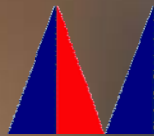




# Strengths and weaknesses of existing food classification systems

Jayne Ireland & Anders Møller



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EFSA Scientific  
Colloquium  
on Food Classification  
23 June 2010,  
Parma, Italy



# What is a classification system?

- **Dictionary:** a listing of words and phrases giving information, e.g. definitions, usage, origin, equivalents in other languages
- **Classification/taxonomy:** a structure that organizes concepts into a hierarchy, possibly in a scheme of facets
  - **Facet:** clearly defined, mutually exclusive, and collectively exhaustive aspects, properties or characteristics of a class or specific subject
- **Thesaurus:** a structure that manages the complexities of terminology and provides conceptual relationships, through classification/ontology
  - Descriptors authorized for indexing and searching form a **controlled vocabulary** (index language)
- **Ontology:** a system of entities with the relationships between them explicitly defined, with a system grammar (or syntax) and an inference engine

*Source: D. Soergel (2002), Thesauri in Digital Libraries, JCDL 2002, Portland, OR, USA*





# Food Classifications

The point of view is important



Classification  
is a point of  
view

*Source:  
Danish Food Hygiene campaign,  
Danish Food Agency 1994*





# Existing food classification systems

## Specific international food classification systems

- Food additives (CIAA, Codex Alimentarius GSFA)
- Pesticides (Codex Classification of Foods and Feeds, CCPR)
- Contaminants (Codex Classification for Contaminants and Toxins, GSC)
- EC Common Nomenclature, PRODCOM (Eurostat), World Trade Organisation, ...
- Global Product Classification (GS1 GPC, GSDN Food and Beverage Extension)
- European Food Groups (Cost Action 99/EFCOSUM) and EFSA Food Categorisation (Concise European Food Consumption Database)
- Food Composition Databases (EuroFIR classification)
- ...

and many, many different national food classifications







# Important questions to ask about Food Classification Systems

Food classification systems are reporting level and purpose specific:

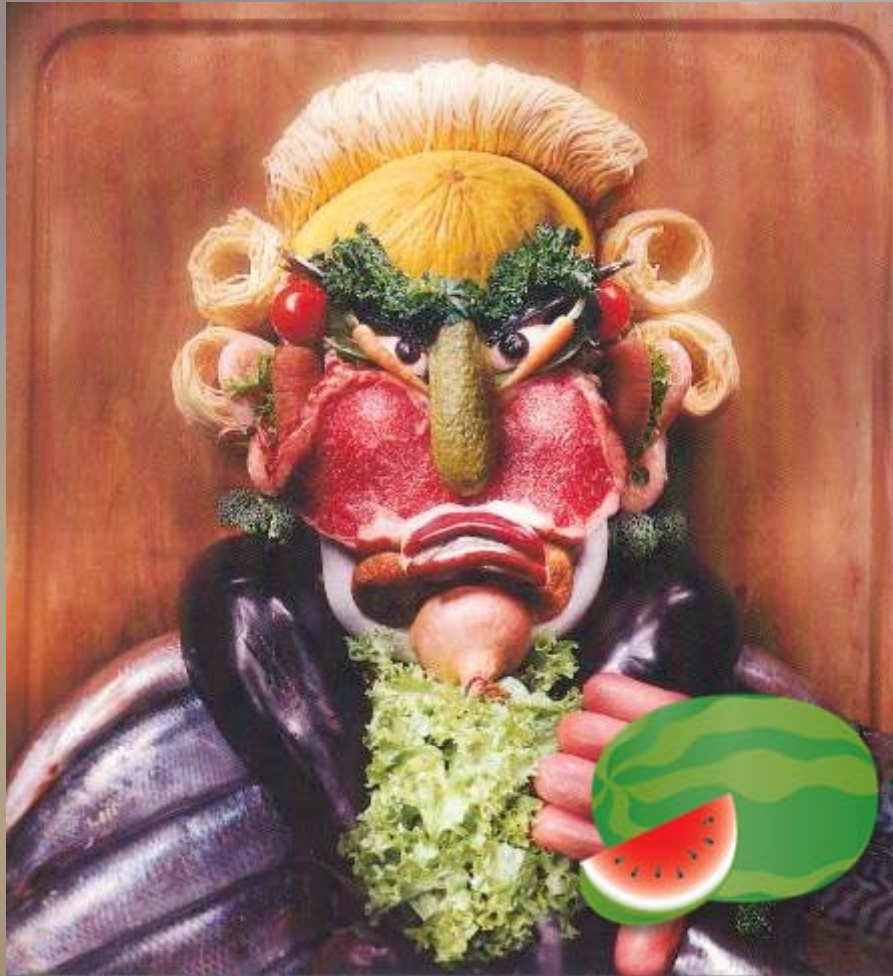
- At what level are the foods recorded?
- What is the purpose of the classification?
- What do we want to classify?  
Foods as consumed, ingredients, commodities, pre-packed foods, or ...?





