The Swedish-American Influence on Food Composition Databases

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In a historical perspective the American influence on the nutrient databases of the world is far more comprehensive than the Swedish one. But let us first start with some comments on the written databases or the food composition tables.

Food composition tables

Albuminates + extractive substances, fat, carbohydrates, salts, water, refuse, the relation between the different energy providing nutrients, the price per kg and per 'skålpund' food, expressed in öre (1/100 of one SEK). A 'skålpund' is 425 g, thus similar to a pound. The relation between albuminates = protein, fat and carbohydrates should be 1 : 0.75 : 3 but could be 1 : 0.50 : 4. This information was included in the first Swedish food composition table: *The composition, the nutrient value, price and cheapness of our most common foodstuffs* (1). It was published in 1885 by a physician, August Almén. This table was followed by several food lists with nutrients added.

The former National Institute of Public Health, one of the forerunners to the National Food Administration, NFA, was established in 1938. One task of the institute was to analyze foodstuffs for nutrients. A new food composition table *Foodstuff tables* was published in 1947 (2) by Professor Ernst Abramson, the first head of the Institute. The nutrient values of this table were based on the institute´s own analyses and those from the Swedish food industry, but also, according to the introduction, on *McCance and Widdowson, Chemical Composition of Foods* and *Tables of Food Composition, U.S. Dep. of Agriculture No. 572*. Your 1945 edition of the Recommended Dietary Allowances (RDA) also seems to be included in this table, even if the reference is not given. This conclusion can be drawn from the second edition of the table, 1952, where the source is stated to be the Food and Nutrition Board, Washington, 1948. Still today the Swedish Nutrition Recommendations are largely based on your RDA and are used in nutrient databases and text-books. The Abramson table exists today side by side with the official tables published by our Administration. To Abramson´s name a new author has been added and the table has now changed name to *Diet table (3)*.

The great American influence on food composition tables and databases started first in the 1960s. But other events have occurred that had and still have importance for both our food composition tables and databases.

Standardized measuring cups and spoons

At the end of the forties, the head of the KF Test Kitchen (KF = The Swedish Co-operative Union and Wholesale Society) Anna-Britt Agnsäter, visited the USA. There she was very impressed by your use of standardized measuring cups and spoons in recipe construction. As a matter of fact, she postponed the publishing of the first edition of the test kitchen´s cook book *Our Food* (4) in order to use standardized measures in the recipes. Furthermore, she also

activated another KF branch, Gustavsbergs, in order to produce a measuring set in plastic. The set contained initially four parts: 1 dl (100 ml), 1 table spoon (15 ml), 1 teaspoon (5 ml) and a spice spoon (1 ml). Today a 1/2 dl measure and a coffee measuring spoon (20 ml) have also been added.

Standardized food measures

Mrs. Agnsäter was also influenced by your *Handbook of Food Preparation* (5), as the Test Kitchen produced a *Food cooking key* (6). The idea of that handbook was later passed on to the present National Board of Consumer Policies. So far Board has published 9 editions of *Measures for Foods* (7). As a matter of fact, when I started to work at the Board on revising the fifth edition of the booklet, I was given your handbook and a German one (8) and was asked to study it in order to pick up new tables for the booklet. These standardized food measures, as weights per household measure, per serving and density for foods are used in recipe construction for databases. As the National Food Administration needed more standardized portion sizes, food weights and density information to be used in our databases, we compiled our own *Weight table* (9). In producing that booklet we compared and sometimes borrowed values from two of your books, namely *Agriculture Handbook No. 456* (10) and Bowes & Church´s *Food values of Portions Commonly Used* (11).
Lately the Board and the Nutrition Division at the NFA have discussed producing a handbook on standardized food weights and serving sizes for use in recipes and in meal planning. Another set of serving sizes is also needed for dietary studies. A Nordic project group is planned to review dietary surveys, in which the weighed food record method has been used, in order to establish serving sizes for different categories of people.

