G.Lkhagvaa Prof. D.Sc.
S.Serjmyadag Ph.D.
Mongolian University of Science and Technology

NEW CONCEPT OF FOOD CLASSIFICATION

On the basis of new concepts of food functionalities which developed by our scientists, we found out the new classification of food by their functionalities. The functionalities of food nutrients showed in table 1.

The functionalities of nutrients in food

Table1

Functionality	Lipid			Carbohydrate		Protein	
	Monounsaturated fatty acids	Polyunsaturated fatty acids	Saturated fatty acids	Mono- and disaccharide	Polysaccharide (digested)	Peptide	Polypeptide
Cell membrane changing effect	$1\ \alpha$	α_{n+1}	β	β	β	β	β_{n+1}
Effect on α-membrane of cell	$+\alpha$	$+\alpha_{n+1}$	$+\beta$	$+\beta$	$+\beta$	$+\beta$	$+\beta_{n+1}$
Effect on β-membrane of cell	$+\alpha$	$+\alpha_{n+1}$	$+\beta$	$+\beta$	$+\beta$	$+\beta$	$+\beta_{n+1}$
Effect on γ-membrane of cell	$+\alpha$	$+\alpha_{n+1}$	$+\beta$	$+\beta$	$+\beta_{n+1}$	$+\beta$	$+\beta_{n+1}$

Food classification by their functionalities

A.Fatty food (polyunsaturated fatty acid content above 4,5%)

$$\alpha_{index} = \frac{\text{polyunsaturated fatty acid, g}}{\text{(protein + carbohydrate)}} \quad (1)$$

$$\beta_{index} = 1 - \alpha_{index} \quad (2)$$

α- or β-functionality of food is determined by dividing the largest number of α- or β-index to a smaller number (3)

For example:

$$\alpha\text{-functionality} = \frac{\alpha_{index}}{\beta_{index}} \quad (4)$$

$$\beta\text{-functionality} = \frac{\beta_{index}}{\alpha_{index}} \quad (5)$$

Food classification by their functionalities
(functionality of 100 g food)

Table 2

Food	Protein g/100g	Carbohydrate g/100g	Polyunsaturated fatty acid g/100g	α_{index}	β_{index}	α-functionality (unit)	β-functionality (unit)
A	1	2	3	4	5	6	7
Horse milk	2,2	6,6	33,8	4	-	4,0	
Camel milk	4,76	4,39	5,1	0,6	0.4	1.5	-
Goat milk	3,87	4,8	5,64	0,6	0.4	1.5	-
Soy beans	18.3	6.6	10.7	0,4	0,6	-	1.5
Horse meat	20,11	0	21,66	0.8	0.2	4.0	-
Mutton	18,82	0	9,35	0,5	0,5	0,5	0,5
Beef meat	20,35	0	7,47	0,4	0,6	-	1.5
Goat meat	20,64	0	5,31	0,3	0,7	-	2.3
Camel meat	18,58	0	4,4	0,2	0,8	-	4.0

B. Food with low fat (polyunsaturated fatty acid content 2.5 to 4,5%)

$$\alpha_{index} = \frac{\text{polyunsaturated fatty acid, g}}{\text{(protein + carbohydrate)}} \quad (6)$$

$$\beta_{index} = 1 - \alpha_{index} \quad (7)$$

α- or β-functionality of food is determined by the largest number of α- or β_{index}, which 0.6 to 0.9 unit is taken as 1 unit functionality, and each 0.5 unit is α=β (8)

Food	Protein g/100g	Carbohydrate g/100g	Polyunsaturated fatty acid g/100g	α_{index}	β_{index}	α-functionality (unit)	β-functionality (unit)
A	1	2	3	4	5	6	7
Sheep milk	5,77	4,17	3,2-4,4	0,4	0.6	-	1
Cow milk	3,42	4.75	2,10	0,3	0.7	-	1
Duck	18.1	+	2.2	0,12	0,8	-	1

Goose	17.7	+	3.3	0,2	0,8	-	1
Chicken	19.9	+	2.5	0,12	0,8	-	1
Rye germs	42	32.7	5,3	0,2	0,8	-	1
Marzipan	8,0	59,0	5,0	0,2	0,8	-	1
Wheat grain	11.4	56,8	4,1	0,2	0,8	-	1
Cream pie	5,0	30,0	3,0	0,2	0,8	-	1
Oil sardine	19,4	+	1,6	0,1	0,9	-	1

C. Food with little fat (polyunsaturated fatty acid content 2%)

$$\alpha_{index} = \left[\frac{\text{protein, g}}{\text{carbohydrate, g}} \right] \times \text{polyunsaturated fatty acid, g} \qquad (9)$$

$$\beta_{index} = 1 - \alpha_{index} \qquad (10)$$

α- or β-functionality of food is determined by the largest number of α- or β_{index}, which 0.6 to 0.9 unit is taken as 1 unit functionality, and each 0.5 unit is α=β (11)

Food	Protein g/100g	Carbohydrate g/100g	Polyunsaturated fatty acid g/100g	α_{index}	β_{index}	α-functionality (unit)	β-functionality (unit)
Oats	12,5	58,7	2,6	0,6	0,4	1	-
Millet	9,8	68,8	1,9	0,3	0,7	-	1
Barley	10,4	71,0	0,2	-	1,0	-	1
Maize grain	8,8	73,5	+	0,1	0,9	-	1
Wheat starch	14,9	17,7	2,3	1,9	-	2	0
Wheat flour	11,7	70,7	1,1	0,2	0,8	-	1
White bread	8,2	48,0	0,7	0,1	0,9	-	1
Rice	7,2	74,1	0,8	0,1	0,9	-	1
Rye bread	6,7	45,7	0,5	0,1	0,9	-	1
White cabbage	4,3	2,5	0,5	0,9	0,1	1	1
Potatoes	2,0	14,8	0,1	-	1,0	-	1
Banana	1,2	20,0	0,1	-	1,0	-	1
Apples	0,3	11,4	0,3	-	1,0	-	1

+ traces

∗ no data

D. Vegetable oil

Vegetable oils (g/100 g)	**Polyunsaturated fatty acid, g**	**α-functionality (alpha effect translated into palm oil), unit**
Soy bean oil	60,6	6
Sunflower oil	63,6	6
Sesame oil	43,7	4
Raps oil	31,5	3,1
Olive oil	9,1	1
Palm oil	10,1	1

Conclusion

There is the new food classification which will be used for healthy nutrition and dietitian, also for individual or season oriented nutrition.

References

1. Baldorj R.
   "Development of industrial technology Mongolian kumis (D,Sc. Dissertation), Moscow 1988
2. Elmadfa I., Aign W., Muskat E., Fritzsche D., Cremer H.-D.
   Die Grosse GU Naehrwert Tabelle, Graefe und Unzer Verlag, Muenchen, 1995
3. Indra R. "Milk yield, composition and properties of different types animals bred in Mongolia" (D,Sc. dissertation) Sofia, 1993
4. Lkhagvaa G. New Concepts about Human and Their Development, “Munhiin Useg Group” Publishing, Ulaanbaatar, 2010
5. Shagj J., Heat production effect in large intestine of mammalian and human, Doctor’s dissertation, Moscow, 1991
6. Enkhtuya B. Some quality index of Mongolian animals, Ulaanbaatar, 2005