# Food Classifications

The point of view is important



At what level  
are the foods  
recorded in  
the food  
classification  
system?

*Source:  
Danish Food Hygiene campaign,  
Danish Food Agency 1994*





# Food Classification Systems

At which reporting level ?

Survey Type	Foods as eaten/prepared	Foods as ingredients/purchased/raw	Foods as commodities
Individual	X	X*	X**
Household Budget Survey		X	X**
Food Balance Sheets			X

\* obtained by disaggregating food intake into ingredient

\*\* obtained by disaggregating ingredients into commodities





# The impact of reporting level

- *European food consumption survey method (EFCOSUM)*

EFG g/day	Intake level	Ingr. level	EFG g/day	Intake level	Ingr. level
Bread and rolls	142	162	Fruits and fruit products excl. juices	108	113
Breakfast cereals	34	14	Fruit juices	156	73
Flour	-	21	Non-alcoholic beverages	587	734
Pasta	17	8	Coffee, tea, cocoa powder	815	815
Bakery products	39	1	Beer	187	187
Rice and other c.p.	15	7	Wine	60	60
Sugar	3	22	Other alcoholic beverages	5	5
Sugar products excl. chocolate	16	1	Red meat and meat products	89	111
Chocolate	7	7	Poultry and poultry products	14	17
Vegetable oils	-	4	Offals and offal products	1	1
Margarine and lipids of mixed origin	16	33	Fish and seafood	22	21
Butter and animal fats	6	8	Eggs and egg products	15	19
Nuts and nut products	2	2	Milk	276	314
Pulses and pulse products	4	8	Cheese	22	31
Vegetables excl. potatoes	80	99	Other milk products	55	71
Starchy roots and potatoes	110	119	Miscellaneous foods	190	5

Source: *Dietary habits of the Danes, 1995*







# Food Classification Systems

defined by reporting level (1)

- Intake level (food as consumed)
  - National food classifications for consumption surveys (DK, SE, UK, etc.)
  - International food classification for consumption surveys (EPIC)
  - Food classifications for food composition databases (EuroFIR food classification, USDA, etc.)





# Food Classification Systems

defined by reporting level (2)

- Ingredient level (pre-packed foods, foods as purchased, raw foods)
  - Classification systems for food composition databases
  - International food classifications for comparing consumption surveys
    - European Food Grouping (Cost Action 99/EFCOSUM)
    - Eurocode2
  - CIAA Food Categorization System/Codex Food Categorization System for food additives (GSFA)
  - Global Product Classification (GS1 GPC, GSDN Food and Beverage Extension)
  - ...





# Food Classification Systems

defined by reporting level (3)

## ■ Commodity level

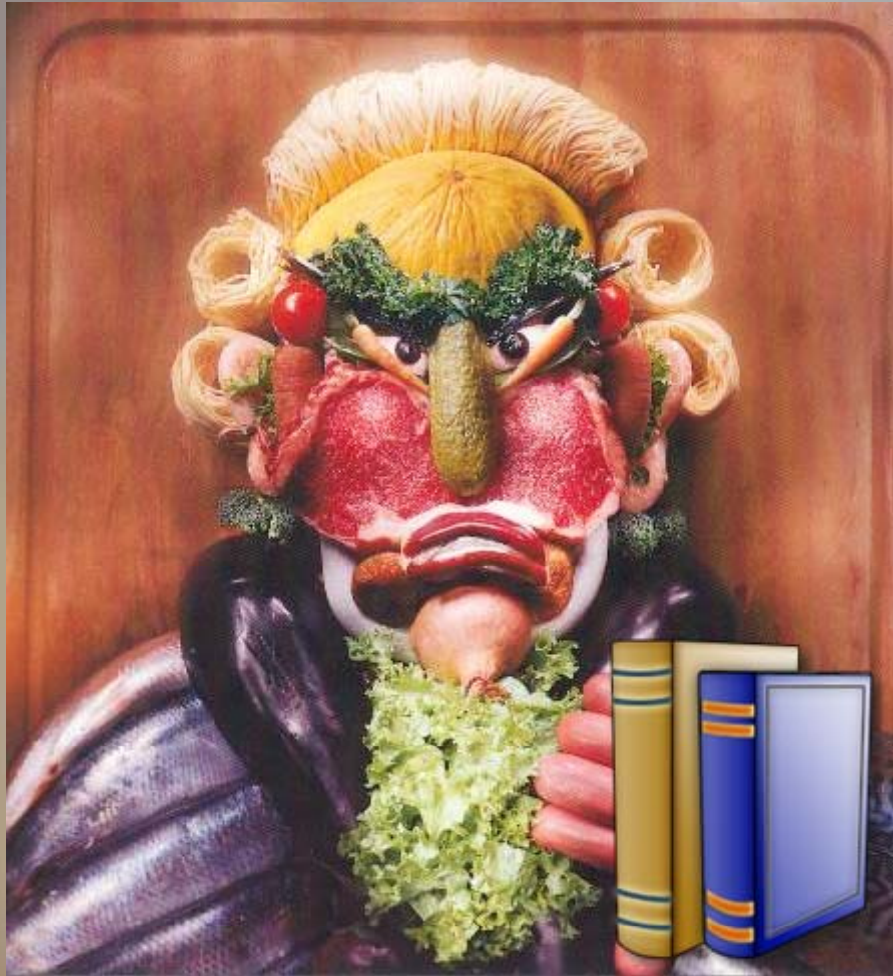
- Harmonized Commodity Description and Coding System (WTO)
- Codex Classification of Foods and Animal Feeds (Codex CCPR)
- Codex General Standard for Contaminants and Toxins in Foods (CCFAC)
- Food Balance Sheets "Presumptive diet"
- other classifications of commodities (PRODCOM, etc.)