Yield studies

Another idea that Mrs. Agnsäter and others partly picked up in the USA was yield studies on home recipes. To consider yield and trying to find high-yield cooking methods for industry and catering foods was and is still vital for businesses, but to study yield on home recipes was not so common. One of the first things I learnt when working on the above-mentioned Board was how to perform yield studies on fish at the KF Test Kitchen. This knowledge I had good use for when revising the Measures for foods and later when making all the recipes for our database. As a matter of fact, the main part of the yield values in our database derive from Measures of Foods and the KF Test Kitchen, but some yields are also American (12,13). It was very good to have this background too, when writing the report on *Nutrient Losses and Gains in the Preparation of Foods* (14).

Food groups

Food guides have been in use since 1916, when the first was presented in the USA by Langworthy and Hunt (15). These guides have been presented in many different shapes: circles with different numbers of food groups, 8, 7, 6, 5, squares, rectangles, pillars, serpent form, pyramids - ordinary or squared - , plate or in plain text (16).
Since 1953 Sweden had a diet circle and the first official dates back to 1963. Both were based on the US Seven Groups´ Guide, but somewhat modified regarding the vegetable and fruit groups.

Even our circle has been revised since 1963 and given a new name, the Food Circle, we still have the old grouping system both in our food composition tables and in our food composition databases. The first figure in the code refers to the food group and you don't easily change a code system. But we are also using more differentiated food grouping in our national dietary survey and in other dietary studies.
In 1974 Mrs. Agnsäter created the Swedish Food Pyramid. This is used side by side with the circle, but is not official, like your pyramid. But nonetheless our new food circle is a compromise between the old diet circle and the pyramid.

Cooking terms

KF´s Test Kitchen is one of the leading cookbook producers in Sweden. *Our Cookbook* has been published in 18 editions since 1951. For writing cookbooks standardized cooking terms are needed. But the list we have had was limited. Therefore, in 1992, the present head of KF Test Kitchen, Christina Möller came up with the idea of a book with standardized Swedish cooking terms with definitions and English translation of the terms included. The book, *Cooking Terms - The Test Kitchens explain* (17), was written in co-operation with two other test kitchens. Langual was one model available to the authors of the Cooking Terms and if the book will be fully translated to English you might also have use for the terms. The cooking terms in our database are not yet as differentiated as in the book. But these Swedish standardized terms will probably be used in the future together with Langual.

Earlier Swedish databases

In the beginning of the 1960s, the National Institute of Health, together with IBM in Sweden, developed the first Swedish computerized nutrient calculation system. That system was still used in the middle of the 1970s (18). At that time, Professor Arvid Wretlind was head of the Department of Food Hygiene and he seemed to have had good contacts with American scientists in nutrition. Considering that you started to use computer technology for nutrient databanks in the end of the 1950s, one must say that we in Sweden adopted your idea very quickly. I still remember when we had to go to the IBM office in order to get the database updated.
As the system was rather expensive both to update and to use in processing of different dietary studies, the NFA decided to make a new system of our own. This work started in earnest in the late 1970s in order to be used in a national dietary study on children in Sweden. The system was developed in co-operation with the Nutrition Division and the Data Processing Division and was ready for use in 1981 (19). All people involved collected and studied available literature on nutrient databanks, mostly in American journals and books. It was a real highlight both for the systems analyst, Hans-Björn Eriksson, and I, to come over here and study your systems, and for me to attend my first Nutrient Databank Conference in 1982.

NUTSYS

As all of you know, when you have been working for several years with a system you realise that it is possible to make the system function better. From 1984 to 1987 we had our second systems analyst for our nutrient data bank, Hernán Isakson. He was used to working with relation databases and he explained to us that all our information should be based on stable data structures, which are not affected by changes in the organisation, working routines or technology. Such stable structures enable large flexibility in the activities and, best of all, you don´t need to reconstruct the database from scratch when different changes in the base are needed. Under the chairmanship of Hernán Isakson, a symposium was held in 1987 with the Nutrition Division and the Data Processing Division on data modeling of food registers. Many of the ideas and wishes emerging from this symposium were taken up later in a pilot project group working between October 1991 to December 1992 with Wulf Becker as project leader and Hernán Isakson as consultant. In 1990, our old computer system that was run on a Nord-100 minicomputer was replaced by a UNIX-based network with personal computers as working stations. The main task of the pilot project group was to investigate the possibilities to replace our old system with a new system. The conclusion of the project report, *NUTSYS - a food and nutrition composition and information management system* (20), was that it would be necessary to develop a new food composition database system. The new system should fulfill the following main criteria:

