https://doi.org/10.29326/2304-196X-2026-15-2-193-200

The biocidal effect of a new disinfectant against microbial isolates

Pavel V. Arzhakov, Tatiana S. Dudoladova, Artem N. Novikov
Omsk Agrarian Scientific Center, prospect Koroleva, 26, Omsk 644012, Russia

ABSTRACT

Introduction. Production of animal products is an essential component of the agro-industry. The concentration of numerous production facilities on animal farms, the increase in their area, high stocking density, and rapid restocking of livestock are all favorable factors for the spread of infections, leading to significant economic losses. To achieve high production targets, it is necessary to constantly maintain proper sanitary and hygienic status of animal farms, which is achieved through combined cleaning of all indoor surfaces (ceilings, walls, floors), equipment and tools, followed by mandatory disinfection. Therefore, the development and implementation of novel complex disinfectants become a relevant task, as this will ensure a high level of biological safety at agro-industrial establishments.

Objective. To study the biocidal effect of a new disinfectant against microflora from different resistance groups to chemical disinfectants under conditions simulating the production environment of livestock facilities.

Materials and methods. The biocidal effect of the new medicinal product was studied on test objects artificially contaminated with microorganisms. The test objects were made of cambric (with and without a protective substrate) as well as construction materials measuring 100 cm^2 used in the construction of livestock facilities. Inactivated bovine blood serum was used as a protective substrate (to simulate production conditions).

Results. On smooth construction materials, the biocidal effect of the new disinfectant against microflora isolates of various resistance groups was achieved using the following application modes: 1.0% for 180 min, 2.0% for 120 min, and 5.0% for 120 min at a consumption rate of 250 mL/m^2. On concrete construction materials, the effect was achieved at: 2.0% for 180 min, 3.0% for 180 min, and 6.0% for 240 min after double treatment with a 120-minute interval at an consumption rate of 400 mL/m^2.

Conclusion. Based on the results of the studies, it was established that the tested disinfectant possesses high bactericidal activity against microorganisms with low, medium, and high resistance to chemical disinfectants under conditions simulating production environment of livestock facilities. Analyzing the data obtained, it can be concluded that further experiments to study the biocidal effect of the new disinfectant in actual conditions of livestock facilities are expedient for developing effective decontamination protocols for agro-industrial production facilities.

Keywords: disinfectant, biocidal effect, microorganism isolates

Acknowledgments: This work was supported by the Ministry of Science and Higher Education of the Russian Federation as part of research project (FNUN-2025-0007) "Development of an effective food security and biosafety system based on the creation of new biological medicinal products for the diagnosis and prevention of socially significant animal diseases as well as for optimization of feed production technologies and selective breeding analysis".

For citation: Arzhakov P. V., Dudoladova T. S., Novikov A. N. The biocidal effect of a new disinfectant against microbial isolates. *Veterinary Science Today*. 2026; 15 (2): 193–200. https://doi.org/10.29326/2304-196X-2026-15-2-193-200

Conflict of interests: The authors declare no conflict of interests.

For correspondence: Pavel V. Arzhakov, Cand. Sci. (Biology), Leading Researcher, Laboratory of Diagnostic Research and Biotechnology, Department of Veterinary Medicine, Omsk Agrarian Scientific Center, ul. Lermontova, 93, Omsk 644001, Russia, *omdez@yandex.ru*

УДК 619:614.48

Биоцидный эффект нового дезинфицирующего препарата в отношении изолятов микроорганизмов

П. В. Аржаков, Т. С. Дудоладова, А. Н. Новиков
ФГБНУ «Омский аграрный научный центр» (ФГБНУ «Омский АНЦ»), пр. Королёва, 26, г. Омск, 644012, Россия

РЕЗЮМЕ

Введение. Производство животноводческой продукции является важной составной частью агропромышленного комплекса. Размещение на животноводческих предприятиях большого количества производственных построек, увеличение их площади, скученность поголовья и быстрая его смена являются благоприятными факторами для распространения инфекций, приводящих к значительному ущербу. Для достижения высоких показателей производства необходимо постоянно поддерживать надлежащий уровень санитарно-гигиенического состояния животноводческих комплексов, который достигается комбинированной очисткой всех поверхностей помещений (потолок, стены, пол), оборудования и инвентаря с обязательной последующей дезинфекцией. Актуальной задачей становится разработка и внедрение новых комплексных дезинфицирующих препаратов, что позволит на высоком уровне обеспечивать биологическую безопасность сельскохозяйственных предприятий.

