

## Brief information about the project

Project name	AP19580351 “Investigation of the biological consequences of the impact of technogenic pollutants on biota, public health and the environment”	
Project relevance	<p>The project aims to explore the fundamental and applied aspects of the impact of environmental pollutants on genome stability. The main methodological approach to the implementation of the project is the search for effective biological indicators that are sensitive to changes in the environment; development of criteria and indicators for assessing the impact of pollutants on human health on indicators such as survival rate, frequency of induced chromosomal and gene mutations, morbidity (children and adolescents), birth and mortality, including genetically determined (eco - dependent) diseases. Through the methods of restriction analysis of genomic DNA, it makes it possible to reveal the features of DNA spectra in their organisms in the studied regions, which differ in the level of environmental pollution. The results of the study of the genome of animal and human cells make it possible to establish limiting mechanisms as an indicator of the effect of radiation pollution. Ecotoxicological indicators of the industrial zone (soil, water, plants, animals and biosubstrates) and adjacent settlements are given. Based on the results of a population and statistical analysis of the health of the population (children) in the territories adjacent to the landfill, the adult and child contingent of the population, including the morbidity structure with hereditary pathologies, is determined. Planned cytogenetic studies (micronuclear, chromosomal – Fish method) to assess the state of the genetic apparatus of the somatic cells of the human body in the studied area are a certain innovation and are of great scientific and practical importance. Using a micro-nuclear test, it is possible to identify people with high genomic instability, with hereditary degenerative diseases of the nervous system, with birth defects, with chromosomal abnormalities. This methodological approach and the results obtained can be used to assess the consequences of exposure to radiation and chemical pollution in other regions of the Republic of Kazakhstan, as well as in neighboring countries.</p>	
The purpose of the project	<p>Қоршаған ортаны ластаушы заттардың геномның тұрақтылығына әсерін Ecogenetic assessment of the influence of environmental pollutants on the stability of the genome. Determination by atomic absorption spectrometry (AAS) of the content of pollutants in test objects (rodents, fish, biosubstrates of domestic animals, humans) to assess the risk of exposure to polygons on the human body; cytogenetic studies (chromosomal and MYA methods) and molecular genetic studies (PCR - RAPD, ISSR methods); population-statistical analysis of the morbidity of the population.</p>	
Objectives	<ul style="list-style-type: none"> <li>• determination by physico-chemical express methods of the content of pollutants in environmental objects, biosubstrates of animals and human.</li> <li>• assessment of the quality of ground and groundwater; development of methods for the disposal of radionuclides and heavy metals.</li> <li>• modern methods of cytogenetic and molecular genetic analysis (PCR, gel electrophoresis, etc.) effect of pollutants (chemical and radiation).</li> <li>• ecogenetic assessment of the risk of pollutants affecting the animal and human genome</li> </ul>	
Expected and achieved results	<p>Reagents and equipment necessary for research will be purchased. The installation and launch of the existing and purchased equipment will be carried out. Preparation of samples and samples for physico-chemical methods for the determination of heavy metals.</p>	<p>Installation and commissioning of existing equipment (AAS, electrophoresis devices, centrifuges, measuring equipment: analytical, torsion scales, setting microscopes, etc.) was carried out. Samples (plants, biosubstrates: blood samples and tissues of animals and humans) were prepared to detect heavy</p>

