

## DESCRIPTION FOR THE GENERAL PUBLIC

In recent years there has been a large increase in consumer interest of the influence of nutrition on the human health. A rich source of substances having beneficial effect on human organism are, among others, fruits and vegetables. One of the most widely consumed vegetables in the world is the potato. That is because of its both high nutritional and culinary values. In particular, in underdeveloped or developing countries, colorful African potatoes are the basis of the diet. Components of this potato have a number of medicinal properties. It has been already proved, that these relatively unknown and undervalued in Europe varieties contain high levels of anthocyanins in acylated forms.

At variance to anthocyanins from fruits that are non-acylated, the acylated ones exhibit e.g. high thermal and hydrolysis resistance, which makes them technologically attractive, on top of health-beneficial properties. Due to that, the first stage of the project is obtaining of acylated anthocyanins (AA) derived from colored potatoes and specification of their standard qualitative and quantitative composition.

For the proposed research on broad biological activity of AA, the authors selected two varieties of purple potatoes: Blue Congo and Vitelotte. These types of potato are characterized by the presence of a dominant aglicon anthocyanin that has in its molecule different substituents in position 5' of the B ring. The Vitelotte variation is rich in anthocyanins, wherein the aglycone is malvidin, and in Blue Congo petunidin derivatives are dominant. It is thought that such a differentiation in the molecular structure of the principle anthocyanins should result in their different properties. We plan to perform *in vitro* studies aiming at determining the following activities of AA: antioxidant, anti-inflammatory, and anticancer.

It is known from numerous works that anthocyanin concentration in the blood achieved after their ingestion was much lower than the concentration at which the antitumor effect is observed, and therefore there are doubts whether anthocyanins will have a positive influence on tumors other than those associated with the digestive system. Therefore, the authors of the project chose three cell lines to test the antitumor activity of anthocyanins, one of them related with the human epithelial pancreatic cell line EPG 85-257 and the other two related with the gastrointestinal tract: the human colon cancer cells CaCo2 and HT29.

The interaction between AA and oncological medicines (5-fluorouracil, oxaliplatin and doxorubicin) will also be studied to determine the therapeutic effectiveness of such mixtures, their possible synergism or cooperation of other type in action on tumor cells. Due to the fact that until now no studies were made of the way AA transport across the epithelium of the alimentary system occurs, and it has not been confirmed whether AA get into blood circulation and what are their metabolites, we intend to carry out this project. In the first stage of the research we want to determine the effect of AA on tumor cells of CaCo2 line. That line constitutes a perfect model of human cells *in vitro* for studying the effect of compounds of potential healing activity towards brush border membrane of human intestine. In here it will be possible to explain the potential mechanism of AA permeation across the intestinal wall, and specify their metabolites.

From the literature on biological activity of extracts from color potatoes it follows that there are no publications containing comprehensive studies explaining the molecular mechanisms that are responsible for protecting the lipid bilayer against peroxidation processes.

Hence, the parallel aim of the project is to explain the principles of the mechanism of interaction between AA and biomolecules – lipids of a mimetic membrane and albumin. Research has shown that natural compounds can change the properties of membranes when interacting with them. The character of the changes may follow e.g. from protective functions played by the substances (antioxidative or antitumor). Structural studies with the use of model lipid membranes conducted with various methods are expected to furnish information on the way the AA modulate the physicochemical properties of membranes. They will indicate, on the basis of changes in measured parameters, the localization of AA components within the membrane and explain the way of the antioxidant and anticancer activity of anthocyanins towards lipid membranes. Since albumin is the principal component of the plasma, responsible for transport of many exo- and endogenous substances to specific destinations within the body, exploration of the process of AA association with transport proteins is expected to clarify the probable mechanism of AA distribution within the body.

Our studies are expected to be essential not only due to their importance in basic research, aiming at explaining the possible mechanism of the beneficial effect of AA on the human organism, but also in further applicative studies, e.g. in relation to food and nutrition or in medicine. The AA as colorants may find profitable and broad application in the food industry, being an excellent alternative to unstable, non-acylated anthocyanins, also as dietary supplements.