Table 1

- based on modern computing and informatics techniques and standards
- flexible, i.e. easy to develop and modify further
- user-friendly
- designed to enable easy communication with other systems for data exchange
- NFA´s software for program development must be used

The group identified a number of functions and modules that should be included in the new system. The most important are:

Table 2

- registers for foods, nutrients and other substances
- database for nutrients and other substances
- recipe calculation system
- reference system for compositional data
- modules for print-out of food composition tables
- system for handling data from dietary surveys including validations of food and nutrient intake data
- system for menu planning

NUTSYS - specific requirements are:

Table 3

- storage of an 'unlimited' number of foods, components
- indication of origin, quality, source, etc. of a value
- indication of the period during which a value is valid
- indication of the origin (country, region) of a food
- indication of the method of preparation and processing of a food
- indication of the density, portion weight, etc. of a food
- grouping of foods and components according to different criteria
- use of multiple names, languages, codes etc.
- exchange of recipe ingredients, breakdown of recipes
- use of yield and retention factors in recipe calculation

The preliminary model shown in figure 1 was rather comprehensive. Therefore the project group limited it. The current model is within the dotted lines.

EuoroNIMS

At the FLAIR Eurofoods-Enfant Project meeting in May 1991 in Crete, we met a Belgian group working on a system similar to ours. This group suggested a European co-operation in order to build up a new common system, based on the Belgian NUBEL Institute system, NIMS (Nubel Information Management System). As we knew by experience how much it costs to develop a new system, Wulf Becker took contact with the Belgian party in order to discuss co-operation. Also other countries were interested in co-operation. From the beginning there were several countries in this co-operation together with two technical partners (Logimed, Belgium and IDUFIC - Ian Unwin, United Kingdom). The group took the name EuroNIMS that stands for European Nutrition Information Management Systems. Other countries have later joined the co-operation. The partners contributed with their own work in this early stage of the project. Sweden offered, e.g. the NUTSYS structure and suggestions. A Technical Advisory Committee, with people such as Wulf Becker, Sweden, Anders Møller, Denmark, Jayne Ireland-Ripert, France and Ian Unwin, UK, has been established and, together with the technical team of Logimed, is responsible for the development of EuroNIMS. The group is now evaluating and implementing all the suggestions received from the partners.

Here are some of EuroNIMS version 1.0 features:

Table 4

- client-server architecture
- multilinguality both at the user interface and data storage
- international food identification (country, organisation, sequential and version number)
- parallel management of different coding and classification systems
- registration of food manufacturers and distributors and of analytical laboratories
- registration of items as aggregated or representative foods
- a range of algorithms for the calculation of recipes, using yield and retention factors
- facilities for Langual encoding

A preliminary version 0.9 has been released. It is compatible with several data base management systems, e.g. Sybase, SQL Server, Oracle and Ingres.

The EuroNIMS application is an MDI (Multiple Document Interface) application. In other words, you can open several windows or documents in the main window. In version 0.9 there are four main documents:

Table 5

- A **food item** document: information about a certain food item
- An **organisation** document: information about an organisation
- A **contact person** document: information about a contact person
- A **value** document: information about values of a certain food item/component

Each document has one or more views. A view contains data about the document opened. For instance: a food item document contains the Naming View, that shows all the names that are related to a food item.
The EuroNIMS application has two toolbars, one menu and one document. The buttons included in the tool-bars make it easier to handle the different kinds of information that you want.

Ian Unwin and Wulf Becker have just finished a report, *Component Aspect Identifier. A Tool for Handling Food Component Information in a Food Database Management System* (21). The Component Aspect Identifier (CAId) is proposed as a convenient method of structuring and summarising data associated with analytical, calculated and imputed compositional values. Aspects include component identification, mode of expression, analytical or calculation method, source reference and value quality.