# Food Classifications

The point of view is important



What is the purpose of the classification system?

*Source:  
Danish Food Hygiene campaign,  
Danish Food Agency 1994*







# Food Classification Systems

International systems for exposure studies

- **Based on commodities' similar potential for pesticide residues or contaminants**

- **Codex Classification of Food and Animal Feed Commodities (CCPR)**

<ftp://ftp.fao.org/codex/ccpr38/pr38CxCl.pdf>

- **Codex General Standard for Contaminants and Toxins in Foods (GSC)**

<https://apps.who.int/fsf/Codex/GENERALSTANDARDCONTAMINANTSANDTOXINSINFOODS.pdf>

- **EC Classification of Products of Plant and Animal Origin**

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:029:0003:0025:EN:PDF>

- ☐ **CLASSIFICATION OF FOOD AND FEED COMMODITIES (CODEX ALIMENTARIUS) [A0643]**
  - ☐ **A. PRIMARY FOOD COMMODITIES OF PLANT ORIGIN (CCPR) [A0644]**
    - + 01 FRUITS (CCPR) [A0649]
    - + 02 VEGETABLES (CCPR) [A0650]
    - + 03 GRASSES (CCPR) [A0651]
    - + 04 NUTS AND SEEDS (CCPR) [A0652]
    - + 05 HERBS AND SPICES (CCPR) [A0653]
  - ☐ **B. PRIMARY FOOD COMMODITIES OF ANIMAL ORIGIN (CCPR) [A0645]**
    - + 06 MAMMALIAN PRODUCTS (CCPR) [A0654]
    - + 07 POULTRY PRODUCTS (CCPR) [A0655]
    - + 08 AQUATIC ANIMAL PRODUCTS (CCPR) [A0656]
    - + 09 AMPHIBIANS AND REPTILES (CCPR) [A0657]
    - + 10 INVERTEBRATE ANIMALS (CCPR) [A0658]
  - ☐ **C. PRIMARY FEED COMMODITIES (CCPR) [A0646]**
    - + 11 PRIMARY FOOD COMMODITIES OF PLANT ORIGIN (CCPR) [A0659]
  - ☐ **D. PROCESSED FOOD OF PLANT ORIGIN (CCPR) [A0647]**
    - + 12 SECONDARY FOOD COMMODITIES OF PLANT ORIGIN (CCPR) [A0660]
    - + 13 DERIVED PRODUCTS OF PLANT ORIGIN (CCPR) [A0661]
    - + 14 MANUFACTURED FOODS (SINGLE INGREDIENT) OF PLANT ORIGIN (CCPR) [A0662]
    - + 15 MANUFACTURED FOODS (MULTI-INGREDIENT) OF PLANT ORIGIN (CCPR) [A0663]
  - ☐ **E. PROCESSED FOOD OF ANIMAL ORIGIN (CCPR) [A0648]**
    - + 16 SECONDARY FOOD COMMODITIES OF ANIMAL ORIGIN (CCPR) [A0664]
    - + 17 DERIVED EDIBLE PRODUCTS OF ANIMAL ORIGIN (CCPR) [A0665]
    - + 18 MANUFACTURED FOOD (SINGLE-INGREDIENT) OF ANIMAL ORIGIN (CCPR) [A0666]
    - + 19 MANUFACTURED FOOD (MULTI-INGREDIENT) OF ANIMAL ORIGIN (CCPR) [A0667]





# Food Classification Systems

## International systems for exposure studies

### ■ Allocation tools for food additives

- CIAA Food Categorization System  
<http://www.ciaa.be/asp/index.asp>

- Codex Food Categorization System for food additives  
<http://www.fao.org/docrep/meeting/005/X7137E/x7137e1v.htm>

