**Name of the project:** Study of genetic markers and environmental factors in phakomatoses and neurogenic tumors.

**Relevance:** Neurogenic tumors are among the most difficult in terms of diagnosis and treatment of human tumors, not only because of their malignancy, but also because of their localization in the central nervous system and along the nerve trunks and nerve plexuses. The availability of next generation sequencing (NGS) methods appeared in 2022 in the Republic of Kazakhstan due to the transfer of technology from a number of leading clinics and scientific communities of near and far abroad. There are monogenic tumors (mainly caused by hereditary phakomatoses), and tumors with a set of several "driver" genes [Northcott PA, Buchhalter I, Morrissy AS, Hovestadt V et al. 2017]. Factomatosis is a rare disease that causes swelling in the skin and tissues near the nerves. It occurs in a population with a frequency of 1 per 3000 newborns, is characterized by a monogenic autosomal dominant type of inheritance and complete penetrance, and patients also experience plexiform neurofibromas, gliomas of the optic nerves, delayed psychoverbal and psychomotor development in children. [David H. Gutmann, Rosalie E. Ferner, Robert H. Listernick et al., 2017] The expression of malignancy genes depends on a number of genomic mechanisms that can be controlled by environmental conditions, environmental factors that can act as a trigger for genome changes, mutations and malignancy. [Lui W., Ma L., Abuduwaili J. 2020; Reynolds, BA, Oli, MW, Oli, MK. Eco-oncology: 2020]. The project is aimed at studying the dependence of genetically determined neurogenic tumors on the ecological status of the environment.

**Purpose of the project:**

The aim of the project is to identify the genetic predisposition to neurogenic tumors in the presence of genes for phakomatoses and genes for oncogenic proliferation, in association with environmental factors (pollutants) mainly in children and young adults.

**Project objectives:**

1. Definition of a cohort of patients with neurofibromatosis types 1 and 2, tuberous sclerosis and other neurogenic tumors of various localization in children and young adults. The definition of a cohort will make it possible to describe a sample of patients with neurogenic tumors, as well as a control group.

2. Next generation sequencing (NGS) from peripheral blood samples of the genome of patients with neurofibromatosis types 1 and 2, tuberous sclerosis and other neurogenic tumors of various localization.

3. Analysis of soil and water samples from open sources for the presence of heavy metals and other pollutants in the regions where patients live (assumed Zhetysu, Almaty, Turkestan, Kyzylorda regions, Mangistau region, as well as the cities of Almaty, Shymkent, Kyzylorda); environmental analysis will reveal the role of the environment on the mutation load and clinical status of the patient cohort.

4. Correlations of genetic changes, tumor status, clinical data and environmental factors. Correlation analysis is needed to describe the relationship between genome status, environmental factors, and clinical data.