread"			
A 92	Classic							
B 317		Ripe	Raw			<i>Cucurbita moschata</i>	Menina Verde	SP
B 319		Ripe	Fried/10'			<i>Cucurbita moschata</i>	Menina Verde	SP
B 241			Boiled/10'			<i>Brassica oleracea</i> L.	Hamanore	SP
B 243			Microwaves/6' HP			<i>Brassica oleracea</i> L.	Hamanore	SP
C 203		Ripe				<i>Mangifera indica</i> L.	Golden	
C 200		Unripe				<i>Mangifera indica</i> L.	Haden	
G 198			Light		"Corpus"			Danone
G 214								Danone
G 173			Partially-skimmed	UHT	"Vigor"			Vigor

ODBC), PHP module incorporated. The Microsoft® WordPad 5.0 was the application used to write the scripts.

## FOOD COMPOSITION DATABASE PROFILE

### *The Internet Approach*

The Brazilian Food Composition Database Web Site (USP, 1998) ([www.fcf.usp.br/tabela](http://www.fcf.usp.br/tabela)) was created in 1998. After that, other versions were elaborated annually with new data and modifications in the structure. The current version was elaborated using a third generation design with the PHP language and access to database (Microsoft® Access 2000).

There are several available alternatives to PHP, such as Microsoft Active Server Pages (ASP), ColdFusion and Java (Castagnetto *et al.*, 2001). However, all of them offer advantages and disadvantages. Some can only operate in very specific environments, some depend on having special licence and others are still costly. Being free not only for personal use but also for commercial and educational purposes, the PHP can be implemented in several platforms (Microsoft, Mac or Unix). Moreover, it has wide-ranging utilization instructions on the Internet, which facilitates learning. It also offers direct access to several relational databases (Oracle, Sybase, PostgreSQL, mSQL, MySQL, etc.), and access via ODBC, when necessary. In conclusion, the PHP is in continuous development, increasing new functions and correcting errors.

The Windows 2000, IIS 5.0, Access 2000 and WordPad 5.0 were chosen for having previously implemented options and availability for academic use under licences of Microsoft Corp. The Access 2000 was the application used for database development as it creates active relational databases, compatible with the standard SQL. The access to the database has been fulfilled through API ODBC and SQL language commands, which are used on standard programming for accessing and handling information from Access 2000.

This Internet approach was chosen as it offers a number of advantages over the traditional printed materials. One of the main advantages is closely related with the faster update of data. This is a considerable aspect for the countries where the practice of suitable food chemical analysis has been recently achieved and is still going through constant changes in structure and evolution. So, the substitution or introduction of data can be obtained in a more dynamic and precise way. Another advantage is related to the cost of its elaboration, since the costs of printed materials are prohibitively high for developing countries. Some disadvantages of the Internet approach could be mentioned, such as the difficulty in accessing data which are previous to the last update and also the lower number of people accessing Internet in developing countries, although this situation has been changing remarkably.

The Web site is made up of information concerning national foods or products commercialized in the country and is presented in five files for the following sets of nutrients: proximal composition; dietary fibre; resistant starch; vitamin A and carotenoids; fatty acids and cholesterol. The information about each nutrient is distributed in three "database tables": (1) data—it contains figures referring to the components based on 100 g of edible part of food; (2) food index—it contains the foods listed in alphabetical order, giving the food code, the complete food name and the code of data origin; (3) references—it contains the bibliographic reference of each data. In parallel to this, other links are accessible in the site, focusing the complement of data not available. The Web site quotes 16 publications elaborated

by members of BRASILFOODS about adequate procedures for analysis, compilation and data utilization of food composition.

A statistics system has been established recently. It involves a set of routines whose aim is to obtain a brief description of the users: the highest access according to month, day, schedule; language; origin of the users from different continents (general information); the most used browser, system and colour resolution (hardware profile); other important information for the Web site management. An on-line version of the data compilation form (Menezes *et al.*, 1997) cited in the Procedure section has been prepared, as well as the personal register form which aims to identify potential analysts and compilers.