### ■ Ingredient level (products)

FOOD CLASSIFICATION FOR FOOD ADDITIVES (CODEX ALIMENTARIUS) [A0355]
BAKERY WARES (CCFAC) [A0632]
BEVERAGES, EXCLUDING DAIRY PRODUCTS (CCFAC) [A0639]
CEREALS AND CEREAL PRODUCTS (CCFAC) [A0631]
COMPOSITE FOODS (CCFAC) [A0641]
CONFECTIONARY (CCFAC) [A0630]
DAIRY PRODUCTS, EXCLUDING FATS AND OILS, FAT EMULSIONS (CCFAC) [A0626]
EDIBLE ICES, INCLUDING SHERBET AND SORBET (CCFAC) [A0628]
EGG AND EGG PRODUCTS (CCFAC) [A0635]
FATS AND OILS, AND FAT EMULSIONS (TYPE WATER-IN-OIL) (CCFAC) [A0627]
FISH AND FISH PRODUCTS (CCFAC) [A0634]
FOODSTUFFS INTENDED FOR PARTICULAR NUTRITIONAL USES (CCFAC) [A0638]
FRUITS AND VEGETABLES (CCFAC) [A0629]
MEAT AND MEAT PRODUCTS (CCFAC) [A0633]
READY-TO-EAT SAVORIES (CCFAC) [A0640]
SALTS AND SPICES, SOUPS, SAUCES AND SALADS, PROTEIN PRODUCTS ETC. (CCFAC)
SWEETENERS (CCFAC) [A0636]





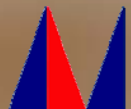
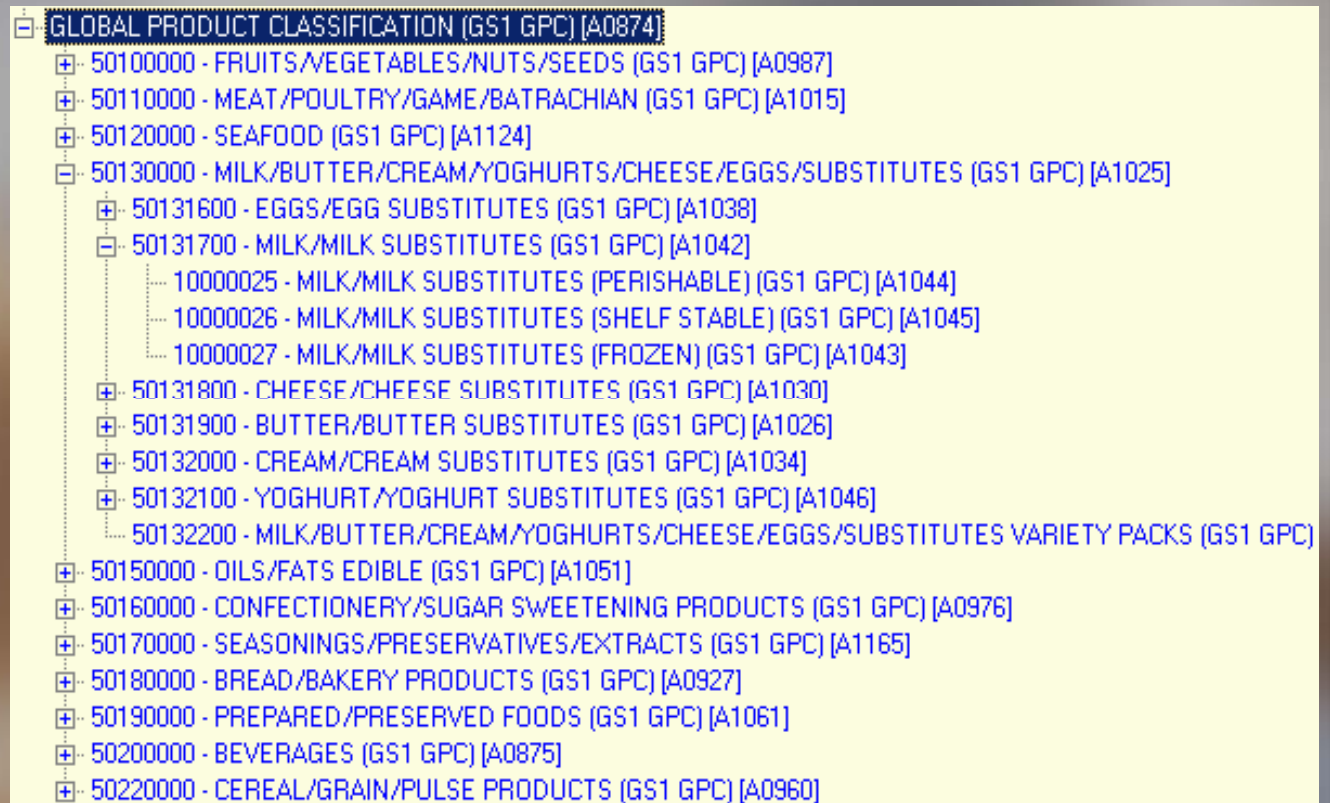
# Food Classification Systems

