

REVIEW

of the official reviewer for dissertation work

KHAIDAROV Saken Zharkynovich on the theme «Study of the antiviral activity of drugs against the SARS-COV-2 virus *in vitro*» submitted for the degree of Doctor of Philosophy (PhD) in the specialty «8D05110 Virology».

№	Criteria	Eligibility (one of the options must be checked)	Justification of the position of the official reviewer
1.	The topic of the thesis (as of the date of its approval) corresponds to the directions of development of science and/or state programs	<p>1.1 Compliance with priority areas of science development or government programs:</p> <p>1) The thesis was completed within the framework of a project or target program financed from the state budget (indicate the name and number of the project or program) ✓</p> <p>2) The thesis was completed within the framework of another state program (indicate the name of the program)</p> <p>3) The dissertation corresponds to the priority direction of the development of science, approved by the Higher Scientific and Technical Commission under the Government of the Republic of Kazakhstan (indicate the direction)</p>	<p>The topic addresses SARS-CoV-2 antiviral evaluation and molecular characterization, which is aligned with national priorities in public health, biosafety, and preparedness for emerging infections.</p> <p>The dissertation was performed within the grant project AP09058338 “Study of the antiviral activity of tenofovir alafenamide and other pharmacological drugs against the SARS-CoV-2 virus <i>in vitro</i> and <i>in vivo</i>” (2021–2023) supported by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan.</p>
2.	Importance for science	The work ✓ makes/does not make a significant contribution to science, and its importance is well disclosed ✓/not disclosed	The work contributes to virology and applies antiviral research by providing comparative <i>in vitro</i> efficacy and cytotoxicity profiles of selected drugs against a Kazakhstan SARS-CoV-2 isolate, with confirmatory qRT-PCR and supportive <i>in vivo</i> immunological observations.
3.	The principle of independence	<p>Self-reliance level:</p> <p>1) High; ✓</p> <p>2) Medium;</p> <p>3) Low;</p>	According to the dissertation, the doctoral student carried out literature analysis, experimental work, data processing, and manuscript preparation

		4) No independence	independently under scientific supervision.
4.	The principle of inner unity	4.1 Justification of the relevance of the thesis: 1) Justified; ✓ 2) Partially justified; 3) Not justified.	Relevance is justified by the COVID-19 pandemic impact and the need to identify effective and safe antiviral options using local isolates and standardized laboratory assays.
		4.2 The content of the thesis reflects the topic of the thesis: 1) Reflects; ✓ 2) Partially reflects; 3) Does not reflect	The results and discussion focus on SARS-CoV-2 strain characterization, cytotoxicity assays, antiviral activity testing, and confirmatory analyses corresponding to the stated topic.
		4.3. The purpose and objectives correspond to the topic of the thesis: 1) correspond; ✓ 2) partially correspond; 3) do not correspond	The purpose and tasks (strain isolation/characterization, cytotoxicity, antiviral efficacy, SI estimation, confirmatory qRT-PCR and IL-33 related experiments) are consistent with the topic and are addressed in the chapters.
		4.4 All sections and provisions of the thesis are logically interconnected: 1) completely interconnected; ✓ 2) the interconnection is partial; 3) there is no interconnection	Chapters are logically linked: literature review → methods → <i>in vitro</i> assays → confirmatory molecular testing → discussion and recommendations.
		4.5 The new solutions (principles, methods) proposed by the author are reasoned and evaluated in comparison with the known solutions: 1) there is a critical analysis; ✓ 2) partial analysis; 3) the analysis does not represent one's own opinions, but quotes from other authors	The proposed concentration ranges and comparative selectivity evaluation are supported by experimental data (CCK-8/MTT, viral titration/qRT-PCR) and adequate interpretation.
5.	Scientific novelty principle	5.1 Are the scientific results and provisions new? 1) completely new; 2) partially new (25-75% are new); ✓ 3) not new (less than 25% are new)	The general antiviral mechanisms of the studied drugs are known; however, the comparative <i>in vitro</i> assessment on a Kazakhstan SARS-CoV-2 isolate, with local assay optimization and strain-specific observations, provides partially new scientific results.

