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Functional Food in Nutritional Interventions in Selected Non-communicable Diseases

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Advancing Food Systems in Europe Research & Innovation for Healthier, Sustainable and Resilient Future

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The Functional Food

Food can be considered functional if it has been proven to have a beneficial effect on one or more body functions beyond its nutritional effect, such as improving health and well-being and/or reducing the risk of disease.

(FUFOSE z 1999 r. - Functional Food Science in Europe)

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Bioactive food ingredients – confirmed beneficial health properties:

- *dietary fiber*
- *oligosaccharides*
- *polyols - polyhydric alcohols*
- *amino acids, peptides, proteins*
- *polyunsaturated fatty acids*
- *vitamins*
- *minerals*
- *choline and lecithin*
- *lactic acid bacteria*
- *phytochemicals*

Functional food

- **Non-communicable diseases:**
  - insulin resistance,
  - type 2 diabetes,
  - circulatory system diseases, hypertension
  - osteoporosis
  - cancers
  - obesity
  - malnutrition and comorbidities

Functional food market – a rapidly developing sector of the global food market.

The value of the global functional food market is estimated at $280.7 billion in 2021.

(*Functional Foods Market Analysis Report*)

Factors influencing the development of the functional food market:

- aging of societies,
- increased costs of medical and social care,
- increased incidence of diet-related diseases,
- development of knowledge about biologically active ingredients,
- increased availability of new bioactive food ingredients

Development of Functional Muffins with Fruits of the Chilean Forest (Calafate and Maqui) and Supplemented with Prebiotic Fiber

by **Paula García-Milla** [1,2], **Rocío Peñalver** [1] and **Gema Nieto** [1,*]

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The aim of the study is to create functional foods with therapeutic properties that can counteract oxidative stress and contribute to improving human health.

A muffin with inulin, Maqui berries and Calafate has been developed.

- **strong antioxidant activity**,
- **inulin increases the fiber content** and **antioxidant capacity** of muffins, the **addition of Maqui and Calafate contributes to this effect much more**,
- the **content of phenolic compounds is increased**, and an **increase in the content of folic acid** is observed in the samples compared to the control sample (without additives),
- unique properties in terms of **color, aroma** and **taste**, making them attractive to consumers.

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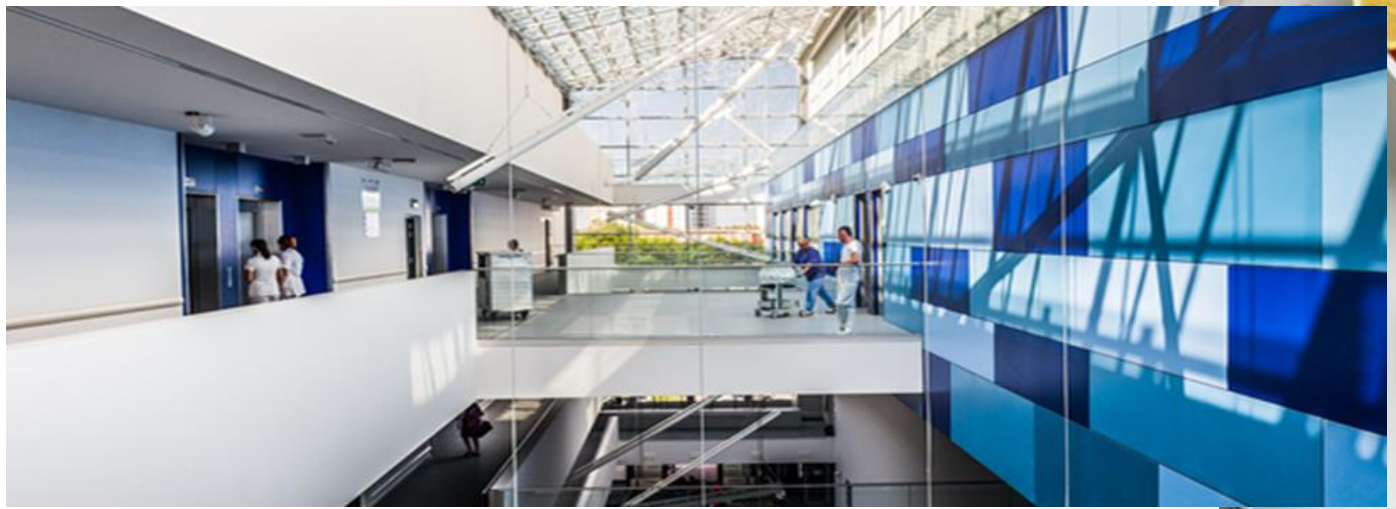
Trends in the development of functional foods:

- Designing new functional products with confirmed (**also by clinical trials**) properties;
- Conducting studies similar to clinical trials – **nutritional interventions** with the use of tested products;
- Cooperating with the food industry sector – joint **R&D projects**;
- Executing **implementation projects.**



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Examples of R&D projects carried out at the Department of Bromatology, MUB

Projects within the "Innovation Incubator 4.0" program:

1. Pre-implementation research "SNACKS FOR INSULIN-RESISTANT" - recipe development and selected qualitative and consumer research
2. Functional food for people with Hashimoto's disease

Project carried out in cooperation with an entrepreneur financed by National Center of Research and Development (NCBR):

Development of recipes for full-value products replacing daily meals

„ SNACKS FOR INSULIN-RESISTANT”

Project stages:

1. Market review and conducting a consumer survey

2. Selection of products with potentially the most beneficial properties (literature review)

3. Development of recipes, conducting sensory analysis, qualitative research, consumer analysis, assessment of the impact of consumption on glycemia

GOAL: snack for insulin-resistant people

Table 1. Glycemic index and glycemic load of the developed snacks.

	Grupa kontrolna		Grupa badana		Razem	
	Indeks glikemiczny	Ładunek glikemiczny	Indeks glikemiczny	Ładunek glikemiczny	Indeks glikemiczny	Ładunek glikemiczny
Przekąska nr 1	28	1,2	19	1,7	24	1,5
Przekąska nr 2	20	2,2	24	2,0	22	2,1
Przekąska nr 3	15	1,9	15	1,4	15	1,7

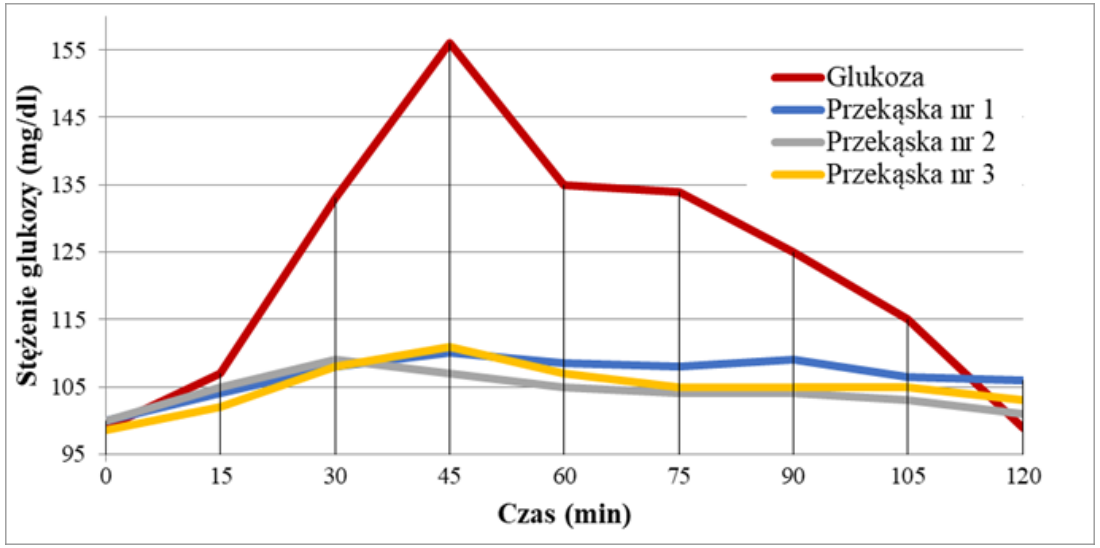

Figure 1. The impact of consuming the developed snacks on glycemia levels.

