Metabolic syndrome (MSyn), includes metabolic abnormalities, leading to an increase in health problems like obesity, dyslipidemia, cardiovascular diseases, and diabetes, which contribute to an increase in mortality rate. Lifestyle changes, as well as diet, which is the source of bioactive peptides, may be helpful in MSyn prophylaxis. After enzymatic action biologically active peptides can be released from parent proteins and interact with body receptors to regulate functions of the organism. According to scientific reports, peptides derived from food proteins exhibit bioactivities important for the prevention of MSyn diseases. That is, they can regulate blood pressure and glycemia, can reduce body mass and scavenge free radicals. Peptides with diversified bioactivities were discovered in some sources of food proteins, e. g. milk, meat, eggs, a variety of plants, and so on but little is known about oat proteins.

This project will provide evidence-based food solutions to address major health problems facing the European consumer, including MSyn. Oat kernels are characterized by a high content of nutrients, such as fats, proteins, vitamins and minerals. High level of soluble fiber and β-glucans have been shown to be effective in preventing heart diseases. Unfortunately, consumption of oat products is smaller in Poland than in Western Europe, Scandinavia, USA or Canada. The project plans to use novel integrated approach to unlock an intelligence in oat with regard to health promotion that is over and above its nutritive functions.

The aim of this study is to show the potential role of oat kernels peptides in the prevention of MSyn in daily diet. Particularly peptides which exhibit the following activities: antihypertensive [angiotensin I-converting enzyme (ACE) inhibition], antidiabetic and antiobesity [dipeptidyl peptidase IV (DPP-IV), α-glucosidase, α-amylase, and lipase inhibition] as well as antioxidative released during the simulated digestion in human will be studied. Bearing in mind that the inhibitory effect determined under in vitro conditions does not always correspond to real activity in human body, are questions arise whether the obtained biopeptides will cross the intestinal barrier in the intact form. This project is an answer to the above demands. Different methods and techniques for separation, identification and characterization of biological activity of peptides and digests will be used: electrophoresis (SDS-PAGE; 2D-PAGE), chromatography (RP-HPLC), spectrophometric analyses of bioactivity, mass spectrometry (LC-MS), *in vitro* Caco-2 cell experiment, combined with bioinformatics methods and tools.

Studies of bioactive peptides from food products are mainly focused on determining their activity toward one specific biological function they may be involved in. Thus, a lot of “mono-functional” biopeptides are well documented in the literature while data on the multi-bioactivity of these compounds is rather poor. In these study special attention will be paid to the peptides that will show dual or multiple action against MSyn targets.

Proposed a novel hybrid (integrated) approach may simplify the discovery of MSyn preventive peptides, as well as highlight some of them as potent bioactive ingredients that may be incorporated into functional foods. The research strategy involving the *in silico* and *in vitro* methodologies may be useful in the production of oat protein hydrolysates supporting the treatment of MSyn dysfunctions.