Цель исследования. Изучение биоцидного эффекта нового дезинфицирующего препарата в отношении микрофлоры, относящейся к разным группам резистентности к химическим дезинфектантам, в условиях, имитирующих производственную среду животноводческих помещений.

Материалы и методы. Биоцидный эффект нового препарата изучали на искусственно контаминированных микроорганизмами тест-объектах, изготовленных из батиста (с добавлением защитного субстрата и без него), а также строительных материалах размером 100 см^2, используемых

© Arzhakov P. V., Dudoladova T. S., Novikov A. N., 2026

при строительстве помещений животноводческих комплексов. В качестве защитного субстрата (для имитации производственных условий) использовали инактивированную сыворотку крови крупного рогатого скота.

Результаты. Биоцидный эффект нового дезинфицирующего препарата в отношении изолятов микрофлоры, относящейся к разным группам резистентности к химическим дезинфектантам, на гладком строительном материале обеспечивали следующие режимы применения: 1,0% – 180 мин, 2,0% – 120 мин и 5,0% – 120 мин при расходе 250 мл/м²; на строительном материале, изготовленном из бетона: 2,0% – 180 мин, 3,0% – 180 мин и 6,0% – 240 мин после двукратной обработки с интервалом в 120 мин при расходе 400 мл/м².

Заключение. По результатам проведенных исследований установлено, что испытуемый дезинфицирующий препарат в условиях, имитирующих производственную среду животноводческих помещений, обладает высокой бактерицидной активностью в отношении микроорганизмов, малорезистентных, резистентных и особо резистентных к химическим дезсредствам. Анализируя полученные данные, можно сделать вывод о дальнейшей целесообразности проведения экспериментов по изучению биоцидного действия нового дезинфицирующего препарата в условиях предприятий по содержанию сельскохозяйственных животных для разработки эффективных режимов обеззараживания производственных объектов агропромышленного комплекса.

Ключевые слова: дезинфицирующий препарат, биоцидный эффект, изоляты микроорганизмов

Благодарности: Работа выполнена при поддержке Министерства образования и науки РФ в рамках проведения научно-исследовательских работ по теме (FNUN-2025-0007) «Разработать эффективную систему обеспечения продовольственной и биологической безопасности на основе создания новых биологических препаратов для диагностики и профилактики социально значимых болезней животных, оптимизации технологий кормопроизводства и анализа селекции племенного дела».

Для цитирования: Аржаков П. В., Дудоладова Т. С., Новиков А. Н. Биоцидный эффект нового дезинфицирующего препарата в отношении изолятов микроорганизмов. *Ветеринария сегодня*. 2026; 15 (2): 193–200. https://doi.org/10.29326/2304-196X-2026-15-2-193-200

Конфликт интересов: Авторы заявляют об отсутствии конфликта интересов.

Для корреспонденции: Аржаков Павел Викторович, канд. биол. наук, ведущий научный сотрудник лаборатории диагностических исследований и биотехнологий отдела ветеринарии ФГБНУ «Омский АНЦ», ул. Лермонтова, 93, г. Омск, 644001, Россия, *omdez@yandex.ru*

INTRODUCTION

Production of animal products is an essential component of the agro-industry. Industrial livestock farming has been developing particularly intensively over the last decade, and it is currently rightfully considered the most dynamic and knowledge-intensive branch of global agro-industrial production. A stable economic situation on animal farms is a mandatory requirement imposed on them. This requirement can only be met if farms maintain healthy animal populations [1, 2, 3].

The concentration of numerous production facilities on animal farms, the increase in their area, high stocking density, and rapid restocking of livestock are all favorable factors for the spread of infections, leading to high mortality and reduced productivity [4, 5].

To achieve high production targets, it is essential to maintain at a constant level the required sanitary and hygienic standards on animal farms. This is accomplished through the comprehensive cleaning of all indoor surfaces (ceilings, walls, floors), equipment, and tools, followed by mandatory disinfection [6, 7].

On animal farms, disinfection is an integral part of the technological process aimed at ensuring biological safety of animal products. Infections that were widespread in the Soviet Union – such as brucellosis, tuberculosis, anthrax, and others – are re-emerging with greater frequency. If such infections are introduced, a significant portion of cattle on animal farms may have to be sent for culling [8, 9].

The effectiveness of disinfection depends largely on the completeness of its implementation. The full range of disinfection measures should be planned as early as the design stage of animal farms. Projects shall include appropriately equipped facilities for washing and disinfecting all vehicles and tools used in animal farming. On supervised farms, disinfection shall be included in the anti-epizootic plan for each individual farm (facility) and the entire holding (number of facilities on the farm) [10, 11].