International systems for products in commerce

## ■ Global Product Classification (GS1 GPC)

<http://www.gs1.org/productssolutions/gdsn/gpc/>

- Data synchronisation between manufacturers and distributors
- Ingredient level (products)
- Support logistics
- Reflects potential for microbiological contaminants: shelf life, origin





# Food Classification Systems

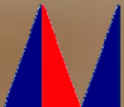
Dietary surveys

## ■ European Prospective Investigation into Cancer and Nutrition (EPIC)

- 10 countries (DK, FR, DE, GR, IT, NL, NO, ES, SW, UK)
- EPIC SOFT software
- Consumption level

1 - Potatoes and other Tubers	5 - Dairy Products
2 - Vegetables	6 - Cereals and Cereal Products
02 01 - Leafy Vegetables (Except Cabbages)	7 - Meat and Meat Products
02 02 - Fruiting Vegetables	8 - Fish and Shellfish
02 03 - Root Vegetables	9 - Eggs and Egg Products
02 04 - Cabbages	10 - Fat
02 05 - Mushrooms	11 - Sugar and Confectionery
02 06 - Grain and Pod Vegetables	12 - Cakes
02 07 - Onion, Garlic	13 - Non Alcoholic Beverages
02 08 - Stalk Vegetables, Sprouts	14 - Alcoholic Beverages
02 09 - Mixed Salad, Mixed Vegetables	15 - Condiments and Sauces
3 - Legumes	16 - Soups, Bouillon
4 - Fruits and nuts	17 - Miscellaneous

Slimani et al (2000) Standardization of the 24-hour diet recall calibration method used in the European Prospective Investigation into Cancer and Nutrition (EPIC) : general concepts and preliminary results. European Journal of Clinical Nutrition, 54, 900-917







# Food Classification Systems

## Dietary surveys

### ■ EFG European Food Grouping

- EU Cost Action 99/Eurofoods & EFCOSUM
- Classification for international comparisons of food consumption & food availability surveys
- Ingredient level

Ireland J et al (2002): Selection of a food classification system and a food composition database for future food consumption surveys. European Journal of Clinical Nutrition, 56 Supplement 2, S33-S45

### ■ Eurocode 2

- FLAIR Eurofoods-Enfant & COST Action 99
- Classification of foods according to groups and subgroups useful in dietary studies

<http://www.ianunwin.demon.co.uk/eurocode/docmn/ec99/ecmgintr.htm>

#### EUROCODE 2 FOOD CLASSIFICATION [A0642]

- 01 MILK AND MILK PRODUCTS (EUROCODE2) [A0724]
- 02 EGG AND EGG PRODUCTS (EUROCODE2) [A0725]
- 03 MEAT AND MEAT PRODUCTS (EUROCODE2) [A0726]
- 04 FISH AND FISH PRODUCTS (EUROCODE2) [A0727]
- 05 FATS AND OILS (EUROCODE2) [A0728]
- 06 GRAINS AND GRAIN PRODUCTS (EUROCODE2) [A0729]
- 07 PULSES, SEEDS, KERNELS, NUTS AND PRODUCTS (EUROCODE2) [A0730]
- 08 VEGETABLES AND VEGETABLE PRODUCTS (EUROCODE2) [A0731]
- 09 FRUIT AND FRUIT PRODUCTS (EUROCODE2) [A0732]
- 10 SUGAR, CHOCOLATE AND RELATED PRODUCTS (EUROCODE2) [A0733]
- 11 BEVERAGES (NON-MILK) (EUROCODE2) [A0734]
- 12 MISCELLANEOUS FOODS (EUROCODE2) [A0735]
- 13 PRODUCTS FOR SPECIAL NUTRITIONAL USE (EUROCODE2) [A0736]