	<p>Radiological study of the studied area.</p> <p>To determine genetic polymorphism, the results of DNA restriction analysis are taken, an article is prepared and sent to a scientific journal.</p> <p>The degree of violation of the stability of the human genome will be determined based on the results of micro-screening of the human population in the studied region (according to the Calendar Plan 2023).</p> <p>Based on the frequency of induced chromosomal mutations, an assessment of the level of destruction of the genetic apparatus of animal objects is carried out. Preparation of the manuscript of the article and submission to the profile journal KOKSON (according to the Calendar Plan, 2024).</p> <p>The level of destruction of the human genetic apparatus will be estimated based on the frequency of induced chromosomal mutations. Preparation of the manuscript of the article and submission to the profile journal KOKSON (according to the Calendar Plan, 2024).</p> <p>The structure of morbidity and mortality of adults and children in the population of the studied area (neonatal, postpartum infant</p>	<p>metals (according to the Calendar Plan 2023, completed).</p> <p>Radiation research to determine the radiation background with the participation of specialists of the branch of the RSE "National Center of expertise" of the Ministry of health of the Republic of Kazakhstan in the Mangystau region "Multirad - gamma" instruments MKs-01A №1935 (according to the Calendar Plan 2023, completed).</p> <p>According to the calendar schedule, blood samples were taken from residents living in the zone of exposure to man-made pollution. Genomic DNA was isolated from Frozen peripheral blood samples of 30 people for molecular genetic analysis of xrc1 and XRCC3 polymorphisms of DNA repair genes in individuals living in an ecologically unfavorable region of Kazakhstan (according to the Calendar Plan 2023, completed).</p> <p>The results of the research using the micronuclear method and the preparation of the manuscript of the article and submission to the profile journal KOKSON (according to the Calendar Plan, 2024).</p> <p>Assessment of the level of violations of the genetic apparatus of animals by the frequency of induced chromosomal mutations. Preparation of the manuscript of the article and submission to the profile journal KOKSON (according to the Calendar Plan, 2024).</p> <p>The results of the study of the level of violations of the human genetic apparatus in terms of the frequency of induced chromosomal mutations. Preparation of the manuscript of the article and submission to the profile journal KOKSON (according to the Calendar Plan, 2024).</p> <p>The structure of morbidity and mortality of adult and child (neonatal, perinatal infant mortality) populations of the study area</p>
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	<p>mortality) is studied and the proportion of environmental-related diseases is determined by genetic determination (according to the Calendar Plan, 2025).</p> <p>An assessment of the impact of pollutants on the environment (degree of contamination with radionuclides, heavy metals in the soil, surface and groundwater), biosubstrates on plants, animals and humans is carried out. Preparation of the manuscript of the article and submission to the profile journal KOKSON (according to the Calendar Plan, 2025).</p> <p>Based on the results obtained, scientifically based recommendations will be developed to prevent adverse effects on living organisms and humans, considering the long-term consequences of preserving the gene pool of biota (according to the Calendar Plan, 2025).</p>	<p>was determined and the proportion of eco-dependent diseases with genetic determination was determined (according to the Calendar Plan, 2025).</p> <p>Assessment of the impact of pollutants on the environment (degree of contamination with radionuclides, heavy metals of soil, surface and groundwater), plants, animal and human biosubstrates. Preparation of the manuscript of the article and submission to the profile journal KOKSON (according to the Calendar Plan, 2025).</p> <p>Preparation of a scientific and practical manuscript based on the results obtained in general (according to the Calendar Plan, 2025).</p>
