

Development of innovative Food for Specific Health Use (FOSHU) technology

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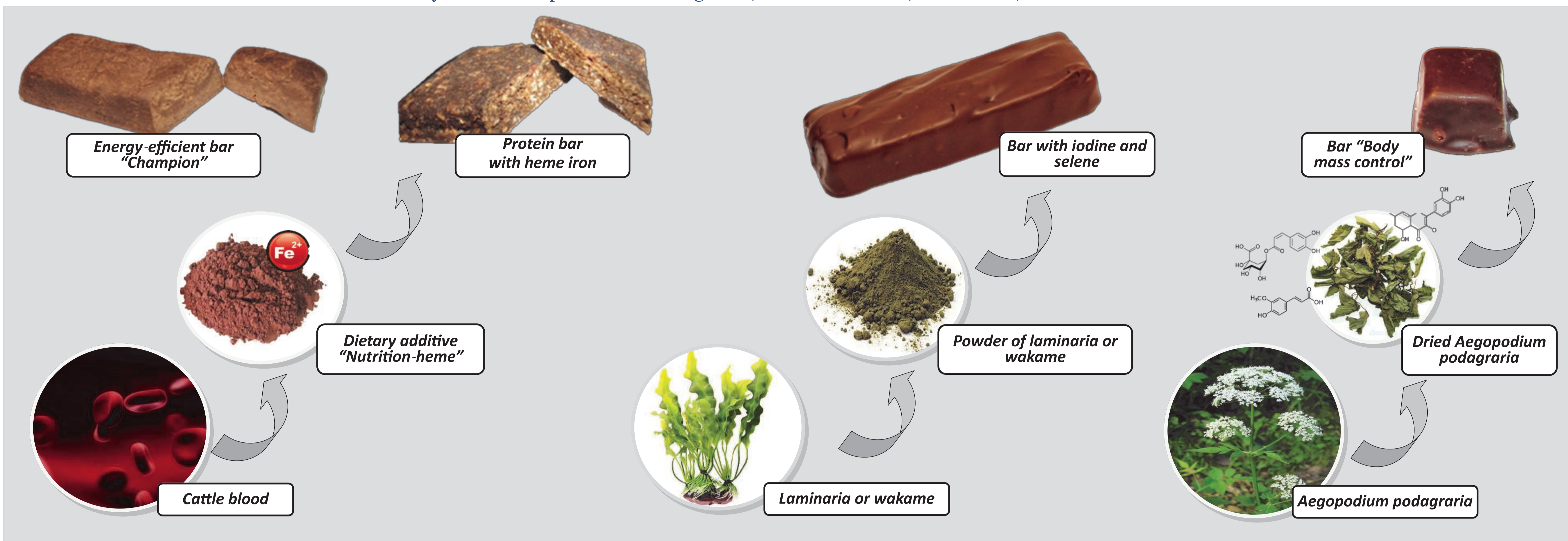
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The main goal of the project

The development of innovative FOSHU technologies to correct the nutrition of the population by means of enriching the diets of the population with the latest products that contain proteins, fats, and carbohydrates in an optimal ratio for organism, as well as vitamins, antioxidants, macro- and microelements



Healthy food product

Human health is determined by its nutritional status more than 90%, in other words, it's determined by degree of organism's provision with energy and a full variety of nutrients. Health can be reached and kept only under condition of full satisfaction of physiological needs in energy and feedstuffs. Any deviation from full nutrition can lead to dysfunction. On the 25th of September, 2015 in New York - the UN Summit on Sustainable Development has approved 17 global goals for the next 15 years (2016-2030). The 3 following points can be emphasized from the viewpoint of my specialty:

- zero hunger: which provides hunger suppression, improvements nutrition quality and its safety;
- good health and well-being: healthy lifestyle for all population groups;
- responsible consumption and production: ensure sustainable consumption and production patterns.

