Brief information about the project

Title	AP25795019 «Determination of new circulating biomarkers associated with nephropathy in patients with type 2 diabetes mellitus»
Relevance	Despite significant advances in diabetes treatment, early diagnosis and prediction of nephropathy remain challenging tasks, particularly in specific populations such as the Kazakh. The main issue lies in the fact that, at early stages, clinical symptoms of diabetic nephropathy (DN) are often subtle or absent, and changes in biomarkers are frequently undetectable during routine examinations, complicating the diagnostic process. In later stages, the disease progresses rapidly, impairing renal function and leading to poor outcomes without timely intervention. The integration of novel microRNA-based biomarkers into clinical practice represents a promising direction in the rapidly evolving field of personalized medicine. This area encompasses not only diagnostic improvements but also the development of effective therapeutic strategies based on new molecular insights.
Goal	To is to investigate the prognostic value of novel oxidative stress biomarkers as well as changes in microRNA expression associated with the development of nephropathy, comparing them with classical biomarkers used in diabetic patients within the Kazakh population.
Tasks	1. To provide a comprehensive assessment of anthropometric and clinical parameters, as well as to compare biochemical indicators between the control group and patients with type 2 diabetes, both with and without nephropathy complications. The study is expected to yield the following results: Collection of blood samples from patients with T2DM, both with and without nephropathic complications, as well as from healthy controls within the Kazakh population. We will collect samples and gather patient demographic and clinical data for analyzing oxidative and epigenetic markers. 2. Determination of microRNA Expression: We will investigate the expression levels of microRNA-21, microRNA-155-5p, and microRNA-146a in patients with T2DM, both with and without nephropathy, as well as in the control group. This will allow us to evaluate how changes in the levels of these microRNAs may be associated with the development of nephropathy. 3. Assessment of Redox status: We will evaluate the oxidative-reductive status by measuring markers of oxidative damage, including advanced oxidation protein products (AOPP) and lipid peroxidation (LPO), in the bloodstream of the studied population. The next step will involve investigating the levels of oxidative stress markers in the same patient groups. Statistical methods (e.g., ANOVA, t-tests) will compare novel and classical biomarkers within groups to assess new diagnostic and monitoring approaches for nephropathy. 4. The obtained data will be compared with clinical indicators and stages of nephropathy, along with an analysis of correlation coefficients between microRNA levels, oxidative stress markers, and the severity of nephropathy. A correlation analysis will be conducted using Pearson or Spearman coefficients to assess the relationship between microRNA and

	oxidative stress markers. 5. Based on the obtained results, an analysis will be conducted on all studied markers and their diagnostic value associated with the presence of type 2 diabetes and its vascular complications within the studied groups. Diagnostic criteria system will be developed based on the identified biomarkers. Utilizing the ROC curve method, the sensitivity and specificity of the proposed diagnostic criteria will be assessed. The establishment of such criteria based on microRNA and oxidative stress markers will enhance early diagnosis and prediction of nephropathy complications. It is anticipated that the data obtained will enable a detailed comparative analysis between the new and classical biomarkers, which may highlight the advantages of utilizing new approaches in diagnostics.
Expected and Achieved Results	The research results will be published in at least 2 (two) articles in the first three quartiles of the impact factor in the Web of Science database or in journals with at least 50 percentiles of CiteScore in the Scopus database. Predictable logs: International Journal of Molecular Sciences (Scopus CiteScore citation index is 8.1, with a 90% percentile https://www.mdpi.com/journal/ijms); Antioxidants (Scopus CiteScore citation index is 10.6, with a 74% percentile https://www.mdpi.com/journal/antioxidants);. The findings will be disseminated among experts in the fields of biomedicine, molecular biology, biochemistry, and endocrinology. The integration of new biomarkers into clinical practice may enhance diagnostic accuracy and treatment effectiveness, ultimately leading to improved quality of life for patients.
Names and Surnames of Research Group Members with Their Identifiers (Scopus Author ID, Researcher ID, ORCID, if available) and Links to Corresponding Profiles	Scientific supervisor- Yessenbekova Arailym Yessenbekkyzy, PhD Scopus ID: 57191110317 ORCID: 0000-0002-0706-6614 Web of Science Researcher ID ABA-0542-2022 Scientific advisor of the project- Ablaikhanova Nurzhaniyat Scopus Author ID: 57197818487 ORCID: https://orcid.org/0000-0001-7288-1917 Web of Science Researcher ID N-4881-2014 Web of Science Researcher ID DSB-8228-2022 Web of Science Researcher ID IIZ-0231-2023 Web of Science Researcher ID IWM-8434-2023
Publications list with links to them	1. Ablaikhanova N.A, **Arailym Yessenbekova,** Tazhiyeva Aigul, Yessimsiitova Z.B., Saidakhmetova A.K., Malibayeva A.E., Sanbaeva B.J., Molsadykkyzy M. Issues of Type 2 Diabetes Disease Effective Treatment in Kazakhstan // Journal of Pharmasy and Nutrition Sciences, – 2020. Vol.10. No.3. – P.116-121, Q3 (34th percentile) SJR -0.141, Citation index – 2, DOI: https://doi.org/10.29169/1927-5951.2020.10.03.5 2. Parina A, Abbas Pirpour Tazehkand, Saiedeh R, Kamran H, Miquel M, Vahideh T, Hossein A, Natália C, Javad Sharifi-ad, Zainab M. Almarhoon, **Arailym Yessenbekova,** A Ydyrys, Ablaikhanova N, William C. Cho. Quercetin Impact in Pancreatic Cancer: An Overview on Its Therapeutic Effects // Oxidative Medicine and Cellular Longevity – 2021. – P. 1-13. Q1 (86th percentile)

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Patent information	There are no plans to obtain a patent for this project.