		<p>5.2 Are the dissertation findings new? 1) completely new; 2) partially new (25-75% are new); ✓ 3) not new (less than 25% are new)</p>	<p>Key findings (effective non-cytotoxic concentration ranges, selectivity considerations, and confirmatory qRT-PCR for TAF) are partially new and relevant to local laboratory practice.</p>
		<p>5.3 Technical, technological, economic or management decisions are new and reasonable: 1) completely new; 2) partially new (25-75% are new); ✓ 3) not new (less than 25% are new)</p>	<p>Practical recommendations regarding <i>in vitro</i> concentration ranges and assay workflow for RdRP-targeting drugs are reasoned and can be applied in preclinical screening settings.</p>
6.	The validity of the main findings	<p>All main conclusions are ✓ /are not based on scientifically significant evidence or well-grounded (for qualitative research and areas of training in the arts and humanities)</p>	<p>Main conclusions are based on experimental results obtained using established virological and molecular methods; the conclusions are generally consistent with the presented data.</p>
7.	The main provisions for the defense	<p>It is necessary to answer the following questions for each provision separately: 7.1 Is the provision proven? 1) proven; ✓ 2) rather proven; 3) rather not proven; 4) not proven 7.2 Is it trivial? 1) yes; 2) no ✓ 7.3 Is it new? 1) yes; ✓ 2) no 7.4 Application level: 1) narrow; 2) medium; ✓ 3) wide 7.5 Is it proven in the article? 1) yes; ✓ 2) no</p>	<p>7.1: The provision is directly supported by experimentally obtained isolation and characterization results that are methodologically sound and internally consistent. 7.2: Although based on standard virological approaches, the obtained data are original for the studied objects and conditions. 7.3: The results present new data on the studied material that have not been previously reported. 7.4: The findings are applicable in research and preclinical contexts but are not intended for immediate large-scale implementation. 7.5: The provision is reflected and substantiated in the author's publications.</p>

8.	The principle of reliability Reliability of sources and information provided	8.1 Choice of methodology - is justified or the methodology is described in sufficient detail 1) yes; ✓ 2) no	The methodology is described in sufficient detail for replication, including cell line, viral strains, drug preparation, and assay readouts.
		8.2 The results of the thesis were obtained using modern methods of scientific research and methods of processing and interpreting data using computer technologies: 1) yes; ✓ 2) no	The work uses relevant modern methods (RT-qPCR, cell culture, cytotoxicity assays, viral titration) appropriate for the research objectives.
		8.3 Theoretical conclusions, models, identified relationships and patterns have been proven and confirmed by experimental research (for areas of training in pedagogical sciences, the results have been proven on the basis of a pedagogical experiment): 1) yes; ✓ 2) no	The theoretical conclusions and identified relationships are generally confirmed by experimental data obtained in the course of the study. The presented experimental results are internally consistent and logically support the author's interpretations. Statistical processing is provided at a basic but sufficient level for the stated objectives and confirms the observed trends and effects. While a more detailed presentation of replicates and variance could further strengthen the robustness of the analysis, this does not affect the validity of the main conclusions.
		8.4 Important statements are confirmed / partially confirmed / not confirmed by references to current and reliable scientific literature	The key statements and conclusions of the dissertation are supported by references to current and reliable scientific literature, including peer-reviewed publications relevant to the research topic. The cited sources are generally appropriate and correctly interpreted, and they are complemented by the author's own experimental results. In a limited number of background sections, the inclusion of more focused or recent references could

