The tomato fruits are a major source of valuable vitamin, minerals and other bioactive compounds with high antioxidant potential. Furthermore, tomatoes up to 90% are consisted of water, hence their low caloric value. A major compound responsible for tomato characteristic color is lycopene. Among of all carotenoids, it demonstrates the strongest antioxidant activity. Lycopene is highly concentrated in mature fruits, and its daily intake decrease the risk of cardiovascular diseases and reduce the risk of certain types of cancer, especially cancers of the prostate, lung, and breast. Tomatoes also contain moderate amount of β- carotene (known for its provitamin A activity) which supports the immune system processes in the human body, and promotes good vision, especially in low light. It has a positive association with decreased risk of some skin cancer generated by sunlight. Others antioxidants presented in tomato fruits are phenolic compounds and vitamin C. Thus, adequate daily intake of fresh tomatoes helps to fight an infection and is linked to a decrease in the risk of several civilization diseases. That phenomenon resulted from the ability of aforementioned compounds to neutralize free radicals i.e. structures that can damage cells and/or affect cell functions, they are also responsible for many human diseases, including cancer.

The fresh tomato are available in the market through the whole year, however the most demanded by consumers due to the proper maturity, taste, and therefore the high nutritional value are the fruits coming directly from the natural, field production. Production of field tomato is limited to a relatively short period. Likely, the fresh fruits are characterized by limited shelf life. Therefore, approximately 60% of the annual production of tomatoes is highly-processed for concentrates, juices, ketchup and other tomato sauces. The processes involving the temperature treatment i.e. pasteurization, sterilization strongly improve shelf life of the end-product but also diminish the product quality due to the changes in quantity and quality of thermolabile phytochemicals. High hydrostatic pressure (HHP) is an innovative technological process of food preservation with emphasis on food sensitive to temperature treatment. The microbial stability and inactivation of enzymes may be achieved under HHP already at room temperature, whereas majority of bioactive compounds can be maintained at the initial level. Moreover, HHP treatment of fruits/vegetables could result in an increase in content of some antioxidants due to higher their extractability upon the treatment.

A following hypothesis will be verified in that project: “If the selection of parameters of high hydrostatic pressure process affect stability and extractability of bioactive compounds from the plant material, than it could also determined their profile, antiradical activity, and functional properties”. Verification of the aforementioned hypothesis will be based on elaboration, and selection of parameters of the pressurization process (pressure volume, treatment time, vacuum condition) of pulp obtained from selected varieties of tomato in order to characterize and estimate the effect of HHP treatment on the content of bioactive compounds, enzymatic and microbial stability. Whereas, suitable extraction procedure, using solvents with different type and concentration, allows to obtain lipo- and hydrophilic extracts and to carry out qualitative and quantitative identification of bioactive compounds presented in the material analyzed. The essence of this project is to apply the HHP as non-thermal process for so-called “cold” pasteurization of tomato pulp at reduced oxygen condition. It is assumed that HHP treatment will result in cell walls breakdown what in turn affect better extractability of potential antioxidants. It is also suggested that proper selection of HHP process conditions allow to reduce significantly enzymatic activity and microbial content in the material treated. This project stands on basic research taking into account selected bioactive substances from the group of carotenoids, phenolic compounds or vitamin C. Special attention will be also paid to evaluate the antioxidant properties of extracts obtained from the tomato pulp as well as to study the ability of tomato pulp to inhibit the formation of advanced glycation end-products. Research that will be carried out in this project enable the overall evaluation of the impact of HHP on the profile of bioactive compounds of tomato pulp, their total antioxidant activity as well as functional properties which will be correlated to the presence of the main antioxidants. These insights would help imporove konowledge about an impact of HHP process on bioactivity of tomato pulp but also target the consumption of tomato in Poland as a part of an overall comprehensive dietary management strategy for type 2 diabetes.