<p>Names, identifiers of research team members (Scopus Author ID, Researcher ID, ORCID, if any) and links to the corresponding profiles</p>	<p>Bigaliyev Aitkhazha Bigalievich, doctor of biological sciences, professor, scientific supervisor of the project Scopus Author ID – 6602390687; <a href="https://www.scopus.com/authid/detail.uri?authorId=6602390687#:~:text=%2C%20A1maty%2C%20Kazakhstan,-6602390687,-%D0%9F%D0%BE%D0%B4%D1%80%D0%BE%D0%B1%D0%BD%D0%B5%D0%B5%20%D0%BE%D0%B1%20%D0%B8%D0%B4%D0%B5%D0%BD%D1%82%D0%B8%D1%84%D0%B8%D0%BA%D0%B0%D1%82%D0%BE%D1%80%D0%B5">https://www.scopus.com/authid/detail.uri?authorId=6602390687#:~:text=%2C%20A1maty%2C%20Kazakhstan,-6602390687,-%D0%9F%D0%BE%D0%B4%D1%80%D0%BE%D0%B1%D0%BD%D0%B5%D0%B5%20%D0%BE%D0%B1%20%D0%B8%D0%B4%D0%B5%D0%BD%D1%82%D0%B8%D1%84%D0%B8%D0%BA%D0%B0%D1%82%D0%BE%D1%80%D0%B5</a> <a href="https://orcid.org/0000-0003-4274-6305">https://orcid.org/0000-0003-4274-6305</a></p> <p>Shalabaeva Klara Zulkharnaevna, doctor of medical sciences, professor, leading researcher. Scopus Author ID – 6602390687 <a href="http://www.scopus.com/inward/authorDetails.url?authorID=56010756200&amp;partnerID=MN8TOARS">http://www.scopus.com/inward/authorDetails.url?authorID=56010756200&amp;partnerID=MN8TOARS</a> <a href="https://www.scopus.com/redirect.uri?url=https://orcid.org/0000-0001-6836-4829&amp;authorId=56010756200&amp;origin=AuthorProfile&amp;orcid=0000-0001-6836-4829&amp;category=orcidLink">https://www.scopus.com/redirect.uri?url=https://orcid.org/0000-0001-6836-4829&amp;authorId=56010756200&amp;origin=AuthorProfile&amp;orcid=0000-0001-6836-4829&amp;category=orcidLink</a></p> <p>Kozhakhmetova Aizada Nurakhmetovna, master of biology, researcher Scopus Author ID – 57221373079; <a href="http://www.scopus.com/inward/authorDetails.url?authorID=57221373079&amp;partnerID=MN8TOARS">http://www.scopus.com/inward/authorDetails.url?authorID=57221373079&amp;partnerID=MN8TOARS</a> <a href="https://www.scopus.com/redirect.uri?url=https://orcid.org/0000-0002-5311-8083&amp;authorId=57221373079&amp;origin=AuthorProfile&amp;orcid=0000-0002-5311-8083&amp;category=orcidLink">https://www.scopus.com/redirect.uri?url=https://orcid.org/0000-0002-5311-8083&amp;authorId=57221373079&amp;origin=AuthorProfile&amp;orcid=0000-0002-5311-8083&amp;category=orcidLink</a></p> <p>Myrzatay Ayaulym Mirbolatkyzy, master of natural sciences, junior researcher, <a href="https://orcid.org/0000-0002-4830-2310">https://orcid.org/0000-0002-4830-2310</a></p> <p>Kulimbetov Amangeldi doctor of medical sciences, professor, leading researcher. <a href="https://orcid.org/0000-0003-2994-6935">https://orcid.org/0000-0003-2994-6935</a></p>	

<p>List of publications (URL, DOI specified)</p>	<p>1. <a href="https://www.nnc.kz/assets/STS-2023_abstracts.pdf">https://www.nnc.kz/assets/STS-2023_abstracts.pdf</a></p> <p>2. Bigaliyev A.B., Akbaev A.M., Myrzatai A.M. Conservation of biological and fossil resources for the sustainable development of chemically and radiation- contaminated territories of the Caspian see region //Материалы XIII Международной биогеохимической Школы-конференции; «Эволюция биосферы, биогеохимические циклы и биогеохимические технологии:связь фундаментальных и прикладных исследований» посвященная 150-летию со дня рождения В.И. Вернадского / Товарищество научных изданий КМК - Пушино: 2023. - 324 с. (с. 179-181).</p> <p>3. An article in English has been prepared and accepted for publication: «Evaluation of consequences of chemical and radiation pollution effect for conservation of biological resources and for sustainable development of the Caspian Sea region», авторы: А.В. Bigaliyev, А.Н. Kozhakhmetova, А.М. Myrzatay, К.З. Shalabayeva, А.К. Kulimbetov, Zh.М. Dosmagambet. в научный журнал рекомендованном КОКЧВО «Bulletin of the E.A.Buketov KarSU, Biology, Medicine and Geography series», №1, 2024.</p> <p>4. Environmental and genetic assessment of the impact of chemical and radiation pollution on biota and public health. Aitkhazha Bigaliyev <sup>1,*</sup>, Kozhakhmetova Aizada <sup>2</sup>, Ayaulym Myrzatay <sup>3</sup>, Klara Shalabayeva <sup>4</sup>, Amangeldi Kulimbetov MDPI International Journal of environmental study. Submission received for publishing. (Submission ID: 235084891). Status (in publishing).</p>
<p>Patent information</p>	<p><a href="http://www.kazpatent.kz">http://www.kazpatent.kz</a> , e-mail: <a href="mailto:kazpatent@kazpatent.kz">kazpatent@kazpatent.kz</a></p> <p>Hereby inform you that the expert organization has decided to grant a patent for the invention "Method for determining the content (benz(a) pyrene) in the body of a marine worm (Nereis diversicolor) from the Kazakh zone of the Caspian Sea to assess the resistance of the genome to the effects of oil pollution" according to application No.2017/1013.1</p> <p>Bigaliev Aitkhazha Bigalievich</p> <p>The DECISION to grant a patent for an invention Application registration number 2017/1013.1 Application filing date 17.10.2017</p>