Reference letter for Ms. Aigul Akimniyazova and her Dissertation for Doctor of Philosophy (PhD) degree on the specialty 6D074000 - Nanomaterials and nanotechnology on the topic "The interaction of miRNAs with mRNAs of candidate genes of gastrointestinal tract cancer"

June 04, 2021
Tampa, Florida, USA

Dear Members of the Review Committee of the Al-Farabi Kazakh National University,

I am writing this letter to support Ms. Aigul Akimniyazova and her Dissertation for Doctor of Philosophy (PhD) degree by the specialty 6D074000 - Nanomaterials and nanotechnology on the topic "The interaction of miRNAs with mRNAs of candidate genes of gastrointestinal tract cancer". It is a real pleasure and honor for me to support Ms. Aigul Akimniyazova as she is a remarkable young scientist and an outstanding colleague with an exceptional set of personal qualities, such as ambition, caring, cooperativeness, courage, dependability, determination, fairness, honesty, imagination, independence, loyalty, maturity, self-control, and straightforwardness.

The characteristics which stand out for Aigul are her exceptional capabilities to work and multi-task. She clearly shows extraordinary research capabilities, and her potential and originality are fantastic. She is completely self-reliant and independent. She is resourceful, open for new ideas, and it is easy and interesting to work with her. She is very well oriented in the scientific literature and is always open for new contacts and collaborates well with others. All these exceptional personal qualities of Aigul combined with her comprehensive research background, far-reaching skills, broad training, exceptional motivation, and bright and mature personality ensure that she is absolutely capable of being an independent and successful researcher.

PhD dissertation of Ms. Aigul Akimniyazova is dedicated to the analysis of interaction of miRNAs with mRNAs of candidate genes of gastrointestinal tract cancer. This work is of exceptional importance, as oncological diseases are an essential medical and social problem that makes a significant contribution to the health of society. Malignant neoplasms of the gastrointestinal (GI) tract are among the leading problems of oncology, accounting for a significant share in the overall morbidity and mortality. The frequency of oncological diseases in Kazakhstan is one of the highest in the world. The scale of the problem, which has medical, social, and economic aspects and is regarded as an important state task, dictates the need to develop and introduce into practice new methods of managing the oncological situation. The points listed above and the lack of comprehensive solutions served as the starting points for this research study. The search for new disease mechanisms, markers of risk, and

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selection of optimal therapy are possible by using computational methods. The predicted miRNA binding sites with mRNA are the basis for the experiments for their verification and use in the diagnosis. Therefore, the investigations of Ms. Aigul Akimniyazova in this area are highly commendable, and it is difficult to overemphasize the importance of her work.

In brief, the research aims of Aigul's dissertation are focused on the analysis of the role of miRNAs in the regulation of genes responsible for the development of gastrointestinal tract cancer. Aigul conducted enormous amount of work and generate massive sets of data for achieving the goal of creating the databases of genes associated with the carcinogenesis of the GI tract and of miRNAs and their target genes. Her analyses also helped revealing the quantitative characteristics of the interaction of miRNA nanomolecules with mRNA of genes involved in the development of the GI cancer.

The dissertation has a traditional structure and includes four major sections, an Introduction, Materials and Methods, Results and Discussion, and Conclusions. The introductory chapter of the Aigul's dissertation provides an in-depth analysis and comprehensive summary of the recent data on the roles of miRNAs in the regulation of GI cancer. This is a well-organized and focused chapter that, in my view, represents a completed review of the subject area and clearly can be published as a review article in a prestigious scientific journal. Materials and Methods section provides detailed description of all the tools and approaches used in this work. During her work on the PhD project of Aigul created databases of the miRNAs and their target genes that are connected with human gastrointestinal tract cancer. She conducted a detailed analysis of the characteristics of miRNA binding sites in mRNAs of these genes, and discovered the key associations of miRNAs and genes that are specifically linked to the development of these diseases. She analyzed the mechanisms of the action of miRNAs on the expression of the key genes associated with the GI cancer. Aigul used computer-assisted design tools for synthetic biology and computer-supported search to predict and analyze binding sites of miRNAs on genes associated with the GI cancer. As a result of this activity, effective associations were established that can be used for the development of methods for the early diagnosis of esophageal squamous cell carcinoma, esophageal adenocarcinoma, gastric cancer, as well as small intestinal and large intestinal cancers. The results of the work are skillfully analyzed and presented in a clearly formulated conclusion at the end of each section. Experimental data are clearly illustrated by the tables. Summary and conclusions are consistent with the obtained results.

Taken together, Ms. Aigul Akimniyazova addresses very important issues of gene expression regulation that are significant for the bionanotechnology and

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nanomedicine. Generally speaking, I think that Ms. Aigul Akimniyazova is one of the most talented students that I have personally known. Therefore, I enthusiastically and wholeheartedly recommend this high-quality work to your committee and for its oral defense at your University to qualify for the degree of Doctor of Philosophy (PhD) in the specialty "6D074000 - Nanomaterials and Nanotechnology".



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