

Nowadays, obesity becomes a common problem that affects human beings, as well as domestic animals. Growing overweight accelerates tissues aging and runs the risk of serious metabolic disorders including insulin resistance and type 2 diabetes. Relatively new and recently described disease entity is **Equine Metabolic Syndrome (EMS)**, which is characterized by the excess weight, insulin resistance, whole-body inflammation and acute or chronic laminitis. Strachy diet is thought to be the major cause of EMS, because it is still considered as a essential nutrition concept due to an easy access to fodder like corns. Taking into account the lack of the effective treatment methods, only proper nutrition management system can limit EMS progression and increase animal welfare. Regular and lasting control of fodder glycemic index, including great demand for insulin sensitivity regulators i.e. chromium, magnesium and manganese, may regulate body-weight and reduce the inflammation of subcutaneous adipose tissue.

The main purpose of this project is to better understand the mechanisms causing EMS, which in turn may contribute to the **development of innovative, therapeutic nutrition strategies for EMS treatment**. The research hypothesis presumes that algae enriched with minerals (Cr(III), Mg(II), Mn(II)) via **biosorption** may remarkably diminish clinical manifestations of EMS on both molecular and cellular levels. Literature data indicates that algae possess very good biosorption properties, and the content of a given microelement can increase in the enriched biomass even several thousand times. The preliminary experiments carried out on lying hens, pigs and goats showed that the enriched natural biomass of plant origin has no negative impact on the production parameters and the overall health of the tested animals. It should be also mentioned that for the production of feed additives for EMS horses, algal biomass collected from the Polish seaside and/or freshwater reservoirs will be used. The excessive amounts of algae in many water reservoirs all over the world (including Poland) are the result of **eutrophication**. Production of feed additives is one of the methods of their utilization.

Presented project concerns two different research areas, while aims and presumptions are based on the exploitation of the research potential and cooperation between two Universities:

- (1) **Biosorption of microelement ions** by the algal biomass and the **analysis of the elemental and nutritional composition of the obtained biomass** (Wrocław University of Technology - PWr).
- (2) **In vitro assessment of the influence of enriched algal biomass** using epithelial colorectal adenocarcinoma cells (Caco-2) along with the **evaluation of manufactured fodder components clinical utility** (Wrocław University of Environmental and Life Sciences - UPr).

Both tasks will demand to convene interdisciplinary team in order to conduct basic research related to the algal biomass collection, detailed evaluation of the biosorption process (selection of optimal parameters - pH, temperature, biomass and metal ions concentrations). Moreover, there is a need to estimate the basic characteristics of manufactured enriched algal biomass and its influence on the carbohydrates/lipids administration in horses suffered from EMS.

The expected results from the project are:

- (1) Production of a highly effective nutrition supplement rich in microelements and other biological active substances for horses diagnosed with EMS.
- (2) Assessment and verification of obtained supplement performance in both *in vivo* and *in vitro* studies.

In compliance with the project plan, the following features are intended to be established: (i) chemical composition of the obtained fodder material, (ii) daily dose covering chromium, magnesium and manganese requisitions, (iii) dosage method. The composition of the obtained feed additive is going to be assessed in PCA accredited laboratory (Laboratory of Multielemental Analyses at Wrocław University of Technology - LCAW) in accordance with PN/EN ISO 17025 quality norm which in the perspective can give a chance to apply, for example to the National Centre for Research and Development for funding for development of an innovative product for animals.