

Stomach cancer is one of the most common malignant tumor. In 2020 it was responsible for nearly 800,000 deaths worldwide. At the same time, it is estimated to be fourth in the world with more than 1,000,000 new cases. The majority of patients diagnosed with malignant gastric cancer are over 50 years of age. As much as 93% of the cases in men and 91% of cases in women occur in this age group. In addition, the risk of developing stomach cancer increases with age. The causes of cancer are not fully explained, although it is believed that as much as 90% of its etiology results from environmental factors with negative effects, i.e. smoking, ethnicity (the incidence is particularly high in Asia, Eastern Europe and in Central and South America) and *Helicobacter pylori* infection. In addition, the development of stomach cancer is also favored by a diet consisting of smoked, pickled, fermented or simply stale dishes.

The 5-year survival rate for patients with gastric cancer is poor due to late detection of the disease at symptomatic stages. The currently used diagnostic methods, incl. gastroscopy, ultrasound, computed tomography or tumor markers are invasive, and often also ineffective and expensive.

In recent years, very promising results have been provided by the volatilomic approach i.e. concept of the application of breath small molecular mass compounds as carriers of the information about the health status of an individual. Sensor-based devices known as e-noses are here a particularly promising alternative because they have been demonstrated to be able to discriminate gastric cancer patients from other patients and controls with high sensitivity and specificity. These devices exhibit many advantages such as speed of analysis, small size and potential point-of-care use. However, the main unresolved issue here is the unclear identity of breath compounds related to gastric cancer, which limit the application of the volatilomic approach in clinical settings.

The aim of the project is to analyze volatile organic compounds (VOCs) in selected bodily fluids, i.e. tissues, gastric juice and breath of patients with gastric cancer toward the identification of the gastric cancer markers. For this purpose advanced analytical techniques such as gas chromatography with mass spectrometric detection and different sample preconcentration methods will be applied. This study will be performed in cooperation with internationally recognized specialists in the field of breath research (University of Innsbruck) and gastric cancer diagnosis (University of Latvia).

The results of the project will help to confirm that the concept of the analysis of volatile organic compounds in exhaled air for medical diagnosis that may support the elaboration of a new screening test for gastric cancer and will help to optimize and tune sensor-based analyzers toward the detection of this disease.