Resistance of pathogenic microflora to disinfectants has not yet become widespread. Nevertheless, imprudent use of disinfectants poses a high risk of resistant pathogenic strains emerging. Studies have shown that even short-term exposure of many bacteria to sub-lethal concentrations of disinfectants can induce mutations, potentially leading to the emergence of disinfectant-resistant pathogens [12, 13].

Bacterial spores exhibit particular resistance to disinfectants due to their multilayered cell wall, which allows them to withstand disinfectant concentrations several orders of magnitude higher than those required to kill vegetative cells. The causative agent of bovine tuberculosis, *Mycobacterium bovis*, is highly resistant to many disinfectants containing alcohols, acids, or alkalis as active substances [14, 15].

Surface contamination impairs disinfection efficacy. Feed residues and animal excretions serve as a protective substrate for microbial cells, blocking disinfectant penetration through the cell wall. Moreover, construction materials used in livestock facilities can absorb disinfectant solutions, necessitating a higher disinfectant consumption rate [16, 17].

The widespread use of technological equipment in the livestock farming sector creates a demand for effective sanitation methods. Processes related to washing and disinfecting various farm facilities account for up to 25% of total working time. However, these critical measures are often neglected, ultimately decreasing the volume of high-quality animal products [18, 19].

A forward-looking approach in decontamination is the use of agents with a simultaneous effect, achieved by incorporating various surfactants into their formulation to impart detergent properties to bactericides. This enables concurrent cleaning and disinfection, significantly saving time and labor costs by reducing the duration of sanitation [20, 21].

Surfactants act as wetting agents, spreaders, and emulsifiers; they effectively coat treated objects by reducing the surface tension of solutions, ensuring rapid contact between disinfectants and the microbial cell [22, 23].

A significant challenge is the ability of bacteria to exist in natural environments as biofilms. The biofilm matrix can impede the penetration of certain antibiotics and other biocidal agents. Such communities possess a remarkable capacity to resist stress factors; biocides at doses effective against microbial cell suspensions are ineffective against microbial biofilms [24, 25]. Consequently, the development and implementation of novel complex disinfectants is an urgent task to ensure a high level of biological safety within the agro-industry [26].

The novelty of this work lies in the analysis of the biocidal effect of a new disinfectant against microorganisms from different groups of resistance to chemical disinfectants under conditions simulating the production environment of livestock facilities.

The objective of this study is to study the biocidal effect of the same disinfectant against microflora from different groups of resistance to disinfectants under conditions simulating the production environment of livestock facilities.

MATERIALS AND METHODS

Characteristics of the studied object. The disinfectant, developed by the Omsk Agrarian Scientific Center is a liquid, viscous, dark-green concentrate that diffuses well in water. The active substances (biocides) are quaternary ammonium compounds (12%) and aldehydes (8%); non-ionic high-molecular-weight surfactants were incorporated into the formulation of the product to impart detergent properties. The biocidal effect of the product was studied using identified microflora isolates obtained from samples collected from surfaces of cattle housing facilities. The obtained microbial isolates belonged to the following groups based on their resistance to chemical disinfectants: low-resistance group – *Escherichia coli, Klebsiella aerogenes, Citrobacter freundii, Hafnia alvei, Aeromonas hydrophila, Proteus mirabilis,* and *Enterococcus faecalis*; resistant group – *Staphylococcus lentus, Staphylococcus capitis*, and *Staphylococcus intermedius*; highly resistant group – *Bacillus cereus*.

The *biocidal effect* was evaluated by treating test objects made of cambric (a type of cotton fabric), both with and without a protective substrate, as well as construction material samples of 100 cm^2 used in livestock facilities: ceramic tiles (smooth material) and concrete (porous, uneven material that readily adsorbs moisture). Inactivated bovine blood serum was used as a protective substrate to simulate production environment conditions. In the control test, the test objects and construction material surfaces were treated with sterile distilled water.

Tests were carried out at a temperature of (18 ± 2) °C.

The biocidal effect was tested in accordance with the methodological guidelines R 4.2.3676-20[1].

Research stages.