#### EUROPEAN FOOD GROUPS (EFG) [A0690]

- 01 BREAD AND ROLLS (EFG) [A0691]
- 02 BREAKFAST CEREALS (EFG) [A0692]
- 03 FLOUR (EFG) [A0693]
- 04 PASTA (EFG) [A0694]
- 05 BAKERY PRODUCTS (EFG) [A0695]
- 06 RICE AND OTHER CEREAL PRODUCTS (EFG) [A0696]
- 07 SUGAR (EFG) [A0697]
- 08 SUGAR PRODUCTS, EXCLUDING CHOCOLATE (EFG) [A0698]
- 09 CHOCOLATE (EFG) [A0699]
- 10 VEGETABLE OILS (EFG) [A0700]
- 11 MARGARINE AND LIPIDS OF MIXED ORIGIN (EFG) [A0701]
- 12 BUTTER AND ANIMAL FATS (EFG) [A0702]
- 13 NUTS (EFG) [A0703]
- 14 PULSES (EFG) [A0704]
- 15 VEGETABLES, EXCLUDING POTATOES (EFG) [A0705]
- 16 STARCHY ROOTS AND POTATOES (EFG) [A0706]
- 17 FRUITS (EFG) [A0707]
- 18 FRUIT JUICES (EFG) [A0708]
- 19 NON-ALCOHOLIC BEVERAGES (EFG) [A0709]
- 20 COFFEE, TEA, COCOA POWDER (EFG) [A0710]
- 21 BEER (EFG) [A0711]
- 22 WINE (EFG) [A0712]
- 23 OTHER ALCOHOLIC BEVERAGES (EFG) [A0713]
- 24 RED MEAT AND MEAT PRODUCTS (EFG) [A0714]
- 25 POULTRY AND POULTRY PRODUCTS (EFG) [A0715]
- 26 OFFALS (EFG) [A0716]
- 27 FISH AND SEAFOOD (EFG) [A0717]
- 28 EGGS (EFG) [A0718]
- 29 MILK (EFG) [A0719]
- 30 CHEESE (EFG) [A0720]
- 31 OTHER MILK PRODUCTS (EFG) [A0721]
- 32 MISCELLANEOUS FOODS (EFG) [A0722]
- 33 PRODUCTS FOR SPECIAL NUTRITIONAL USE (EFG) [A0723]





# Food Classification Systems

## Dietary supplements

- CEN/TC387 Project Committee:  
“Food Data” (SIS/NFA, 2008)
  - Requirements on data structure of FCDBs and interchange of food composition data
  - Identification, description, classification & labelling of foods and ingredients
- Databases on dietary supplements
  - Europe: Finland, the Netherlands, France, Denmark, Ireland
  - US: Office of Dietary Supplements





# Food Classification Systems

## Dietary supplements - DRAFT

### ■ **Proposed classification for Dietary Supplements (LanguaL facet A)**

- AMINO ACID OR PROTEIN SUPPLEMENT
- BOTANICAL OR HERBAL SUPPLEMENT
- MINERAL SUPPLEMENT
  - MULTI MINERAL SUPPLEMENT
  - SINGLE MINERAL SUPPLEMENT
- METABOLITE, EXTRACT OR ISOLATE SUPPLEMENT
  - FATTY ACID OR FAT SUPPLEMENT
  - ENZYME SUPPLEMENT
  - PHYTOESTROGEN SUPPLEMENT
- VITAMIN SUPPLEMENT
  - MULTIVITAMIN SUPPLEMENT
  - SINGLE VITAMIN SUPPLEMENT
- DIETARY SUPPLEMENT, COMBINATION
  - VITAMIN-MINERAL COMBINATION SUPPLEMENT
    - MULTIVITAMIN/MINERAL SUPPLEMENT
    - SINGLE VITAMIN/SINGLE MINERAL SUPPLEMENT
  - BOTANICAL SUPPLEMENT WITH VITAMINS OR MINERALS
  - MULTI VITAMIN-MINERAL AND AMINO ACID COMBINATION SUPPLEMENT
  - MULTI VITAMIN-MINERAL AND FATTY ACID COMBINATION SUPPLEMENT
  - VITAMIN- FATTY ACID COMBINATION SUPPLEMENT
- DIETARY SUPPLEMENT, OTHER
  - CARBOHYDRATE SUPPLEMENT
  - FIBER SUPPLEMENT
  - ELECTROLYTE SUPPLEMENT
- DIETARY SUPPLEMENT TYPE UNKNOWN





# Food Classification Systems

Purpose and food level specific

- **Food classification systems are purpose specific** (reflect specific characteristics, e.g. from legislation) and must exist in parallel
- A food (and food group) can exist on all reporting levels, but the **characteristics of the food change from level to level**
- **Food classification systems are food level specific** (for exposure assessment, a classification system cannot cover several food levels at the same time)
- **Food classification systems are related**, but not necessarily (i.e. almost never) compatible