ASSESSMENT OF THE NUTRITIONAL VALUE OF SELECTED CHOKEBERRY JUICES AND FIBRES AVAILABLE ON THE MARKET, INCLUDING THE DETERMINATION OF THE CONTENT OF BIOACTIVE SUBSTANCES AND CONTAMINANTS

- 25 types of 100% chokeberry juices from different producers (15 organic and 10 conventional)
- 5 types of chokeberry fibers from different producers
- (3 organic and 2 conventional)

1. Determination of vitamin C content - HPLC method
2. Determination of selected mineral components (Zn, Se, Mg, Mn, Cu, Fe) and toxic elements (Pb, Cd, As) - AAS and ICP-MS methods
3. Determination of mercury content - AAS method with amalgamation technique
4. Evaluation of nitrate (V) and (III) contentusing Griess reagent I and II
5. Determination of total phenolic content- using the Folin-Ciocalteu reagent
6. Flavonoid content determination – according to Arvouet-Grand et al. with own modification
7. Evaluation of antioxidant potential using the FRAP method

ASSESSMENT OF THE IMPACT OF CONSUMPTION OF ARONIA JUICE AND ARONIA FIBERON SELECTED METABOLIC PARAMETERSOF THE SUBJECTS

1. Sociodemographic analysis of study participants

2. Assessment of participants' nutrition

3. Assessment of the nutritional status of the study participants

4. Blood pressure measurement

102 study participants (30-65 years old)

study duration: 90 days;

consumption of 100 ml of chokeberry juice daily for 90 days, after 60 days adding chokeberry fiber in the amount of 10 g daily;

all determinations were performed 3 times: before starting the dietary intervention, after 60 days of chokeberry juice consumption, after 90 days - after a month of simultaneous consumption of chokeberry juice and fiber.

5. Assessment of the occurrence of metabolic disorders

6. Analysis of physical activity level-

7. Determination of plasma antioxidant potential of study participants.

8. Determination of the concentration of macroelements, microelements and toxic elements in the blood.

9. Sensory evaluation of juices and fiber on a 5-point scale.

antioxidants

MDPI

Article

Consumption of Chokeberry Bio-Products Improves Specific Metabolic Parameters and Increases the Plasma Antioxidant Status

Ewa Olechno [1], Anna Puścion-Jakubik [2,*], Katarzyna Socha [2], Caterina Pipino [3] and Małgorzata Elżbieta Zujko [1,*]