#### *Development of Data Content*

The proximal composition file includes 696 raw, cooked or processed foods as shown in Table 3.

A great increase in the number of data, comparing to the former Web site version—July, 2000—was obtained concerning manufactured products (gelatines, cakes, puddings, pies, ice creams, flan, soups, spices—from 11 to 138), cereals (sweet and salted biscuits, breakfast cereal, breads, corns, oats—from 65 to 169) and dairy products—from 18 to 82. This increase in information was possible due to our relationship with Brazilian food industries which have been changing their attitude towards food composition. The creation of the Web site in 1998 played such an important role among food industries that they have been sending statements about analysis details and complementary information on analytical methodology, analytical quality control, conversion factors and others. Based on this, an adequate evaluation of information and its inclusion in the Web site were possible.

The number of analysed products (Table 3) indicates priorities taken over proximal composition. As it is necessary to analyse the dietary fibre of regional fruits, vegetables and other products to increase the food figures, efforts are being made in order to increase the analyses of these products (Lajolo *et al.*, 2001). Despite the interest of food industries in collaborating, there are still few data available, considering the diversity of products in the national market. For this reason, a compilation of information about 300 manufactured products (meats, sausages, cereals and others) has been prepared.

TABLE 3  
Number of foods according to food groups and nutrients of the database

Code	Food group	Proximal composition	Dietary fibre	Resistant starch	Vitamin A and carotenoids	Fatty acids/cholesterol
A	Cereals	169	61	42	—	13
B	Vegetables	97	70	74	219	1
C	Fruits	50	30	8	51	8
D	Fats/oils	17	—	—	8	16
E	Fishes/shellfishes	67	2	—	1	33
F	Meats	43	—	—	—	41
G	Milk and dairy products	82	7	1	5	1
J	Eggs	15	—	—	—	1
K	Sugar/sweeteners	11	6	—	—	3
R	Manufactured products	139	44	3	6	—
S	Regional elaborated foods	6	6	—	—	2
Total		696	226	128	290	70/49

The complete names and information about raw or cooked foods are available in the Brazilian food composition database, similar to the U.S.A. database (USDA, 2001). This sort of information is important, as a large amount of foods is not consumed raw and alterations in the contents of different nutrients can occur during preparation. In these two databases, a large number of manufactured foods show the trademark in order to facilitate the search for the product actually being consumed. In the German database (Souci-Fachmann-Kraut Online Database, 2000) the trademark of manufactured product is not shown and most vegetables appear raw, which makes necessary the use of yield and nutrient retention factors. This database also shows an interesting service, although not yet complete, that is the composition calculation of foods mixture, but based in the raw foods database.

As the number of foods is rather large, the databases become too extensive and the retrieval by food facilitates the user search. Such procedure is adopted in the U.S.A. database which contains 6000 foods (USDA, 2001) and German database with 800 foods (Souci-Fachmann-Kraut Online Database, 2000). Currently, the Brazilian food composition database requires a first access to a group of food and only after this to a specific food. However, the food groups are too extensive, and data retrieval is thus difficult. Aiming to facilitate this, the search for each food will be included in the next version.

The adopted methodology in the database reflects the one that has been frequently used by the majority of the analysts for the selected nutrients. It is important to emphasize that another method would be more adequate for certain components. For example, carbohydrates are calculated by difference, when the ideal would be a separate analysis of each component or fraction. The German database (Souci-Fachmann-Kraut Online Database, 2000) adopted the latter methodology. In the short term, it is expected that analysts can adopt this methodology, as it happened with dietary fibre analysis. In the most recent years, the crude fibre method has been substituted by the enzymatic-gravimetric methods in most laboratories. This change occurred as a result of analysts' consciousness about the errors in the crude fibre methodology and the compulsory inclusion of dietary fibre on food labelling.