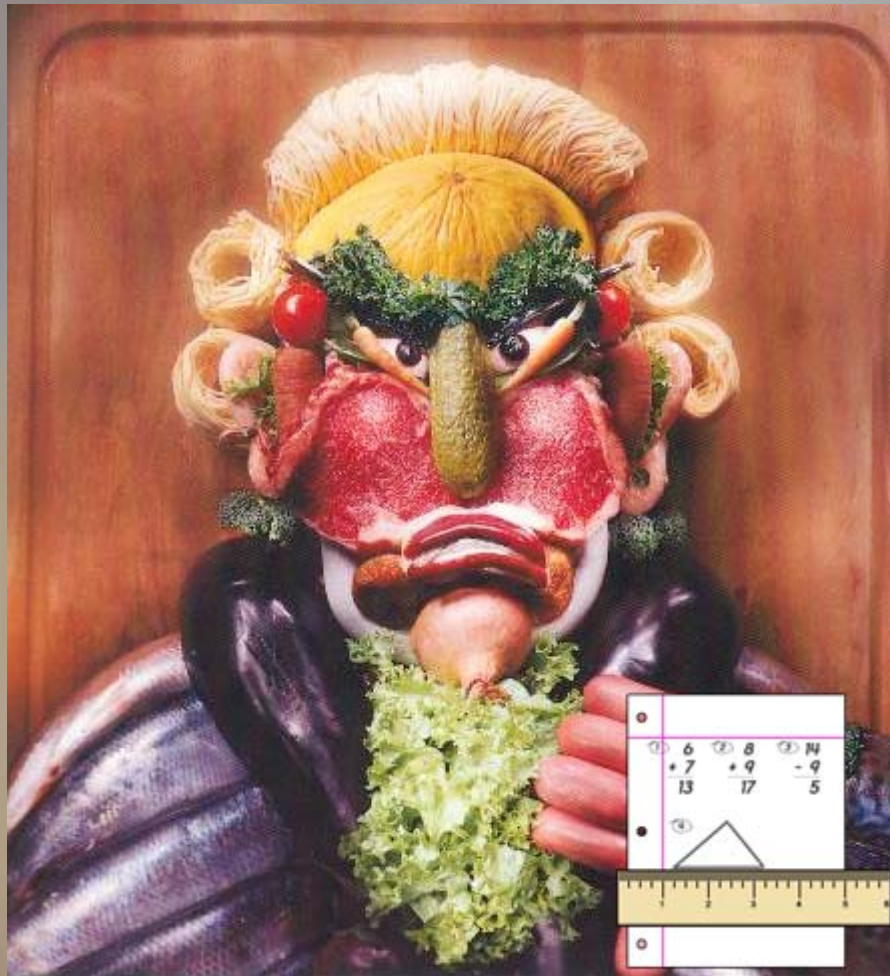






# Food Classifications

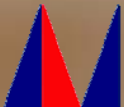
The point of view is important



If classification systems are so different, how can information be retrieved?

How can data be compared?

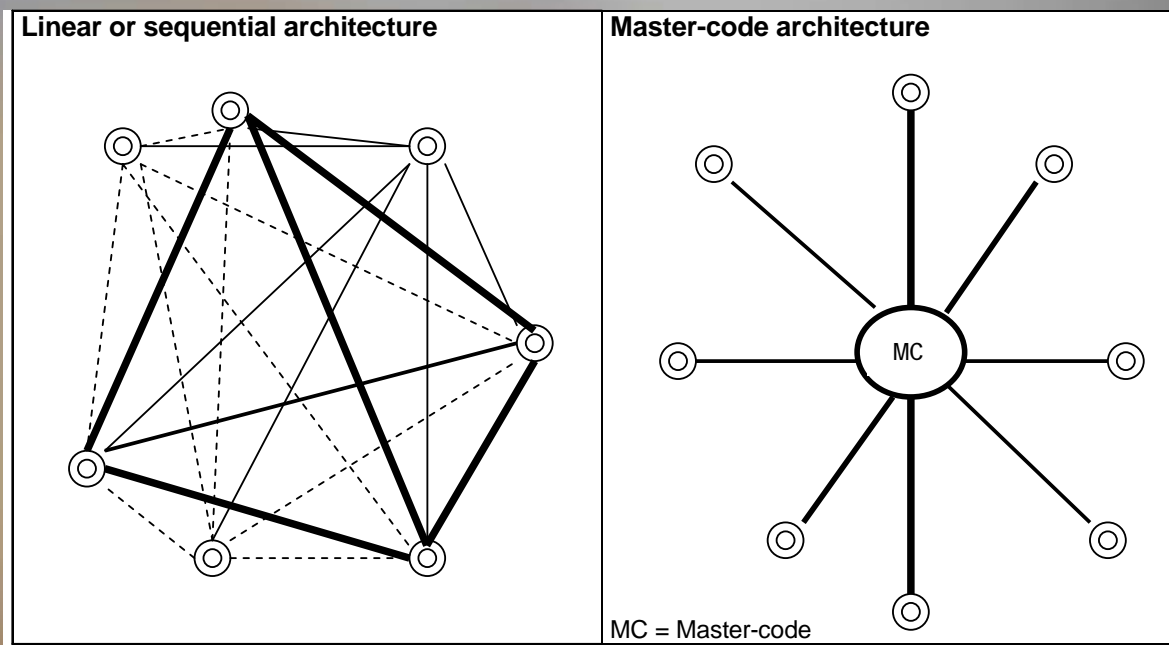
*Source:  
Danish Food Hygiene campaign,  
Danish Food Agency 1994*





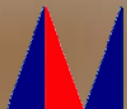
# Solution: Mapping between classification systems

- Create links between food identification systems, by “mapping” one system to another
- Architecture for code translation systems:



Example: CARE Food Safety Project

Weigert P, Conti M, Lia F, Meigs G. (1994). *International Synonyms System – A Software Approach to Merge Different Coding Systems*. CARE Telematics Project within the European Nervous System (ENS), EUR/HFA target 22, World Health Organization, Copenhagen.





