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Determination of Toxicity of Experimental Disinfectant

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Abstract. Excessive use and abuse of disinfectants over the past century has created problems associated with the emergence of resistant microorganisms. In addition, there is always a potential risk to human and animal health, as the use of aggressive disinfectants can lead to diseases. The purpose of the study was to investigate the toxicity of an ex perimental disinfectant to determine the possibility of its use in the presence of humans and animals. Study material – an experimental product (water-soluble disinfection powder). Experimental studies were conducted at the premises of a certified vivarium of the ECOMEDCHIM regional centre of Sumy State University and Sumy National Agrarian University. Acute toxicity of the preparation was studied on 30 white mice weighing 19.5±1.0 and 15 white rats weighing 200±15.0 g. Determination of toxicity by prolonged oral administration was studied in two analogous groups of white rats, 6 animals each with a bodyweight of 185±10.0 g. The effect of the preparation on the state of internal organs was evaluated by comparing relative mass coefficients. The local irritating effect of the preparation was determined by skin applications on 10 rabbits weighing 2.97±0.3 kg. The disinfectant, when administered orally once at doses of 1,250, 2,500, and 5,000 mg/kg of body weight, did not cause the death of experimental mice and rats. When administered orally for 30 days at a dose of 2,500 mg/kg of body weight, the disinfectant did not cause any negative and toxic effects on the body of experimental rats, did not affect the growth and development of rats, and did not cause changes in the relative mass of internal organs. It was found that the average manifestation of erythema in rabbits is 2.46. According to the study results, it was found that the disinfectant can be classified as Hazard Class 4 according to the international standard GOST 12.1.007-76, or Category 5 according to the international global classification Global Harmonised System (GHS) (LD_{50} with oral administration exceeds 5,000 mg/kg of body weight). The results obtained give grounds to assert the possibility of using an experimental disinfectant in the presence of humans and animals

Keywords: disinfectant, acute toxicity, skin-resorptive effect, laboratory animals, erythema, oedema

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INTRODUCTION

The spread of the SARS-CoV-2 coronavirus, which causes the COVID-19 disease, has led to a sharp increase in the use of disinfectants to ensure indoor safety [1]. In animal husbandry, there is a problem with the occurrence of infectious diseases, but their outbreaks can be prevented with proper sanitary control measures. Infectious diseases of livestock are widespread all over the world. Thus, the global outbreak of African swine fever in 2018 was extremely dangerous, as 6.8 million pigs were killed. The negative impact on the environment caused by an increase in the number of livestock in a limited area is the most important environmental problem [2]. Therefore, farms need to be protected from pathogens of infectious diseases of animals to prevent the death of livestock. Due to the economic crisis, the development of disease prevention tools using financially affordable and universal disinfectants is promising [3].

However, not all disinfectants are safe to use in the presence of humans. Animal husbandry is associated with exposure to organic dust containing allergens and micro-organisms, endotoxins, and other factors such as irritating gases, ammonia, and disinfectants. These exposures have been identified as specific agents that may cause the risk of developing asthma, rhinitis, and chronic bronchitis. Therefore, there is an urgent need to focus on the impact of farming to protect farmers and others working in these and related industries from the development of respiratory diseases and allergies [4]. For example, quaternary ammonium compounds (QAC) are recommended by the U.S. Centers for Disease Control and Prevention (CDC) and the Environmental Protection Agency (EPA) for disinfection procedures specifically targeting SARS-CoV-2. However, exposure to QAC has been associated with a number of negative health effects [5]. Hospital waste and wastewater, especially without proper treatment, will put the population at risk of infection. In particular, in the context of the 2019 coronavirus disease pandemic (COVID-19) in China, it is very important to reduce risks to public health and the environment [6].

One of the components of the experimental disinfectant is thymol (2-isopropyl-5-methylphenol) – $C_{10}H_{14}O$, monoterpene phenol derived from thyme essential oil *Thymus vulgaris*. To determine the antibacterial activity against individual gram-positive substances (*Staphylococcus aureus* and *Bacillus cereus*) and gram-negative bacteria (*Salmonella Infantis, Escherichia coli* the researchers used thymol and carvacrol essential oils, which showed strong antioxidant and antibacterial potential [7]. Essential oil of Thymus vulgare caused the destruction of 90% of the biofilm in the 72-hour culture of *Chromobacterium violaceum* and *P. fluorescens* [8]. In addition, another component of the product, chloramine (sodium tosyl chloramide), contains 25% active chlorine. Studies in dentistry have shown that chloramine has antifungal and antibacterial properties, probably affecting both the cell wall and membrane permeability, and has shown low toxicity in vitro [9].

