

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection strongly affected the economy, health care system and social life around the World. Scientists try to find the medicine and vaccine which will help our organisms to fight with SARS-CoV-2. Important also is protection of ourselves but not only recognized as the social distance, disinfection and frequent hand washing or covering nose and mouth with mask. It seems that one of most important factor of this protection is immune system, who protect our organism from various types of infection. For this reason, people trying to protect themselves from infection use various types of vitamin and mineral supplements as well as natural food products, especially herbs. *Nutritional state plays an important role in proper function of the immune system.* It is documented that protein, n-3 fatty acids, vitamin D and A, iron, zinc, selenium are necessary for immune response in human organism. Well balanced diet with food products rich in the mentioned above nutrients can be one of most important factors to prevent and fight with the SARS-CoV-2 and another's future infections. **Sardines and sprats**, seem to be a natural food product which can improve nutritional status of our organism. They are rich sources of n-3 fatty acids, vitamin D, calcium, magnesium, zinc, selenium and iodine. Sardines and sprats don't cumulate a lot of toxins. For this reason they can be consumed in amount 4 kg per week. *Consumption of fish and seafood in Poland is low i.e. 12-13.5 kg per capita per year. In the Czech Republic consumption of fish is lower i.e. 5,7 kg per capita per year. This is almost 50% and 75% respectively, less like in other countries of European Union.*

Therefore the aim of the proposed research is:

- 01)** To assess the nutritional value of sardines and sprats after cooking, steaming, baking, and frying.
- 02)** To evaluate impact of sardines or sprats after cooking, steaming, baking, and frying in *in vitro* model of digestion, intestinal permeability, and inflammatory response in colon adenocarcinoma cell lines.
- 03)** To test the potential impact of evaluated fish for production of antioxidative enzymes and their role in inflammatory activity on the leukemic, macrophages and two types of colon adenocarcinoma cell line cultures.
- 04)** To assess the potential anti-inflammatory effect of sardines and sprats fish on human lung fibroblasts and colon adenocarcinoma cell lines infected by coronaviruses with the identification of potential molecular mechanisms of action.
- 05)** To monitor the impact of sardines or sprats added to the experimental diets of Wistar rats with induced oxidative stress on the changes of biochemical parameters connected with oxidative stress and immune response evaluated also by genes, and its protein expression.

Project will be realized in cooperation of Czech University of Life Science Prague (CZU), Czech Republic and University of Agriculture (UAK) in Poland.

The research teams from both universities will carry out basic research using cell lines models and the experimental Wistar model of rats. In these studies, it will be evaluated whether sardines and sprats can help to reduce inflammation and oxidative stress. An important part of the proposed experiments will be the assessment of the influence of sardines and sprats on the coronavirus infection in two models of cell lines. In an animal model, it will be checked whether the addition of fish to experimental diets will improve the antioxidant status and reduce the production of pro-inflammatory cytokines. The idea of undertaking of this type of research results from the current epidemic situation and the information on the deficiency of vitamin D3, n-3 acids, calcium and magnesium in the food rations of Czech and Polish populations. The deficit of these nutrients probably has a significant impact on the infection and the course of SARS-CoV-2 infection. Perhaps promoting a higher consumption of fish, including sardines and sprats, will help reduce the deficiency of n-3 acids, vitamin D3, calcium, magnesium and other trace elements, and thus significantly improve the function of the immune system. The results obtained from this project can be used to plan further human studies.