

**Innovative approach to support healthy ageing:  
a multidirectional evaluation of the health-promoting potential of iodine biofortified lettuce  
- a study in a D-galactose-induced ageing rat model**

**Research problem:**

Population ageing is one of the most important public health challenges of the 21st century. It is estimated that the number of seniors will increase significantly in the coming decades. Unfortunately, prolonging life does not always mean maintaining a good quality of life. Many health problems increase with age. These include memory disorders, chronic inflammation, neurodegenerative diseases, decreased immunity and nutritional deficiencies. More and more attention is being paid to finding ways to support so-called healthy aging — that is, maintaining physical, mental fitness, and independence for as long as possible. One of the underestimated nutritional challenges in older adults is iodine deficiency — a trace element essential for the proper functioning of the thyroid gland, metabolism, brain function, and the immune system. Still in many countries, the primary dietary source of this element is table salt. However, the World Health Organisation's recommendation to limit its intake may increase the risk of iodine deficiency, especially in the geriatric population. This may accelerate aging processes and contribute to cognitive decline. One promising and alternative approach to increasing dietary iodine intake is plant biofortification — enriching plants with this trace element during cultivation.

**Aim of the project:**

As part of the scientific project, we plan to assess whether iodine enrichment of a readily available and widely consumed vegetable such as lettuce (*Lactuca sativa* L.) can support healthy ageing - improving memory, reducing oxidative stress and inflammation, benefiting brain function, gut function and cellular processes during ageing.

**Research description:**

The innovative aspect of our project lies in its comprehensive, interdisciplinary approach: from plant biofortification and detailed analysis of the chemical composition of lettuce, to the evaluation of a broad spectrum of biological effects following its consumption in laboratory animals using a D-galactose-induced accelerated aging model. To date, there have been no studies to assess the impact of consuming a vegetable biofortified with iodine on ageing-related processes.

The first stage of the research will be to cultivate lettuce biofortified with iodine using potassium iodate (KIO<sub>3</sub>). Subsequently, an untargeted metabolomic analysis will be carried out to provide detailed information on the effect of biofortification on the chemical composition of the plant, which will enable an assessment of the health-promoting potential. The next step will be an *in vivo* study in an animal model. In this experiment, we will evaluate how the addition of iodine-enriched lettuce will affect parameters related to the ageing process in Wistar rats. Cognitive function, morphological changes in the brain, levels of oxidative stress and inflammation will be assessed, and the effects of this type of plant on the expression of genes relevant to ageing will be analysed in selected organs. This will be complemented by an analysis of the gut microbiota.

**Expected impact:**

The expected outcome of the project will be to provide new data on the potential use of biofortified plants in the nutrition of older people. The obtained results can be the basis for the planning of future clinical trials and the development of new dietary strategies to support healthy ageing. In addition, the project will contribute to the knowledge of iodine biofortification of vegetables. Importantly, the planned research is in line with current global public health challenges and priorities, including the World Health Organisation's activities under the Decade of Healthy Ageing (2021-2030).