Cuprum sulphate salts have significant antibacterial activity against nosocomial pathogens with multiple preparation resistance. However, isolates of gram-negative bacteria that are not sensitive to cuprum sulphate have been isolated in a public hospital and health department in Helm, Algeria [10]. To solve this problem, the experimental preparation was created in such a way that its components complement and enhance the antimicrobial effect.

Research by scientists proves that divalent iron negatively affects resistance of *L. pneumophila* in biofilms [11]. It is determined that the surfaces of residential and livestock premises are often contaminated with micromycetes of the genus *Aspergillus* [12].

Calcium sulphate dihydrate is used as a sorbent to reduce moisture during disinfection in rooms with high relative humidity. Calcium sulphate dihydrate is also a high-quality carrier for antimicrobial substances [13]. Zeolite, as a component of a multicomponent experimental disinfectant, has significant chemical, mechanical and thermal stability [14; 15].

Due to the COVID-19 pandemic, a large number of disinfectants are used in Ukraine, but one of the main issues remains the effectiveness and safety of disinfectants used in the presence of people and animals.

The purpose of the study is to determine the degree of toxicity of the experimental disinfectant and establish the possibility of its use in the presence of humans and animals.

Research objectives include: determination of acute toxicity of an experimental disinfectant with oral administration; investigation of the toxicity of an experimental disinfectant with prolonged oral administration; investigation of the skin-resorptive and local-irritating effects of an experimental disinfectant.

MATERIALS AND METHODS

Toxicity studies were conducted on laboratory animals to determine the safety of the experimental disinfectant. The experiments included two types of studies: determination of acute toxicity with oral administration and with prolonged oral administration. Then the information received was processed and analysed.

Study materials – water-soluble disinfection powder containing the following substances (%): chloramine – 0.2; thymol – 0.1; copper sulphate – 2.0; iron sulphate – 1.0; calcium sulphate dihydrate – 45.0; kaolin – 9, zeolite – 42.0; pine-scented fragrance – 0.1. When developing the product, the study relied on the requirements for disinfectants, which are provided for by the order of the Ministry of Health "On state registration (re-registration) of disinfectants" dated 01.04.2021. An important indicator for disinfectants is the wide spectrum of antimicrobial

action and safety when used in the presence of humans and animals.

Experiments were conducted at the premises of a certified vivarium of the ECOMEDCHIM regional centre of Sumy State University and Sumy National Agrarian University. All studies on laboratory animals were carried out in accordance with directive 2010/63/EC [16] as amended by Regulation (EU) 2019/1010 and approved by the conclusion of the commission on ethics and bioethics of the Faculty of Veterinary Medicine of Sumy National Agrarian University dated 21.12.2020.

Determination of acute toxicity of an experimental disinfectant when administered orally

Acute toxicity of the disinfectant was studied in 30 white mice weighing 18.5-20.5 g and 15 white rats weighing 180-210 g. The animals were kept in accordance with sanitary norms and rules for keeping in the vivarium of the Regional Centre using specialised mixed feed. Before conducting the study, the animals were weighed. The experimental disinfectant, before being administered orally to animals, was thoroughly ground to a fine powder in a mill and intensively mixed equally with water. Immediately after mixing, the product was quickly administered to the animals in the morning, before feeding. The disinfectant was administered once using a probe with a cannula at the rate of 1,250, 2,500, and 5,000 mg/kg of body weight. Feeding of animals began two hours after the administration of preparation. Each of these doses of the preparation was administered to ten white mice and five rats.

Experimental rats and mice were monitored for 14 days after the introduction of the disinfectant. In the course of the studies, the clinical condition of the animals was monitored daily, considering their activity, feed and water consumption.