1. Preparation of cambric test objects. A piece of cotton fabric was submerged in a container with cold tap water for 24 hours to dissolve the starch. Subsequently, it was thoroughly washed with surfactants, boiled, and dried in a dry-heat oven. The cambric was then cut into test objects, placed into sterile containers, and sterilized.
2. Inoculation. Test objects were immersed in a microbial suspension (2×10^9 CFU/mL) with the addition of a protective substrate.
3. Decontamination. Test objects were treated with working solutions of the disinfectant at concentrations of 0.5; 1.0; 2.0; 3.0; 4.0; 5.0%, and exposure times of 30, 45, 60, 120, and 180 minutes.
4. Neutralization. Following the specified exposure concentrations and times, the disinfectant was neutralized by immersing the test objects in a neutralizing solution containing Tween 80 (3%), saponin (0.3–3.0%), histidine (0.1%), and cysteine (0.1%).
5. Incubation. Neutralized test objects were plated onto the surface of a solid nutrient medium (meat peptone agar) and incubated in a laboratory incubator at 37 °C.

Decontamination of construction materials

1. Surface contamination. Construction material samples (100 cm^2 each) were inoculated with 1 mL of microbial suspension (2×10^9 CFU/mL).
2. Substrate addition. 2 mL of a protective substrate was added to the suspension.
3. Decontamination. Wet method surface disinfection was carried out using disinfectant concentrations of 1.0–6.0% (1.0; 2.0; 3.0; 5.0; 6.0%) with exposure times of 30–180 minutes (30, 45, 60, 120, and 180 minutes). The consumption rate was 250 mL/m^2 for ceramic tiles and 400 mL/m^2 for concrete.
4. Sampling. Following each treatment, samples were taken from the materials with sterile cotton swabs, subsequently inoculated onto nutrient media, and incubated at 37 °C.

Evaluation of results: microbial growth on culture media indicated that the disinfectant was ineffective, whereas the absence of growth confirmed its biocidal effect.

Microbiological studies were carried out within a class II biosafety cabinet.

Statistical analysis was performed using Microsoft Excel.

[1] R 4.2.3676-20 Methods of laboratory research and testing of disinfectants to assess their effectiveness and safety: approved by the Federal service for surveillance on consumer rights protection and human well-being on December 18, 2020. https://docs.cntd.ru/document/573820733?marker=7D20K3 (in Russ.)

Table 1
The biocidal effect of the disinfectant on cambric test objects without a protective substrate

Concentration of tested product, %	Microorganism name	Exposure, minutes				
		30	45	60	120	180
low-resistant microorganisms						
0.5	*E. coli*	+	+	–	–	–
0.5	*K. aerogenes*	+	+	+	–	–
0.5	*C. freundii*	+	+	–	–	–
0.5	*H. alvei*	+	+	–	–	–
0.5	*A. hydrophila*	+	+	–	–	–
0.5	*P. mirabilis*	+	+	+	–	–
0.5	*E. faecalis*	+	+	+	–	–
resistant microorganisms						
0.5	*S. lentus*	+	+	+	+	+
1.0		+	+	+	–	–
0.5	*S. capitis*	+	+	+	+	+
1.0		+	+	+	–	–
0.5	*S. intermedius*	+	+	+	+	+
1.0		+	+	+	–	–
highly resistant microorganisms						
2.0	*B. cereus*	+	+	+	+	+
3.0		+	+	+	+	–
Control: sterile distilled water		+	+	+	+	+

"–" – no microbial growth (disinfectant effective);
"+" – microbial growth (disinfectant ineffective).

Table 2
The biocidal effect of the disinfectant on cambric test objects with a protective substrate

Concentration of tested product, %	Microorganism name	Exposure, minutes				
		30	45	60	120	180
low-resistant microorganisms						
0.5	*E. coli*	+	+	+	+	+
1.0		+	+	+	–	–
0.5	*K. aerogenes*	+	+	+	+	+
1.0		+	+	+	–	–
0.5	*C. freundii*	+	+	+	+	+
1.0		+	+	+	–	–
0.5	*H. alvei*	+	+	+	+	+
1.0		+	+	+	–	–
0.5	*A. hydrophila*	+	+	+	+	+
1.0		+	+	+	–	–
0.5	*P. mirabilis*	+	+	+	+	+
1.0		+	+	+	+	–
0.5	*E. faecalis*	+	+	+	+	+
1.0		+	+	+	+	–
resistant microorganisms						
1.0	*S. lentus*	+	+	+	+	+
2.0		+	+	+	–	–
1.0	*S. capitis*	+	+	+	+	+
2.0		+	+	+	–	–
1.0	*S. intermedius*	+	+	+	+	+
2.0		+	+	+	–	–
highly resistant microorganisms						
3.0	*B. cereus*	+	+	+	+	+
4.0		+	+	+	+	+
5.0		+	+	+	–	–
Control: sterile distilled water		+	+	+	+	+

"–" – no microbial growth (disinfectant effective);
"+" – microbial growth (disinfectant ineffective).

