# DESCRIPTION FOR THE GENERAL PUBLIC

Efficient pig production is crucial to the breeding industry. Different additives to animal feeds can serve as additional sources of energy, vitamins, and fatty acids. Peruvian maca (*Lepidium meyenii*) is a plant that has grown in the Peruvian Andes for over 2000 years and whose roots are now used in the human diet as a supplement for their positive effects in preventing osteoporosis, forming muscles, and in developing endurance, as well as regulating hormonal balance. Dried and minced maca roots are over 60% of carbohydrates and over 10% plant-derived proteins. Maca is rich in fiber, amino acids, microelements, vitamins, and unsaturated fatty acids. Thus, supplementing pigs' diets with *Lepidium meyenii* may provide a source of valuable bioactive ingredients, which could have a positive effect on growth rate and nutritional value of the meat. Moreover, the pig is an important large animal model in biomedical research, so this project can provide new knowledge on the dietary effects of maca supplementation. Its influence on blood lipid profile (including cholesterol level) could be important for human medicine.

**The hypothesis** is that lyophilized roots of *Lepidium meyenii* are a valuable source of nutritional bioactive ingredients, which can positively affect pig growth and fatty acid composition of the muscle tissue. Moreover, supplementation with maca, by regulating the expression of genes involved in lipid metabolism in the liver, can improve cholesterol and triglyceride levels in the blood.

**The aim** of the study is to determine the effects of *Lepidium meyenii* supplementation in pig nutrition on: 1) production traits (growth rate, feed utilization) and pork quality parameters; 2) transcriptomic profile of muscle tissue and its relation to meat fatty acids composition; 3) hepatic mRNA level of the selected genes involved in cholesterol synthesis and lipid metabolism in the context of the lipid profile in the blood. Moreover, the methylation of the promotors of the differentially expressed genes, as well as the levels of their encoded proteins will be examined.

We plan to divide the forty female pigs into and experimental and a control group. The experimental group (n = 20) will receive a standard diet similar to that of the control animals (n = 20), but with addition of dry and minced roots of Peruvian maca for about 90 days. During the experiment, basic parameters such as daily weight gain, and daily feed consumption will be recorded. The feeding experiment will finish when the pigs reach about 120 kg. During routine slaughter in the slaughterhouse, blood samples, liver and muscle tissue samples will be collected. Global RNA sequencing (RNA-seq) of muscle tissue will be performed and the results will be checked on a larger group using real-time PCR method. The protein levels and the DNA methylation profiles will also be determined. These results will be considered in relation to the fatty acid profile of muscle. In liver tissue, selected genes important for cholesterol synthesis will be studied for transcript level and DNA methylation profile, in relation to lipid profile measured in blood serum. The protein level of the most interesting genes will also be studied.

We believe that the comprehensive methodology we are proposing will allow us to identify the potential benefits of Peruvian maca supplementation in pig feeding. There is limited data on this bioactive plant additive in domestic animal feeding, which gives us the conviction that our results will be valuable to farm animal breeding community, as well as to the feed industry. As the pig is a valuable large animal model in the biosciences, our nutrigenomic study is likely to provide new information helpful for humans with civilization diseases.