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Name of the unit: TEAM OF STARCH TECHNOLOGY AND CONFECTIONERY Institute of Food Technology and Analysis, Lodz University of Technology		Symbol: I-54 https://www.binoz.p.lodz.pl/pl/instytut-technologie-analzy-zywnosci/o-instytucie
Head of the unit: Prof. Dorota Żyżelewicz	Potential promoters: Prof. Dorota Żyżelewicz PhD. Joanna Oracz – auxiliary promoter	Contact person: Prof. Dorota Żyżelewicz tel: 48-42-631-34-61 dorota.zyzelewicz@p.lodz.pl
Scope of activities: <ul style="list-style-type: none">▪ Characteristics of raw materials, semi-finished and finished products, mainly of plant origin, in terms of the qualitative and quantitative composition of nutrients (proteins, fats, carbohydrates) and bioactive compounds (vitamins, phenolic compounds, alkaloids, biogenic amines, anti-nutritional compounds - e.g. acrylamide, acrolein, polycyclic aromatic hydrocarbons, <i>trans</i> fatty acids and others)▪ Identification and characterization of the structure of various groups of bioactive compounds and their metabolism products and other active substances derived from raw plant extracts and food products (UHPLC-DAD-ESI-HR-MS / MS, FTIR)▪ Development and optimization of new methods of extracting biologically active compounds with antioxidant, anti-inflammatory and neuroprotective properties▪ Fractionation and purification of plant extracts▪ Use of various methods for the encapsulation of standard substances and raw and purified plant extracts as well as their application to food▪ Determination of antioxidant and anti-inflammatory properties of reference substances, plant extracts, encapsulates and food products using <i>in vitro</i> methods▪ Research on the stability of food ingredients in processing and during storage▪ Determining the interaction between phenolic compounds and food ingredients▪ Searching for bioactive phytochemicals and testing their properties to prevent civilization diseases (e.g. heart and circulatory system diseases, cancer and neurodegenerative diseases)▪ Testing the bioavailability of food ingredients using <i>in vitro</i> methods		Graphical material   



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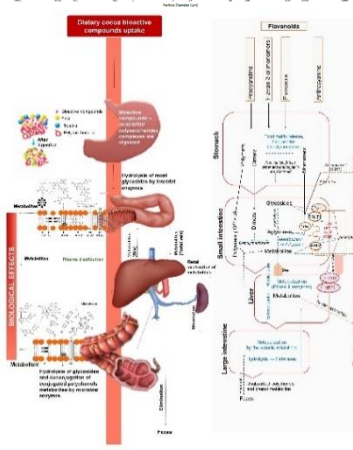
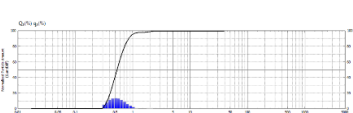
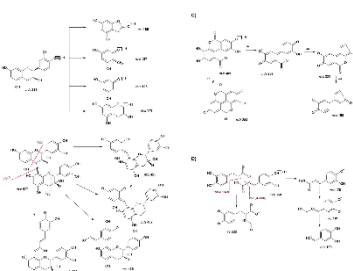
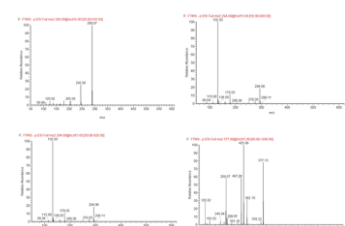
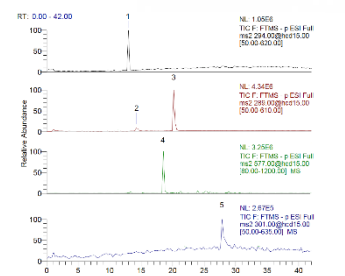
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Present activities:

The Team of Starch Technology and Confectionery conducts research in the discipline of Nutrition and Food Technology. The research topics of the Team include the following areas:

1. Food composition testing, including nutritional value, basic chemical composition, and food quality and authenticity
2. Identification and characterization of bioactive components of the diet
3. Examination of the stability of the composition during food processing and storage
4. Designing food with pro-health properties and for people with special nutritional requirements (eg for diabetics, with reduced energy value). Functional food
5. Limiting the degradation of bioactive compounds and the formation of anti-nutritional compounds during technological processes
6. Encapsulation of bioactive substances and plant extracts
7. Use of waste and by-products from food processing to obtain functional food and edible packaging
8. Research on bioactive food ingredients in the direction of preventing civilization diseases