Table 3
The biocidal effect of the disinfectant on ceramic tiles with a protective substrate

Concentration of tested product, %	Microorganism name	Exposure, minutes				
		30	45	60	120	180
low-resistant microorganisms						
1.0	*E. coli*	+	+	+	–	–
1.0	*K. aerogenes*	+	+	+	–	–
1.0	*C. freundii*	+	+	+	–	–
1.0	*H. alvei*	+	+	+	–	–
1.0	*A. hydrophila*	+	+	+	–	–
1.0	*P. mirabilis*	+	+	+	+	–
1.0	*E. faecalis*	+	+	+	+	–
resistant microorganisms						
2.0	*S. lentus*	+	+	+	–	–
2.0	*S. capitis*	+	+	+	–	–
2.0	*S. intermedius*	+	+	+	–	–
highly resistant microorganisms						
5.0	*B. cereus*	+	+	+	–	–
Control: sterile distilled water		+	+	+	+	+

"–" – no microbial growth (disinfectant effective);
"+" – microbial growth (disinfectant ineffective).

Table 4
The biocidal effect of the disinfectant on concrete with a protective substrate

Concentration of tested product, %	Microorganism name	Exposure, minutes					
		30	45	60	120	180	240
low-resistant microorganisms							
2.0	*E. coli*	+	+	+	+	–	–
2.0	*K. aerogenes*	+	+	+	+	–	–
2.0	*C. freundii*	+	+	+	+	–	–
2.0	*H. alvei*	+	+	+	+	–	–
2.0	*A. hydrophila*	+	+	+	+	–	–
2.0	*P. mirabilis*	+	+	+	+	–	–
2.0	*E. faecalis*	+	+	+	+	–	–
resistant microorganisms							
3.0	*S. lentus*	+	+	+	+	–	–
3.0	*S. capitis*	+	+	+	+	–	–
3.0	*S. intermedius*	+	+	+	+	–	–
highly resistant microorganisms							
5.0	*B. cereus*	+	+	+	+	+	+
6.0	*B. cereus*	+	+	+	+	+	–
Control: sterile distilled water		+	+	+	+	+	+

"–" – no microbial growth (disinfectant effective);
"+" – microbial growth (disinfectant ineffective).

RESULTS AND DISCUSSION

Analysis of the obtained results demonstrates the biocidal effect of the tested disinfectant against microflora belonging to various resistance groups: low-level resistant, resistant, and highly resistant microorganisms. In experiments conducted on cambric test objects (without a protective substrate), working solutions of the new product at concentrations ranging from 0.5 to 3.0% showed high efficacy. The biocidal effect against low-level resistant microflora was achieved as follows: for *E. coli, C. freundii, H. alvei,* and *A. hydrophila* – by treating test objects with a 0.5% solution for 60 minutes; for *K. aerogenes, P. mirabilis,* and *E. faecalis* – after applying the same concentration for 120 minutes. An effective protocol for decontaminating disinfectant-resistant microflora (*S. lentus, S. capitis, S. intermedius*) was a 120-minute exposure to a 1.0% solution.

Decontamination of test objects inoculated with highly resistant microflora (*B. cereus*) was achieved after treatment with a 3.0% solution of the new disinfectant for 180 minutes (Table 1).

In tests studying the biocidal effect with a protective substrate, the following results were obtained. For the low-resistant microflora *E. coli*, *C. freundii*, *H. alvei, A. hydrophila*, and *K. aerogenes*, bactericidal action was observed after exposure to a 1.0% solution of the product for 120 minutes. Test objects inoculated with *P. mirabilis* and *E. faecalis* were decontaminated by exposure to the same concentration for 180 minutes. A working solution of the new disinfectant at a mode of 2.0% / 120 minutes was effective against *S. lentus*, *S. capitis*, and *S. intermedius*, which belong to the resistant group.

Highly resistant microflora (*B. cereus*) showed sensitivity to the tested product when treated at a concentration of 5.0% for 120 minutes (Table 2).

Decontamination of ceramic tiles inoculated with low-resistant microflora was achieved using the mode of 1.0% / 180 minutes. Against the disinfectantresistant microflora *S. lentus*, *S. capitis*, and *S. intermedius*, the biocidal effect was observed at a 2.0% concentration with a 120-minute exposure. The highly resistant *B. cereus* showed sensitivity to the product at a concentration of 5.0% for 120 minutes (Table 3).