The dietary fibre file of the database (Table 3) includes information about total dietary fibre of 226 foods, soluble and insoluble dietary fibre of 65 foods, and content of moisture to facilitate data export. We have included only data obtained with enzymatic-gravimetric methods of Association of Official Analytical Chemists (AOAC) (Cho *et al.*, 1997) or non-enzymatic-gravimetric methods (Li and Cardozo, 1992) in the case of fruits with little or no starch for dietary fibre. It is important to comment that energy intake can be miscalculated depending on the data on fibre since the carbohydrate is usually obtained by difference. Comparing the energy intake of the Brazilian population calculated using fibre contents obtained by crude fibre analytical method, 11% energy overestimation was observed (Lajolo and Menezes, 2001). For instance, for a typical Brazilian diet (for women, between 18 and 30 years and moderate activity) containing rice, beans, meat, vegetables and fruits, the fibre intake would be 7 g using crude fibre or 27 g using the enzymatic-gravimetric methods. The real energy intake, in that case, would be 8790.6 kJ (2100 kcal) and not 9837.1 kJ (2350 kcal). Another example of analytical method affecting the energy calculation can be found in the Argentinian table (Closa and Landeta, 2002) that shows some foods analysed by crude fibre and others by dietary fibre.

All the tables relate the components based on 100 g of food, while the North American table offers the user several options concerning home measures (cup, spoon, or small, medium and large sizes). The new version of Brazilian food composition database will also include data in this way.

*Evaluation of dietary fibre data quality.* Food composition data are very relevant to any study of human nutrition. An important consideration related to data is its quality control, which ensures the reliability of the information. It is not enough to have just data but their quality has to be evaluated. The application of a clear and accurate program of quality control is crucial for data gathering (compilers), for exact analysis of nutrient (analysts) and for the correct data interpretation and utilization (users).

Considering the importance of the quality evaluation of the compiled information, the dietary fibre data were evaluated in accordance with the model proposed by Menezes *et al.* (2000). It describes with details the necessary procedures for adequate evaluation and compilation of dietary fibre data, focusing their inclusion in food composition database. In order to facilitate the application of these quality control criteria, standardized questions and decision pathways (pattern schemes) were elaborated (Caruso *et al.*, 1999; Menezes *et al.*, 2000).

This model was grounded on studies carried out by USDA with other nutrients, such as selenium, carotenoids and folates (Holden *et al.*, 1987; Mangels *et al.*, 1993; Holden, 1997). According to criteria set forth by Holden *et al.* (1987) and Mangels *et al.* (1993), adaptations in the parameters were introduced so that it would be more suitable when applying to data referring to fibre (Menezes *et al.*, 2000). Data quality parameters usually include: suitable number of samples, sampling plan, sample handling procedures, analytical method and analytical quality control.

The results achieved in quality evaluation data of the Brazilian foods were 29% under codes A and B. The other foods (71%) were classified under code C, meaning that the user might have less confidence in it because of limited quantity and/or quality of data (Menezes *et al.*, 2000). The high number of C-graded foods was in part due to the lack of detailed information about the analytical procedures, insufficient number of samples or poor description of the analytical quality control used. Another factor is related to the non-usage of standard reference material.

The quality evaluation of the dietary fibre allowed not only the assessment of reliable actual data, but also the identification of priority foods for analysis. The evaluated dietary fibre data allowed users to obtain acceptable information on the intake of dietary fibre by the population (Lajolo and Menezes, 2001; Lajolo *et al.*, 2001).

Considering that dietary fibre and resistant starch may have a complementary role in the prevention of determined chronic diseases (Asp *et al.*, 1994), the latter component has been evaluated in Brazilian foods according to the method proposed by Goñi *et al.* (1996). The database includes the content of resistant starch in about 128 foods submitted to different kinds of processing (cooking, cooling and freezing) (Table 3).

Table 3 includes the number of compiled data related to saturated, mono-unsaturated and polyunsaturated fatty acids (70) and cholesterol (49). The number of foods analysed is still scarce for these nutrients, and this is critical from a nutritional point of view.