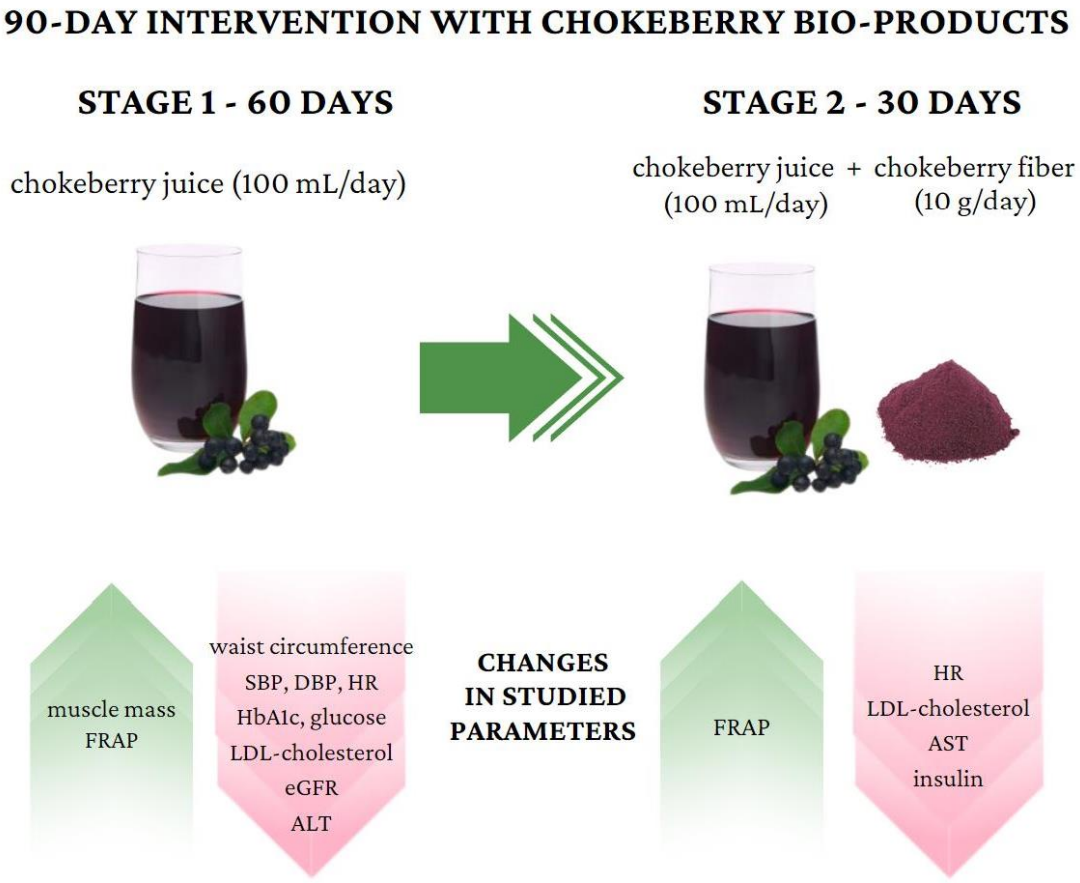

Figure 2. Important changes in studied parameters during chokeberry intervention.

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Current research project:

The effect of ground buckwheat husk supplementation on the selected biochemical parameters, concentration of selected mineral components, total antioxidant status, and the degree of severity of skin changes and subjective assessment in patients with psoriasis.

Common buckwheat
***Fagopyrum Esculentum* Moench**

Common buckwheat
***Fagopyrum Esculentum* Moench**

- **Source of antioxidants, polyphenols and flavonoids,**
- **Rich in minerals such as phosphorus, potassium, magnesium, zinc, copper, manganese and B vitamins,**
- **Anti-inflammatory, antibacterial, anticancer, antioxidant effects,**
- **Rich in fiber, improves the functioning of the digestive system, has a positive effect on the intestinal microbiome,**
- **Supports immunity and has anti-inflammatory effects, which may be beneficial in relieving psoriatic lesions,**
- **Recommended for people with metabolic disorders, dermatological diseases, as well as to support the treatment of obesity and diabetes.**

Preliminary results after a three-month nutritional intervention:

↓Psoriasis Area Severity Index (PASI), ↓ TG, ↓ CRP, ↓ glucose, ↓ creatinine

↓ activity of liver enzymes, ↓ ASO titer indicating arthritis,

↓ visceral fat content in body composition analysis

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MEDICAL RESEARCH AGENCY

Grant: ***„Innovative food products as food for special medical purposes for patients with metabolic disorders – pre-implementation studies”***

Aim - development of ready-to-implement, innovative products (3 recipes) tailored to the nutritional needs of **patients with insulin resistance and lipid disorders**, the consequences of which are cardiovascular diseases.

The properties of the products and the safety of consumption will be verified in studies on **two animal models** (rats with hyperglycemia and Zebrafish - Danio rerio with induced obesity) and by means of a **nutritional intervention conducted among patients**.

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Sales of know-how for entrepreneurs:

- *Development of recipes for health bars for children*

- *Modification of the recipes of functional bars*

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Medical University of Białystok – research centers

Laboratory of Genomics and Epigenetic Analyses

performs a wide range of analyses based on DNA sequencing using Next Generation Sequencing (NGS) methods ...

Metabolomics and Proteomics Laboratory of the Clinical Research Centre at the MUB

specialises in metabolomic and proteomic analyses used in medical research, e.g. on personalised medicine ...

Experimental Medicine Centre

is one of the most modern experimental facilities in Europe that creates favorable conditions for the work of research teams ...

Academic Centre for Pathomorphological and Genetic-Molecular Diagnostics

is one of the largest in the country and the largest in the north-eastern region comprehensive diagnostic centre ...

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Medical University of Białystok - leader in building the region's potential in the area of medical sciences, pharmaceutical sciences and health sciences

We invite you to cooperate!

Polish Society of Nutritional Sciences

Faculty of Pharmacy with the Division of Laboratory Medicine
Medical University of Bialystok

4th International Scientific Conference
"Dilemmas of Human Nutrition Sciences - Today and Tomorrow"

„PLANT DIET – BENEFITS AND RISKS”

June 12-13, 2025 - Bialystok

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