			further enhance clarity; however, this does not affect the overall confirmation of the main statements by the scientific literature.
		8.5 Used literature sources are sufficient ✓ /not sufficient for a literature review	The literature review includes relevant sources on coronaviruses, antiviral mechanisms, and assay principles; overall coverage is sufficient for the dissertation scope.
9	Practical value principle	9.1 The thesis has theoretical value: 1) yes; ✓ 2) no	The work has theoretical value by summarizing and interpreting RdRP-targeting antiviral strategies and linking them to experimental assay outcomes.
		9.2 The thesis is of practical importance and there is a high probability of applying the results obtained in practice: 1) yes; ✓ 2) no	The thesis has practical importance for laboratory-based preclinical screening and for selecting candidate concentration ranges for further studies.
		9.3 Are the practice suggestions new? 1) completely new; 2) partially new (25-75% are new); ✓ 3) not new (less than 25% are new)	The proposed practical recommendations regarding concentration ranges and assay workflow are partially new, as they represent an adaptation and optimization of known methodological approaches to the specific experimental conditions, including the use of a Kazakhstan viral isolate. While the general principles are based on established practices, their application to the local isolate and experimental setting provides original and practically relevant elements, justifying the classification as partially new.
10.	The quality of writing and design	Academic writing quality: 1) high; 2) average; ✓	The dissertation is written in a clear and generally understandable academic style and is logically structured, which allows the reader to follow the research

		<p>3) below average; 4) low.</p>	<p>objectives, methods, and conclusions. At the same time, minor inconsistencies in language use and terminology are present, as well as occasional stylistic issues typical for technical scientific texts. These points are editorial in nature and can be corrected without affecting the scientific content or the validity of the results, which justifies an overall assessment of average academic writing quality.</p>
11.	Notes on a thesis		<p>Minor remarks (editorial, not affecting the scientific content):</p> <ol style="list-style-type: none"> 1) Ensure consistent naming of the investigated variant/strain throughout the text (Alpha vs. other mentions). 2) Harmonize units and notation ($\mu\text{M}/\mu\text{g}\cdot\text{mL}^{-1}$, MOI, TCID₅₀) and provide uniform formatting in tables/figures. 3) Reduce repetition in some background paragraphs and improve English grammar/style in several places. 4) Clarify the number of biological/technical replicates for key assays in the Methods/figure captions. <p>The remarks listed above are editorial and technical in nature and are aimed at improving the clarity, consistency, and presentation quality of the dissertation. They do not affect the scientific validity, originality, or reliability of the obtained results and conclusions. Ensuring consistent terminology for the investigated variant/strain, harmonizing units and notation, and refining language and formatting will enhance readability</p>

			and methodological transparency. Clarification of the number of biological and technical replicates in the Methods section and figure captions would further improve reproducibility and ease of interpretation, without requiring any changes to the experimental design or data interpretation. Overall, these comments are recommendatory and can be addressed during editorial polishing of the thesis.
12.	Scientific level of the doctoral student's articles on the topic of research (in case of defense of the dissertation in the form of a series of articles, the official reviewers comment on the scientific level of each article of the doctoral student on the topic of research)		The scientific level of the doctoral student's publications corresponds to the requirements for a PhD dissertation. The main results of the research are reflected in 12 publications, including articles indexed in international databases (Web of Science/Scopus), national peer-reviewed journals, and conference proceedings. The publications consistently cover the key objectives, methods, and findings of the dissertation, demonstrating the author's ability to conduct independent research and present results in recognized scientific formats. The presence of articles in indexed international journals confirms the scientific relevance and credibility of the work, while national publications and conference theses ensure broader dissemination within the professional community. Overall, the publication record is sufficient and appropriate for a doctoral dissertation..
13.	Decision of the official reviewer (pursuant to paragraph 28 of the		The dissertation meets the basic requirements for PhD theses in the specialty 8D05110 – Virology.

	present Model Regulations)		Considering the relevance, obtained results, and practical significance, I recommend awarding Mr. KHAIDAROV Saken Zharkynovich the degree of Doctor of Philosophy (PhD).
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In reviews, official reviewers indicate one of the following solutions:

- 1) to award the degree of Doctor of Philosophy (PhD) or Doctor of Specialization

Copies of the reviews of the official reviewers are handed over to the doctoral student no later than 5 (five) working days before the defense of the thesis.

Official Reviewer:

TABYNOV Kairat Kazybayevich, PhD, Associate Professor
Head of the Laboratory of Preclinical and Experimental Studies,
Kazakh National Agrarian Research University (KazNARU)

Signature:  Date: December 29, 2025

The signature of K.K. Tabynov is hereby certified:

KERIMOVA Ukilay Kerimovna
Chief Academic Secretary, KazNARU

Signature:  Date: 29.12.25

