INTRODUCTION INTO FOODS COMBINATORICS

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Background

The Food Combinatorics combines ideas of modern informatics, trophology, biophysical and chemical bases of food technology and particular technologies of multicomponent food products for special groups of population classified by age and metabolic state. Combinatorics is a science studying combinations of various objects (Encycloperia). ("Combination" is the term from Latin "combinatio"; it means combination – mutual arrangement of something.).

Objects of mathematical combinatorics are: all kinds of permutations, arrangements, and combinations. As applied to food processing industry, the notion of combinatorics is identified with arrangement, rearrangement, and combination of dominant characteristics of the objects of foods processing. Such objects are: raw materials; functional components; formulation mixtures formed from raw materials and functional components; half-finished products obtained at different stages of formulation mixtures processing; finished products which are the final purpose of the food protophysiological technology; diets which predetermine the effectiveness of its physiological technology including consumption, digestion, assimilation, and evacuation; technological processing, equipment for implementation of technological processes, parameters ensuring effective functioning of technological processes and equipment.

In addition, using the term "food combinatorics", the authors mean that it combines principles and methods of realization of results of designing of food products as material objects with predetermined characteristics created from separate elements, not providing these characteristics individually.

Objectives

The aim of the present work is to summarize personal notions of the author about an interdisciplinary field of knowledge - FOOD COMBINATORICS developed by them in recent years.

Materials and methods

All above-stated allows us to formulate the following definition:

THE FOOD COMBINATORICS is an interdisciplinary field of knowledge directed for studying and practical application of regular features of mutual influence of combinations of objects in the food production process.

Taking into account the experience and specifics of scientific and practical interests of the authors, one can state that the greatest attention is paid to the complex of problems connected with the quality improvement of baby foods prepared on the basis or with the use of components obtained in processing of meat raw materials, eggs, and milk.

Results and discussion

Medical and biological aspects of food combinatorics

On the whole, these aspects determine the complex of necessary and appropriate conditions providing possibility of quantitatively determined improvement of baby food quality through combinatory changes forming their alimentary adequacy of macro- and micronutrients and predetermine rightfulness of their assignment to so-called products of new generation.

The authors believe that the content of the paper, which follows hereinafter, will be better understood as logically tied links of the common methodological chain, if the following definition is given: Polycomponent baby foods of new generation are the safe products whose formulations comprise non-traditional for products

on meat, milk, cereals or fruit-vegetable bases some macro- or microfractionated components of these kinds of raw materials, as well as physiological functionally- methabolic ingredients added in amounts and ratios, assisting in the presence, apart from nutrient adequecy, of predetermined level of methabolic adequacy or special properties, and providing the absence of negative organoleptical perceptions in children, who are combined by determinated age, homeostasis or other signs.

As far as biological value of protein components contained in new baby foods is concerned, it should be noted, that apart from the conventional amino acid balance predetermined by the combinations of indispensable amino acids and in special cases dispensable amino-acids, the individual protein digestion is taken into account in the proposed methodology. In addition, while creating products, guaranteeing absence or minimum probability of occurrence of protein allergenic reaction, the most important are combinations of molecular-mass characteristics of almost all macromolecular and polypeptide components of total protein. At the same time, special attention is to be paid to the fact that these combinations depend on similar combinations in protein ingredients of the total protein and on the complex of processing technologies and parameters of their implementation.

In full measure, medical and biological aspects of the food combinatorics embrace the analysis, evaluation, and purposeful use of combinations and arrangements of factors, which predetermine nutrient and metabolic adequacy of such macronutrients of baby foods as fatty acids and carbohydrates, which have dominant influence on the food energetic value.

One of the most important part of medical and biological aspects is the study and practical realization of combinatory factors forming macro- and microelement adequacy of food products and diets containing them. Quantitatively the analysis of combinations not concerning the process factors and forming the food value on the whole can be accomplished with the help of mathematical models, developed by researchers headed by N.N.Lipatov (Jr.) (Academician of the Russian Academy of Agriculture).

In realization of these models by computers as applied to designing of foods for babies we used the rated values of the alimentary reference summarized in Table 1.

Table 1. Rated indices of the alimentary reference for babies up to one year

Nutrients	Content	Nutrients	Content
Indispensable amino acids:	g/100 g of prot.	Na	20.00
Isoleucine	4.60	S	11.20
Leucine	9.80	P	24.00
Lysine	7.50	Cl	54.4
Methionine+cystine	4.00	*Microelements:*	µg/1 g of protein
Phenylalanine+tyrosine	8.60	Fe	800.00
Threonine	4.60	J	2.80
Tryptophan	1.50	Co	-
Valine	5.20	Mn	2.40
Histidine	-	Cu	32.00
Fatty acids:	g/100 g of fat	F	_
∑ UFA	41.78	Zn	240.00
∑ MUFA	43.03		
∑ PUFA including:	12.42	*Vitamins:*	mg/1g of protein
Linoleic	10.85	B_1	$3.2x10^{-2}$
Linolenic	0.62	B_2	$4.8x10^{-2}$
Arachidonic	0.95	B_6	$3.2x10^{-2}$
Macroelements:	mg/1 g of protein	B_{12}	$3.2x10^{-3}$
K	48.00	PP	$3.2x10^{-1}$
Ca	40.00	A	$4.8x10^{-2}$
Mg	4.00	E	$4.8.10^{-1}$

Conclusions

The authors hope that the International Association of scientists in the field of food technology (including the meat technology) would pay due attention to the present information and take an active part in discussions and further development of theoretical, experimental, and practical aspects of new interdisciplinary scientific direction - THE FOOD COMBINATORICS.