On a concrete surface inoculated with low-resistance microorganisms, the product demonstrated efficacy at a concentration of 2.0% for a 180-minute exposure time. The biocidal efficacy against disinfectant-resistant microflora (*S. lentus, S. capitis, S. intermedius*) required a 3.0% concentration, while decontamination of *B. cereus* was achieved after two treatments with a 6.0% solution of the product and a 240-minute exposure (with a 120-minute interval) (Table 4).

CONCLUSION

Based on the results of experiments simulating production environments of livestock facilities (with a protective substrate and common construction materials used in the construction of livestock facilities), the new disinfectant demonstrated the pronounced biocidal effect across various microbial resistance groups.

The biocidal effect against low-resistant microflora on cambric test objects was observed at a mode of 1.0% / 180 minutes; a mode of 2.0% / 120 minutes was effective against the resistant group, while highly resistant microflora showed sensitivity to the product at a mode of 5.0% / 120 minutes.

Decontamination of ceramic tiles – a smooth construction material that does not adsorb the disinfectant solution – inoculated with low-resistant microflora was achieved at a mode of 1.0% / 180 minutes. Against resistant microflora, the biocidal effect was observed when treated with a 2.0% solution for 120 minutes; highly resistant *B. cereus* showed sensitivity to the product at a mode of 5.0% / 120 minutes.

On concrete test surfaces inoculated with low-resistant microflora, the efficacy of the tested product was achieved using a 2.0% solution with an exposure time of 180 minutes. The biocidal effect against resistant microflora was observed at a mode of 3.0% / 180 minutes, while the absence of growth of highly resistant *B. cereus* was recorded following two treatments with a 6.0% solution and a total exposure of 240 minutes (with a 120-minute interval).

Analyzing the obtained data, it can be concluded that further tests under production conditions of livestock facilities, including during the autumn-winter-spring period, are advisable to asssess the disinfectant effect of the new product at low temperatures in order to develop effective decontamination protocols for production facilities of the agro-industry.

REFERENCES

1. Popov N. I., Sherbakova G. Sh. The roles find plase of disinfection for the prevention of infection diseases in animal. *Veterinariya*. 2022; (9): 57–64. https://doi.org/10.30896/0042-4846.2021.25.9.57-66 (in Russ.)

2. Smirnov A. M., Dorozhkin V. I., Popov N. I., Gunenkova N. K. Main directions of scientific activity on providing veterinary and sanitary livestock well-being. *Russian Journal "Problems of Veterinary Sanitation, Hygiene and Ecology"*. 2021; (1): 6–14. https://doi.org/10.36871/vet.san.hyg.ecol.202101001 (in Russ.)

3. Dengis N. A., Vlasenko V. S., Borisov E. S. Epizootic situation on cattle tuberculosis in the Omsk Region. *Bulletin of KrasSAU*. 2024; (3): 108–114. https://doi.org/10.36718/1819-4036-2024-3-108-114 (in Russ.)

4. Sherbakova G. Sh., Popov N. I. Antimicrobial activity of a new drug for the rehabilitation of veterinary control facilities. *Veterinariya*. 2025; (1): 35–39. https://doi.org/10.30896/0042-4846.2025.28.1.35-39 (in Russ.)

5. Butko M. P., Popov P. A., Onishchenko D. A. Classification of disinfectants and evaluation of their effectiveness. *Russian Journal "Problems of Veterinary Sanitation, Hygiene and Ecology"*. 2018; (3): 134–142. https://doi.org/10.36871/vet.san.hyg.ecol.201803024 (in Russ.)

6. Dorozhkin V. I., Popov N. I., Prokopenko A. A., Bochinin Yu. I. Ecologically safe disinfectant agents for treatment of premises and equipment for the bird flu. *Veterinariya*. 2018; (4): 50–53. https://doi.org/10.30896/0042-4846.2018.21.4.50-53 (in Russ.)

7. Kyvshinchikov N. N., Shcherbakova G. Sh., Popov N. I., Shuteeva E. N. Study of the bactericidal properties of a new disinfectant for use in veterinary medicine. *Russian Journal "Problems of Veterinary Sanitation, Hygiene and Ecology"*. 2025; (1): 16–24. https://doi.org/10.36871/vet.san.hyg.ecol.202501002 (in Russ.)

8. Kamenskaya T. N., Lukyanchik S. A., Makarenko V. A. Chemical disinfection as a factor in protecting animals from infection in conditions of intensive animal husbandry (review). *Ecology and Animal World.* 2024; (2): 48–53. https://elibrary.ru/pgwima (in Russ.)