# Food classification in the LanguaL thesaurus

LanguaL (<http://www.languaL.org>) includes important food classifications in parallel in Facet A, and provides Related Terms for the different classifications

- [-] A. PRODUCT TYPE [A0361]
  - [-] FOOD ADDITIVES [A0323]
    - [+] CODEX ALIMENTARIUS, FUNCTIONAL CLASSES [A0351]
    - [+] FOOD ADDITIVE CLASSIFICATION, EUROPEAN COMMUNITY [A0324]
  - [-] PRODUCT TYPE, EUROPEAN UNION [A0356]
    - [+] CIAA FOOD CLASSIFICATION FOR FOOD ADDITIVES [A0357]
    - [+] CLASSIFICATION OF PRODUCTS OF PLANT AND ANIMAL ORIGIN, EUROPEAN COMMUNITY [A1220]
    - [+] EUROCODE 2 FOOD CLASSIFICATION [A0642]
    - [+] EUROFIR FOOD CLASSIFICATION [A0777]
    - [+] EUROPEAN FOOD GROUPS (EFG) [A0690]
  - [-] PRODUCT TYPE, INTERNATIONAL [A0352]
    - [+] CLASSIFICATION OF FOOD AND FEED COMMODITIES (CODEX ALIMENTARIUS) [A0643]
    - [+] FOOD CLASSIFICATION FOR FOOD ADDITIVES (CODEX ALIMENTARIUS) [A0355]
    - [+] GENERAL STANDARD FOR CHEESE (CODEX ALIMENTARIUS) [A1207]
    - [+] GLOBAL PRODUCT CLASSIFICATION (GS1 GPC) [A0874]
  - PRODUCT TYPE, NOT KNOWN [A0001]
  - PRODUCT TYPE, OTHER [A0004]
  - [-] PRODUCT TYPE, USA [A0289]
    - [+] PRODUCT TYPE, U.S. CODE OF FEDERAL REGULATIONS, TITLE 21 [A1270]
    - [+] PRODUCT TYPE, USDA STANDARD REFERENCE [A1269]
- [+] B. FOOD SOURCE [B1564]

Classification for Dietary Supplements and EFSA Main Food Categories are proposed for inclusion in LanguaL 2010





# Food classification in the LanguaL thesaurus

Multiple facets and languages make the LanguaL thesaurus a good choice for “Master Code” for mapping classification systems

- [-] A. PRODUCT TYPE [A0361]
  - [+] FOOD ADDITIVES [A0323]
  - [+] PRODUCT TYPE, EUROPEAN UNION [A0356]
  - [+] PRODUCT TYPE, INTERNATIONAL [A0352]
  - ..... PRODUCT TYPE, NOT KNOWN [A0001]
  - ..... PRODUCT TYPE, OTHER [A0004]
  - [+] PRODUCT TYPE, USA [A0289]
- [+] B. FOOD SOURCE [B1564]
- [+] C. PART OF PLANT OR ANIMAL [C0116]
- [+] E. PHYSICAL STATE, SHAPE OR FORM [E0113]
- [+] F. EXTENT OF HEAT TREATMENT [F0011]
- [+] G. COOKING METHOD [G0002]
- [+] H. TREATMENT APPLIED [H0111]
- [+] J. PRESERVATION METHOD [J0107]
- [+] K. PACKING MEDIUM [K0020]
- [+] M. CONTAINER OR WRAPPING [M0100]
- [+] N. FOOD CONTACT SURFACE [N0010]
- [+] P. CONSUMER GROUP/DIETARY USE/LABEL CLAIM [P0032]
- [+] R. GEOGRAPHIC PLACES AND REGIONS [R0010]
- [+] Z. ADJUNCT CHARACTERISTICS OF FOOD [Z0005]





# Conclusions

- **All classifications are purpose driven**
  - Created for a specific purpose/use
  - Fit for purpose
- **This is both a strength and a weakness**
  - A classification system often cannot be used for another purpose than the one it was designed for
  - A classification system cannot be used for foods at all levels (foods as eaten, ingredients, commodities)
  - Mono-hierarchical classifications lack flexibility, both for indexing and for retrieval
- **Mapping is necessary**
  - A faceted classification or thesaurus can be used as “Master code” to map between classification systems
  - Recipe/processing factors







# Food classifications depend on the point of view



Thank you  
for your  
attention!

*Source:  
Danish Food Hygiene campaign,  
Danish Food Agency 1994*