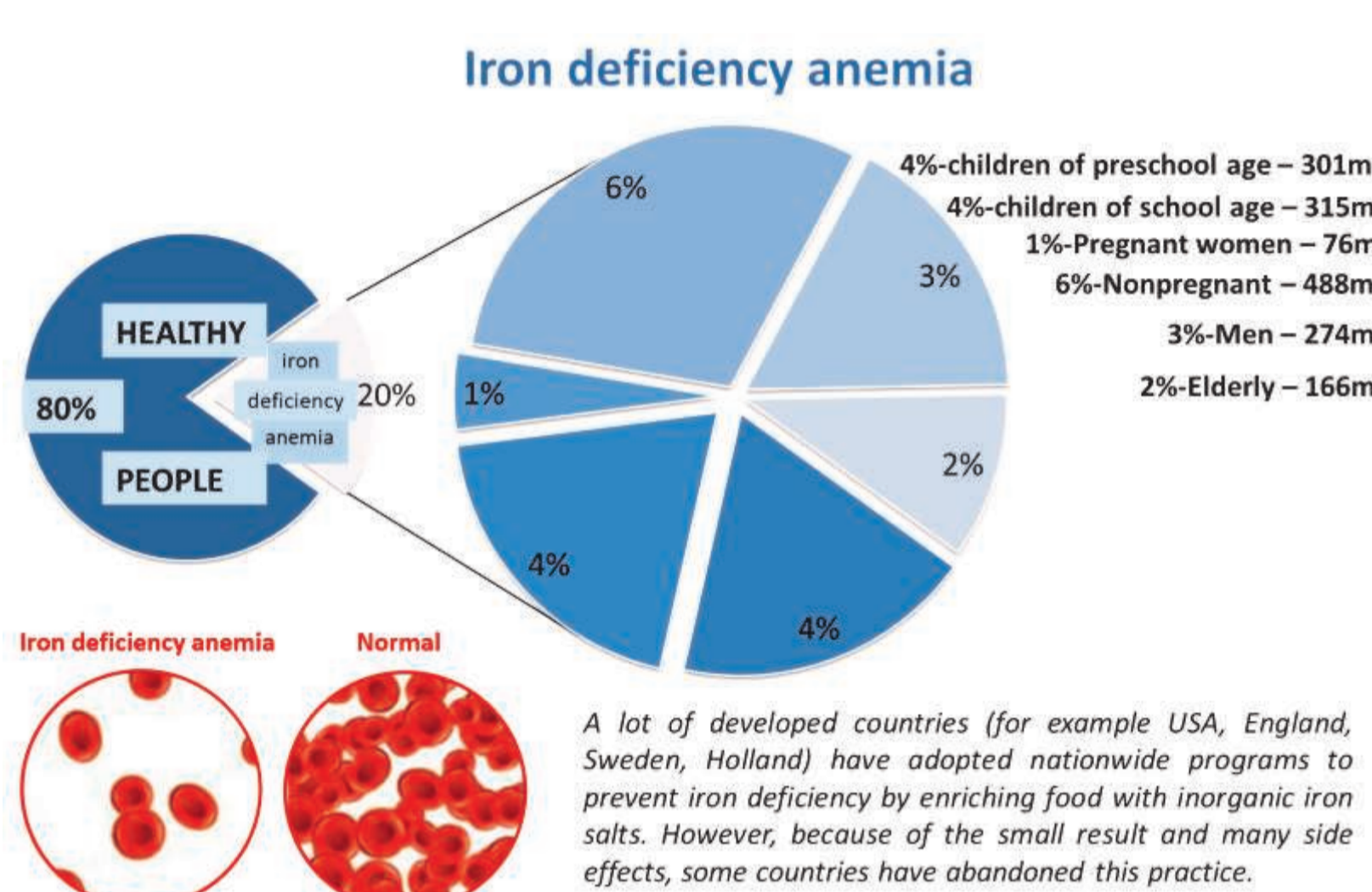
The basis of the full-fledged nutrition is products, which are useful to health. They are represented by four categories. This group includes products that have the ability of favorable affecting on the physiological functions of the body and processes of metabolism, at the systematic use in the range from 10 to 50% from daily physiological requirement. The greatest interest is attracted these days by functional products (FOSHU or Food for Specific Health use). The main principle of such products production is the target physiological effect on the human organism to reduce the risk of diseases occurrence.