The information is structured as follows:

Mode of Expression with Code, Category Code, Meaning and Comments
Table 6

Xnon-weight expression of component (e.g. monosaccharide equivalents)
Rexpression as a ratio (e.g. essential to total amino acid ratio)
Fexpression in terms of alternative food measures
Cexpression in terms of another component (e.g. amino acids per g nitrogen)
Pexpression as a percentage (e.g. energy, percent contributed by carbohydrate)

Mode of Expression			
Code	Category	Meaning	Comments
M	X	as monosaccharide equivalents	For available carbohydrates. It may co-occur with other codes, in which case it precedes them
R	R	ratio	For any components. It requires two component part identifiers. It may co-occur with other codes, in which case it precedes any except code 'M'
W	F	per food weight	
V	F	per food volume	
D	F	per dry weight	
N	C	per g nitrogen	For amino acids
P	C	per g protein	For amino acids
F	C	per 100g total fatty acids	For fatty acids
E	P	percent contribution to energy	For alcohol, total available carbohydrate, total fat and protein

Origin Type with Flag Code, Category Code, Meaning and Method Part Association
Table 7

Aanalytical results
Ccalculated values
Iimputed values

Origin Type			
Code	Category	Meaning	Method part association
a	A	analytical result(s)	'Headline' analytical method
b*	A	analytical results set	'Headline' analytical method
c	A	selected value based on analytical results	'Headline' analytical method
d	C	value derived as simple average of accepted contributing results	'Headline' analytical method, if applicable
e	C	value derived as average of accepted contributing results, weighted by sample size	'Headline' analytical method, if applicable
g	C	calculated as aggregate food item	Missing value indicator
h	C	calculated as recipe	NLG factor set; Missing value indicator
i	I	imputed from similar food (value taken across unmodified)	Identifier of similar food
j	I	imputed from related food (value modified)	Identifier of related food
p	C	calculated on component profile	Component profile keyword or profile food identifier
s	C	summation from constituents	Constituent set keyword
t	C	summation including conversion factors	Conversion factor keyword, e.g. (ENERC) STDT: energy, Atwater, total carbohydrate (VITE) USDA: factors for alpha-tocopherol equivalents
x	–	no origin information available	–
* Reserved for possible implementation later			

Source Type with Flag Code, Code, Meaning and Reference Part Association
Table 8

Source Type			
Flag	Code	Meaning	Reference part association
o	own	inhouse or affiliated laboratory	Internal document identifier
i	ind	industry or independent laboratory	External document identifier
f	ftb	food composition table	Food table identifier
p	pub	published in (non-ftb) journal, book, report, etc.	Reference identifier
s	sys	value created within host-system	System identifier
e	els	other source (elsewhere)	External reference identifier

The work within EuroNIMS continues with different domains as:

Table 9

- parallel grouping systems for classification of food item.
- recipe system
- bibliography system
- quality index for values

The bibliographic information includes e.g.:

Table 10

- code
- author
- title
- publication
- volume
- year
- country

At present, partners from at least five countries, United Kingdom, Sweden, Norway, Hungary and France, are testing the 0.9 version. The 1.0 version is planned to be released later this year.

Conclusion

Now, when you have heard this information on the Swedish-American influence on food composition databases you might ask yourselves, how large the Swedish influence will be on the next generation of databases. Perhaps you will adopt some of the applications suggested by NUTSYS. Anyhow this question is rather difficult to answer. But I will try to do so with an experience that I had some years ago. At that time, I did a very interesting study of the Journal of the American Dietetic Association. I went through all the volumes we have in our library, and that goes back to the 1936 issue of the journal. I was looking for information on food composition tables, computer and computer processing, recipe calculation, yield studies, nutrient changes in the preparation of foods and diet information tools.
There I found the same thing that you realise in every domain when you look at it in a historical perspective. Every idea follows an undulation in time and place. What you think is completely new, has been dealt with before. It is a flow that continues. Sometimes, however, you get better tools that make it easier to develop the ideas though, such as the computer. What is important with, e.g. EuroNIMS, is that compiled knowledge in nutrition, chemistry, computer science, etc. from several countries is brought together. The inspiring fact is, that through co-operation between people, ideas are moving back and forth and the working result is constantly getting better. Good examples for this process and progress are EuroNIMS and your Nutrient Databank Conferences, with their dissemination of knowledge.

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Figure 1. The preliminary data model. The current model is within the dotted lines.