9. Lavrentiev I. A., Igolkin A. S., Shevtsov A. A., Kolbin I. S., Puzankova O. S., Gavrilova V. L., Chernyshev R. S. Virucidal activity of disinfectants against African swine fever virus. *Veterinary Science Today*. 2025; 14 (2): 156–163. https://doi.org/10.29326/2304-196X-2025-14-2-156-163

10. Popov N. I., Shcherbakova G. Sh. Disinfection as a key element in the prevention and elimination of infectious diseases of animals. *Disinfectology*. 2025; 1 (1): 15–25. https://doi.org/10.47470/dez004 (in Russ.)

11. Netychuk S. S., Popov P. A. Activity and the development of modes of use of the drug DISINFICENT-NP of veterinary surveillance facilities. *Veterinariya.* 2024; (11): 39–42. https://doi.org/10.30896/0042-4846.2024.27.11.39-42 (in Russ.)

12. Zaberezhny A. D., Aliper T. I. Modern technologies to protect human and animal health. *Trudi VIEV*. 2019; 81 (1): 2–5. https://doi.org/10.30917/ATT-PRINT-2019-4 (in Russ.)

13. Manevich B. V., Burykina E. A. Aspects of safe use of modern disinfectants in dairy enterprises. *Disinfection Affairs*. 2024; (3): 20–24. https://doi.org/10.35411/2076-457X-2024-3-20-24 (in Russ.)

14. Pirozhikhin V. A., Shcherbakova G. Sh., Shuteeva E. N., Konyashkina A. V., Popov N. I., Gruznov D. V. Studying the disinfection effectiveness of a new product based on tertiary amines in relation to gram-positive and gram-negative microorganisms in laboratory conditions. *Russian Journal "Problems of Veterinary Sanitation, Hygiene and Ecology"*. 2024; (1): 8–13. https://doi.org/10.36871/vet.san.hyg.ecol.202401001 (in Russ.)

15. Kozak S. S., Tararova K. S. Multicomponent washing-and-disinfection solution for veterinary objects disinfection at poultry processing enterprises. *Poultry & Chicken Products*. 2024; (2): 40–43. https://doi.org/10.30975/2073-4999-2024-26-2-40-43 (in Russ.)

16. Doan D. T., Hoang T. L. G., Vu N.-N., Nguyen T. H., Assadi A. A., Nguyen-Tri P. Synthesis of copper complex and 2d zinc-organic framework with enhanced disinfection properties. *ACS Applied Bio Materials*. 2026; 9 (1): 196–209. https://doi.org/10.1021/acsabm.5c01758

17. Al-Amine O. B., Ugryumova V. S., Mingaleev D. N., Ugryumov O. V., Ravilov R. Kh., Yarullin R. S. Study of the latitude of the antimicrobial effect spectrum of the disinfectant Recobact, inclusing *Fusobacterium necrophorum*. *Proceedings of the Kuban State Agrarian University*. 2022; (101): 330–334. https://doi.org/10.21515/1999-1703-101-330-334 (in Russ.)

18. Popov N. I., Shcherbakova G. Sh., Michko S. A., Alieva Z. E., Stepanova S. P. Evaluation of the effectiveness of the disinfectant "Biolok". *Russian Journal "Problems of Veterinary Sanitation, Hygiene and Ecology"*. 2021; (1): 59–66. https://doi.org/10.36871/vet.san.hyg.ecol.202101009 (in Russ.)

19. Kuzmin V. A., Fogel L. S., Sukhinin A. A., Makavchik S. A., Smirnova L. I., Orekhov D. A. Estimation of efficiency of disinfection of surfaces of equipment with "Fumiod" drug in animal and pig breeding spaces during sanitary break. *International Bulletin of Veterinary Medicine.* 2020; (3): 94–99. https://doi.org/10.17238/issn2072-2419.2020.3.94 (in Russ.)

20. Popov P. A., Netychuk S. S., Timofeeva I. V. Study of the disinfecting effect of a composite preparation on the vegetative microflora. *Russian Journal "Problems of Veterinary Sanitation, Hygiene and Ecology"*. 2022; (4): 420–424. https://doi.org/10.36871/vet.san.hyg.ecol.202204002 (in Russ.)