The main types of healthy food products



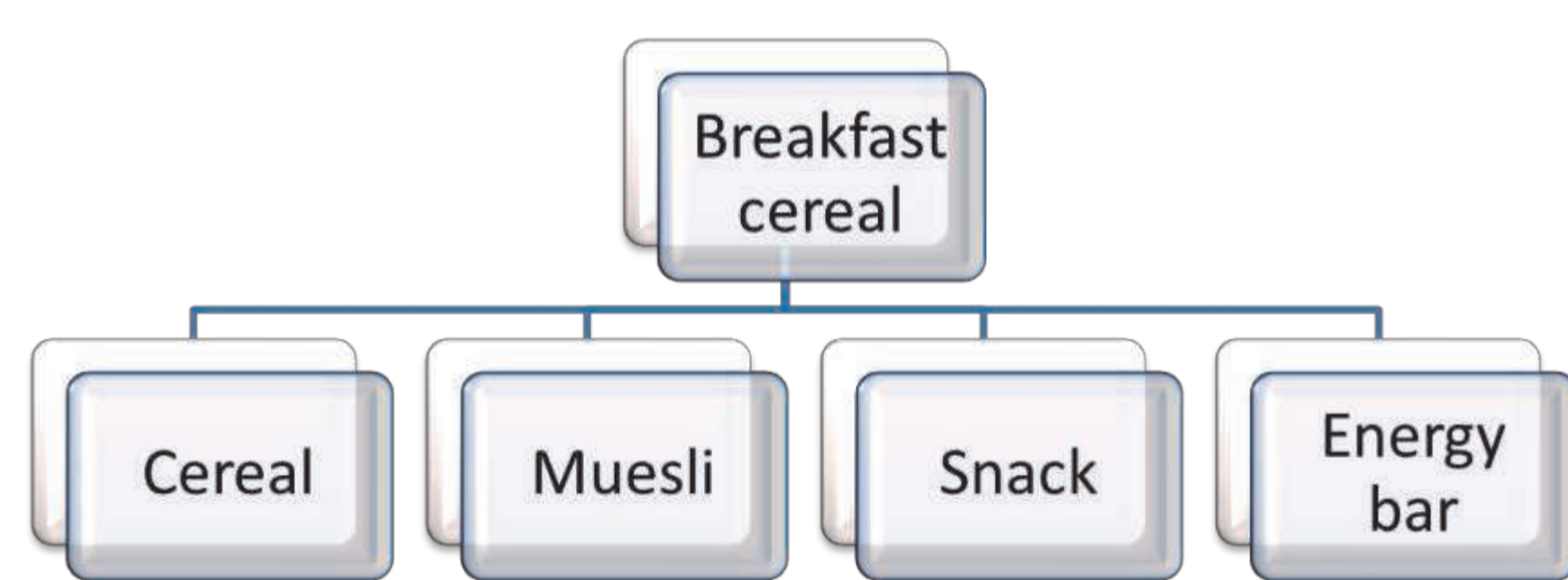
Medical problem requiring approval

Iron deficiency anemia is one of the most widespread pathological deviations. According to World Health Organization – about 2 billion of people in the world have this disease. Iron deficiency conditions are common even in advanced countries. It has been scientifically proven that iron is more easily digested from the products of animal origin, up to 25%. Therefore, a lot of developed countries (for example USA, England, Sweden, Holland) have adopted nationwide programs to prevent iron deficiency by enriching food with inorganic iron salts. However, because of the small result and many side effects, some countries have abandoned this practice.



New FOSHU Products

The high pace of life limits a lot of people in time. The demand for products that meet the requirements of fast food, is rapidly increasing. Therefore, breakfast cereals received a wide acceptance, which are the products ready to eat, with the directive functional effect, like granola, energy bars, etc:



At the moment, our group has developed 3 types of energy bars, with specific functional effect. Each of energy bars is produced from natural components, balanced on fats, carbohydrates and proteins, sugar free, contains low percent of moisture (7-10%) and also they can be stored for a long time. All these things make them competitive.

Energy bar with heme-iron. First of all, it is necessary to say, that iron deficiency anemia is one of the most widespread pathological deviations. According to World Health Organization – about 2 billion of people in the world have this disease. Iron deficiency conditions are common even in advanced countries. It has been scientifically proven that iron is more easily digested from the products of animal origin, up to 25%. Therefore, a lot of developed countries (for example USA, England, Sweden, Holland) have adopted nationwide programs to prevent iron deficiency by enriching food with inorganic iron salts. However, because of the small result and many side effects, some countries have abandoned this practice.