In relation to minerals and vitamins data (except vitamin A) it can be said that these components' analysis is a priority to basic Brazilian foods. The information about minerals and vitamins being evaluated presents a high variability of results due to the different analytical methods applied and also because of the non-utilization of analytical quality control. Therefore, a very low number of data shows relevant reliability and in consequence, they are not likely to be included in the Web site.

The database contains accurate information about vitamin A contents of available and potential food sources (290 foods) and part of the samples were analysed through separation and quantification of provitamin A isomers (Table 3). The

content of vitamin A was calculated through the addition of vitamin A activity of retinol and carotenoids (total vitamin A activity =  $\mu\text{g}$  retinol +  $1/6 \mu\text{g}$   $\beta$  carotene +  $1/12 \mu\text{g}$  other provitamin A carotenoids). A series of factors can be responsible for the differences found in the carotenoid contents of the same cultivar or variety of vegetable (Rodriguez-Amaya, 1997).

Due to their conjugated system of double bonds, the carotenoids are highly unstable structures. Heat, light, acids, oxygen and enzymes lead to modifications or partial destruction of pigments. The exposure of the carotenoids to such agents results in the formation of cis isomers, colour decrease, loss of provitamin A activity and formation of volatile compounds, which are responsible for the modification of the food flavour. Cis and trans isomerization can occur during the food processing and storage. When the isomers were not separated, the vitamin A activity was overestimated, which demonstrates that the isomer separation is necessary for the accurate determination of vitamin A activity in foods.

The complete and detailed identification of food is of decisive importance for data compilation and will bring benefits for users and analysts, so that a right decision can be made on introducing the most correct information of the food in the database. For instance, the content and availability of provitamin A in foods are influenced by many variables: stage of maturity (ripe/unripe); time of the year (winter/summer); processing (raw/processed); kind of processing (lyophilized/dehydrated); variety/cultivar; storage (time/conditions); analysed portion. These points have to be considered in order to explain the variable content of provitamin A in foods and increase the confidence in the information.

#### *Further Considerations*

The resolution number 40, March 21, 2001 (Brasil, 2001) of National Sanitary Surveillance Agency (ANVISA), Health Ministry of Brazil, rules the compulsory nutritional labelling of packed foods and beverages. This resolution demands the declaration of nutrients of current and potential public health concern (food energy, protein, carbohydrates, total lipids, saturated fatty acids, cholesterol, dietary fibre, iron, calcium, and sodium) on the packed products labels based on food portions. Due to this resolution, the industries will have few months to update their product labels. Also, the information about food composition can be obtained through chemical analyses and/or food composition database. It is important to stress that the Brazilian food composition database was indicated as reference to the establishment of this resolution. The ANVISA indication shows the importance and the great utility of this Web site in the national context concerning public health. Besides, the necessity of its enlargement in order to fit not only the user needs but also the current law has been reaffirmed.

The geographical size of our country can be considered as one of the main reasons for such limited number of data concerning the nutrients and foods, that indirectly makes it difficult to retrieve, produce and organize food composition data. In order to integrate the several organizations in charge of food composition spread out all over the country, and also, to increase the awareness of a greater number of researchers and governmental institutions about the importance of this topic, BRASILFOODS has adopted as its priority to continue coordinating the Food Composition Integrated Project, as well as to enlarge and fit the activities according to its needs.

The Brazilian food composition database (USP, 1998) was the first database disseminated on Internet in Latin America and it has been loading the Latin American database (FAO and LATINFOODS, 2000).

## CONCLUSIONS

The Brazilian Food Composition Database is available on line (USP, 1998). It shows a strictly evaluated nutrient data and food identification structure according to the international patterns, making the data interchange among several regions easier all over the world. Being compared with other databases available on line, it could be verified that despite the limited number of data on nutrients and even foods, it is meaningfully well structured and likely to be increased. The Web site has been remarkably valuable in the food composition area. It has been accessed by many professionals nearly 110 times a day and has also been indicated as reference by the Health Ministry of Brazil. Considering the complexity of the works related to the food composition, it is necessary that industries, researchers, analysts and the government work together in order to develop and increase this information in a dynamic, economical and accurate way.

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