21. Wang Y., Wang J., Wei Q., Yu L., Shen J. Interpretation of the Disinfection Effects Testing and Evaluation Methods Section in *Test Methods for Disinfection Products (WS/T 10009-2023)*. *Journal of Sichuan University (Medical Sciences)*. 2025; 56 (5): 1184–1188. https://doi.org/10.12182/20250960102 (in Chinese)

22. Popov N. I., Stepanova S. P., Shcherbakova G. Sh., Gruznov D. V., Alieva Z. E., Shuteeva E. N., et al. Study of the effectiveness of the disinfectant preparation "Vortex" in laboratory conditions. *Russian Journal "Problems of Veterinary Sanitation, Hygiene and Ecology"*. 2023; (1): 38–45. https://doi.org/10.36871/vet.san.hyg.ecol.202301006 (in Russ.)

23. Kanmani S., Kumar P. G., Nizzy A. M., Annenewmy B. Formation of disinfection by-products (DBPs) in water and wastewater treatment systems in Tamil Nadu: evaluating chlorination alternatives for safer water quality. *Environmental Monitoring and Assessment*. 2025; 198 (1):22. https://doi.org/10.1007/s10661-025-14877-8

24. Antonevsky I. V., Pleshakova V. I., Leshcheva N. A. Biofilm-forming microflora in the structure of microorganisms isolated from farm and domestic animals. *Scientific Notes Kazan Bauman State Academy of Veterinary Medicine*. 2025; 261 (1): 16–24. https://doi.org/10.31588/2413_4201_1883_1_261_16 (in Russ.)

25. Ke D., Tan X., Chen K., Xue X., An N., Ye K., et al. Advances in novel disinfection technologies for biofilm-associated nosocomial infections. *Journal of Sichuan University (Medical Sciences)*. 2025; 56 (5): 1243–1250. https://doi.org/10.12182/20250960203 (in Chinese)

26. Dorozhkin V. I., Popov N. I., Shcherbakova G. Sh. Composite preparations for animal health protection. *Proceedings of the Federal Centre for Animal Health*. 2022; 18: 771–785. https://doi.org/10.29326/9785907612136_2022_18_771 (in Russ.)

Received 28.01.2026
Revised 02.03.2026
Accepted 17.03.2026

INFORMATION ABOUT THE AUTHORS / ИНФОРМАЦИЯ ОБ АВТОРАХ

Pavel V. Arzhakov, Cand. Sci. (Biology), Leading Researcher, Laboratory of Diagnostic Research and Biotechnology, Department of Veterinary Medicine, Omsk Agrarian Scientific Center, Omsk, Russia; *https://orcid.org/0009-0001-0812-5540, omdez@yandex.ru*

Аржаков Павел Викторович, канд. биол. наук, ведущий научный сотрудник лаборатории диагностических исследований и биотехнологий отдела ветеринарии ФГБНУ «Омский АНЦ», г. Омск, Россия; *https://orcid.org/0009-0001-0812-5540, omdez@yandex.ru*

Tatiana S. Dudoladova, Cand. Sci. (Biology), Leading Researcher, Laboratory of Diagnostic Research and Biotechnology, Department of Veterinary Medicine, Omsk Agrarian Scientific Center, Omsk, Russia; *https://orcid.org/0009-0006-8307-9472, dud.08@mail.ru*

Artem N. Novikov, Cand. Sci. (Veterinary Medicine), Leading Researcher, Laboratory of Specific Prevention of Brucellosis, Department of Veterinary Medicine, Omsk Agrarian Scientific Center, Omsk, Russia; *novikovart06@mail.ru*

Дудоладова Татьяна Сергеевна, канд. биол. наук, ведущий научный сотрудник лаборатории диагностических исследований и биотехнологий отдела ветеринарии ФГБНУ «Омский АНЦ», г. Омск, Россия; *https://orcid.org/0009-0006-8307-9472, dud.08@mail.ru*

Новиков Артем Николаевич, канд. вет. наук, ведущий научный сотрудник лаборатории специфической профилактики бруцеллеза отдела ветеринарии ФГБНУ «Омский АНЦ», г. Омск, Россия; *novikovart06@mail.ru*

Contribution of the authors: Arzhakov P. V. – concept development, biocidal effect study, data analysis, article editing; Dudoladova T. S. – scientific consulting, biocidal effect study, article editing; Novikov A. N. – research plan development, article preparation.

Вклад авторов: Аржаков П. В. – формирование идеи, изучение биоцидного эффекта, анализ полученных данных, редактирование текста статьи; Дудоладова Т. С. – научное консультирование, изучение биоцидного эффекта, редактирование текста статьи; Новиков А. Н. – составление плана исследований, подготовка текста статьи.