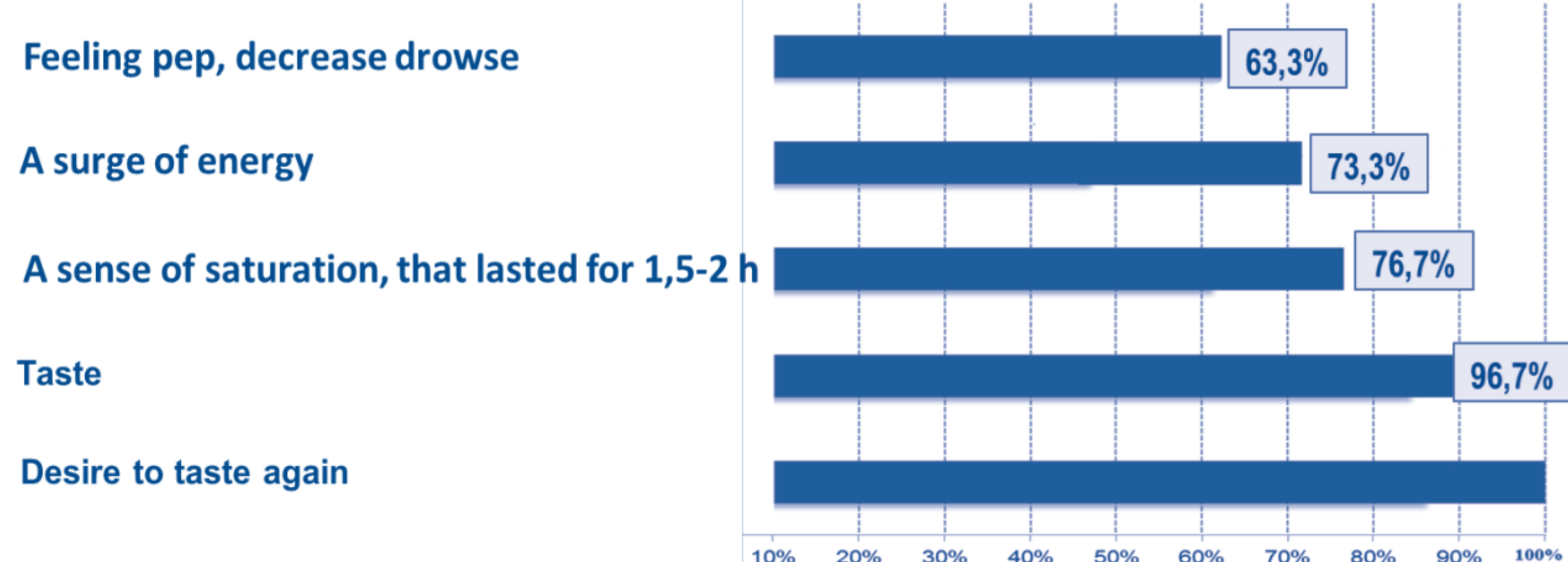
Our group, under the guidance of prof. Evlash V. V. has developed the technology of dietary supplement "Nutrio-Gem", which is made from the blood of cattle. This additive contains a high-grade protein (85g per 100g) and hemolytic divalent organic iron. The use of this additive is possible independently, in the form of biologically active additives (BAD), as well as in the technologies for the production of functional products.

"Nutrition-heme" dietary additive

| Technological properties | Functional properties | Food product |
|---|--|---|
| Color - whitish brown with red shade | Dye, simulating cacao color | confectionery, milk-products, ice-cream, pie |
| Powder with diameter particles (25-30) × 10 ⁻⁶ m | uniform mixing with loose raw materials, moisture-holding ability, correction of structural and mechanical characteristics | Meat products, wurst, pastries |
| Swelling and partial solubility | The moisture binding ability, creaming | Mousse |
| Stability of properties to 100 °C | Thermal stability of color, taste | Products, which have moisture content above hygroscopic |

Also, the approbation was carrying out in one of the Kharkiv universities during two weeks. The size of group was one hundred people.