- Food safety is inextricably linked with public health. Currently, in order to maintain the quality and extend the shelf life of food, the food industry uses various additives, including synthetic ones. However, more and more consumers are looking for natural food, enriched with extracts rich in bioactive compounds that positively affect human health, or enriched with individual or groups of compounds with a targeted pro-health effect. However, many of these valuable bioactive compounds are sensitive to processing conditions and degrade to a greater or lesser extent. Therefore, new methods of food production are sought, including new food additives. One of the current solutions in this area are the encapsulation of extracts, single substances or groups of compounds in order to improve the quality of food, extend its storage life and give new features, including functional ones. The capsule shell protects the substances contained in the capsules against the external environment, ensures precise controlled release of substances, masks their smell, taste, color, reduces or increases volatility, improves water solubility, increases bioavailability and digestibility. Modification of the properties of food ingredients through their encapsulation can be accomplished by using materials with specific barrier properties to manipulate the release of active substances to provide exceptional sensory and/or functional benefits. In the modern conditions of the dynamic development of the food industry, the problem of obtaining and applying encapsulated preparations of plant origin to food is becoming more and more important and requires detailed scientific research. Therefore, research on natural bioactive food ingredients with potential health-promoting properties, also in the form of preparations protected by encapsulation and with properties changed by this process towards functional properties, are one of the most important research directions in food and nutrition technology.

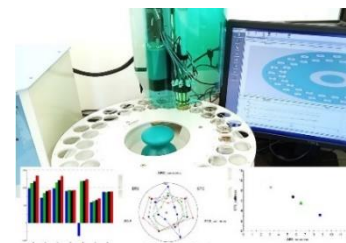




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Future activities:

Searching for new sources of bioactive phytochemicals and testing their properties to prevent civilization diseases.
Study of the effect of encapsulation of bioactive substances present in plant extracts on the properties and bioavailability of bioactive components of the diet.

Keywords:

food, diet, phytochemicals, bioactive compounds, plant extracts, encapsulation, antioxidant activity, bioavailability

List of attachments:

Properties and bioavailability of encapsulated preparations of natural bioactive substances

Publications/patents/awards/grants:

1. Józwiak P., Ciesielski P., Zakrzewski P. K., Kozal K., Oracz J., Budryn G., Żyżelewicz D., Flament S., Vercoutter-Edouart A-S., Bray F., Lefebvre T., Krześlak A., Mitochondrial O-GlcNAc transferase interacts with and modifies many proteins and its up-regulation affects mitochondrial function and cellular energy homeostasis. *Cancers* 2021, no 13, article 2956, p. 1-22
2. Oracz J., Nebesny E., Żyżelewicz D., Budryn, Luzak B. Bioavailability and metabolism of selected cocoa bioactive compounds: a comprehensive review. *Critical Reviews in Food Science and Nutrition* 2020, 60, 12, p. 1947-1985
3. Oracz J., Nebesny E., Żyżelewicz D., Identification and quantification of free and bound phenolic compounds contained in the high-molecular weight melanoidin fractions derived from two different types of cocoa beans by UHPLC-DAD-ESI-HR-MSⁿ. *Food Research International* 2019, no. 115, p. 135-149
4. Żyżelewicz D., Oracz J., Kaczmarska M., Budryn G., Grzelczyk J., Preparation and characterization of inclusion complex of (+)-catechin with β -cyclodextrin. *Food Research International* 2018, no. 113, p. 263-268
5. Budryn G., Żyżelewicz D., Buko V., Lukivskaya O., Naruta E., Belonovskaya E., Moroz V., Kirko S., Grzelczyk J., Bojczuk M., Mostowski R., Falih M., Evaluation of antifibrotic effects of coffee and cocoa extracts in rats with thioacetamide induced fibrosis. *European Food Research and Technology* 2018, Vol. 244, no. 12, p. 2107-2115
6. Żyżelewicz D., Zakłos-Szyda M., Juśkiewicz J., Bojczuk M., Oracz J., Budryn G., Miśkiewicz K., Krysiak W., Zduńczyk Z., Jurgoński A., Cocoa bean (*Theobroma cacao* L.) phenolic extracts as PTP1B inhibitors, hepatic HepG2 and pancreatic β TC3 cell cytoprotective agents and their influence on oxidative stress in rats. *Food Research International* 2016, no. 89, p. 946-957