Results of approbation

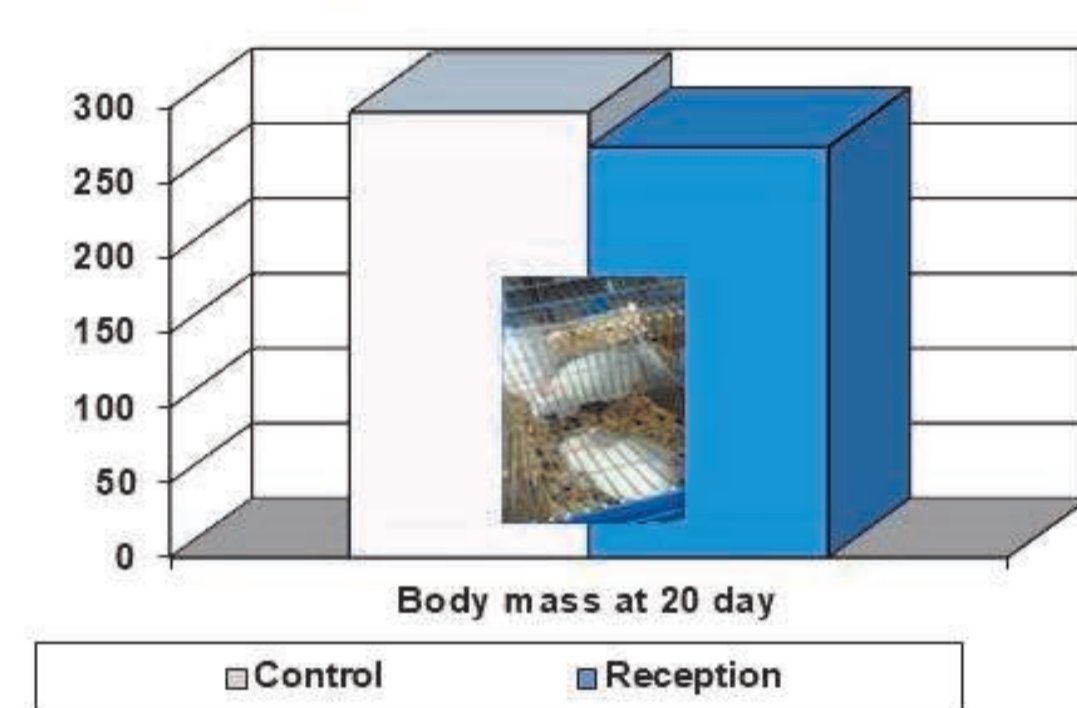


The second type of energy bars is bars with iodine and selenium. Today, ways to overcome the problem of iodine deficiency and other nutrients have been substantiated by enriching the composition of foods or creating dietary additives. However, this problem is still far from being solved. The product of the functional purpose is an energy bar that, in addition, contains to high-energy components with a significant amount of carbohydrates of different structure (low-fat sunflower seeds, dry whey, raisins, dates, cherries, etc.), the wakame seaweed *Undaria pinnatifida* (Harv.) Suringar, which is a source of iodine and selenium. In addition, hypoxia is a pathogenetically important process in the development of fatigue. It normally occurs during the working in complicated conditions and / or with excessive physical activity, especially of a static nature. Preclinical studies have been performed on mice. A 10.4 g / kg energy bar produces a significant actoprotective effect in conditions of dynamic loading (a test for swimming to depletion with a load of 7.5% of body weight within mice), not ceding in the severity of the drug effect with succinic acid at a dose of 270 mg / kg. The prospectivity of the prophylactic use of the bar with iodine and selenium as a means of an actoprotective action is proved.

Bars with *Aegopodium podagraria* (see perception). The technology of bars is developed for a regulation of carbohydrate metabolism and exchange of organic acids, in particular oxalic and lactic acid. *Aegopodium podagraria* is a safe food plant. In modern studies, it has been proven that the active substances of *Aegopodium podagraria* normalize the exchange of uric acid, disrupted by gout, with obesity and metabolic syndrome, suppress inflammation. In our experimental studies on animals, the normalizing effect of the active substances on the metabolism of carbohydrates and lipids has been confirmed.

The carried-out pharmacological tests on animals confirmed a possibility of use of this bar in medical programs for weight reduction and counteraction to an obesity.

Influence of Bar "Body Mass Control" on the dynamics of rats mass



Nutrition facts

| | Protein bar with heme iron | Energy-efficient bar "Champion" | Bar with iodine and selene | Bar with "Body Mass Control" |
|--|----------------------------|---------------------------------|----------------------------|------------------------------|
| (g/100g products) | | | | |
| fat | 6,8 | 11 | 18 | 9,6 |
| protein | 30 | 14 | 22 | 17 |
| carbohydrate | 34 | 68 | 44 | 30 |
| (mg/100g products) | | | | |
| heme iron | 5,1 | 5,2 | | |
| iodine | | | 0,8-3 | |
| Hydroxycinnamic acids | attendant | | | 415* |
| vitamins: C, E, B1, B2, PP, b-carotene | | | | |

* equivalent to chlorogenic acid

Advantage of bars

The advantages of the proposed FOSHU production technologies are minimal heat treatment, which allows preserving all nutrients, convenient packaging, and long term of storage without the adding of artificial preservatives and low energy costs for their production.

Summary

Appointment and application area of innovative technologies FOSHU:

- increase the nutritional and biological value of daily diets for people living and / or working in particularly harmful conditions, as well as with significant physical exertion, with blood loss, loss of strength, surgical intervention or injuries, rehabilitation after physical and psychological stress;
- for general strengthening of the organism; for children in the period of growth and after the diseases;
- women during pregnancy and in the period of breast-feeding; for people with anemia or oncological diseases.

The important things in the diet are plant phenolic compounds, mainly hydroxycinnamic acids. As it mentioned earlier, they can solve the problem of prevention of metabolic syndrome and obesity.

Production

In the production conditions of the Confectionery Factory "Sweet World" (Kharkov, Ukraine), experimental samples of the new Food for Specific Health Use were produced. The Food for Specific Health Use technology is ready for production.



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