Study of the toxicity of an experimental disinfectant with prolonged oral administration

Determination of toxicity by prolonged oral administration was studied in two analogous groups of white rats, 6 animals each with a bodyweight of 185±10.0 g. The animals were kept under the same conditions as when studying the acute toxicity of the disinfectant. Immediately before oral administration, the experimental disinfectant was thoroughly ground to a fine powder, thoroughly mixed equally with water, and administered orally daily to rats of the experimental group at a dose of 2,500 mg/kg of body weight for 30 days. Rats of the second (control) group were orally administered finely ground zeolite in water in the same amount.

Throughout the experiment, the general condition of the rats, their behaviour were monitored, and the amount of food and water consumed by the animals was monitored. Rat body weight indicators were recorded before the start, on the 10th, and 31st days from the beginning of the experiment.

One day after the last administration of the experimental disinfectant, blood samples were taken from rats to determine haematological parameters and the condition of the internal organs of rats (stomach, intestines, liver, lungs, kidneys, heart, spleen) was examined. The effect of the experimental disinfectant on the state of internal organs was evaluated by comparing their relative mass coefficients [15].

Study of skin-resorptive and local-irritating effects

The skin-resorptive effect of the experimental preparation was studied in white outbred mice weighing 20-25 g. Clinically healthy laboratory animals were previously kept under 14-day quarantine in the vivarium of the clinic of the Faculty of Veterinary Medicine. The mice were then divided into experimental and control groups of 6 animals each. In mice of the experimental group, tails 2/3 of the length were treated with a 10% solution of the preparation, and in the control group, they were immersed in 0.9% sodium chloride solution. The exposure was 2 hours, daily, for 5 days. The ability of the preparation to penetrate the skin was evaluated at the end of the experiment. The clinical features of animal intoxication and the effect on the central nervous system were considered. In addition, the "swimming" method was used to assess the performance of mice. The time during which the animal could stay on the surface of the water was recorded.

The local irritating effect of the product was determined by skin applications on 10 rabbits weighing 2.97±0.3 kg, which allowed detecting the development of non-allergic contact dermatitis in them, depending on the dose of disinfectant. 2 days before the start of the experiment, 7x8 cm sections were sheared symmetrically on both sides of the spine on the back of laboratory animals, leaving a 2 cm wide strip of hair between them. A 10% solution of the experimental preparation was applied on the right side at the rate of 1 ml per 1 kg of rabbit body weight, and the same amount of 0.9% sodium chloride solution was applied on the left. To avoid licking the product from the skin during the 4-hour exposure, a plastic collar was put on the animals. After completing the experiment, the disinfectant was washed off with water. The first evaluation of skin samples was performed after 10 days. Changes in the functional state of the skin of an inflammatory nature (erythema, oedema) were determined under natural or near-natural artificial light 1, 24, 48, and 72 hours after the end of exposure according to the classification presented in Table 1.

***Table 1**. Assessment of the harmful effects of new substances on the skin of rabbits by the scoring system (according to Majda and Chrusaielska) [17] using an 8-score system*

Reaction	Rating, score
Erythema:	
Absent	0
Weak (barely noticeable)	1
Moderate severity	2
Expressed	3
Pronounced (dark red) with escharosis	4
Oedema:	
Absent	0
Weak (barely noticeable)	1
Moderate (protrudes no more than 1 mm above the skin surface)	2
Pronounced (protrudes above the skin surface and has clear borders)	3
Pronounced (protrudes more than 1 mm above the skin surface)	4
Maximum possible score	8

With a negative result, the research continued and brought the number of applications to 20. Then, the scores of skin reactions for each animal, including erythema and oedema, were summed up at a certain time interval and divided by the total number of observations. The resulting total irritation index was compared with the values presented in Table 2 and recorded in the study report [18].

***Table 2**. Degree of response to irritation in rabbits*

Response	Score
Insignificant	From 0 to 0.4
Weak	From 0.5 to 1.9
Moderate	From 2.0 to 4.9
Expressed	From 5.0 to 8.0

The results were processed using Microsoft Excel 2010 (Microsoft Corp., USA) and StatPlus 2009 professional 5.8.4 for Windows (StatSoft Inc., USA). The Student's t-test was used to assess the reliability of differences between the samples.

RESULTS AND DISCUSSION

Results of studying the acute toxicity of an experimental disinfectant with oral administration

A thorough approach is necessary to understand the risks associated with the use of the disinfectant and the measures that need to be taken to prevent the negative impact of the disinfectant on biological objects, and will allow using it for disinfection in the presence of animals and people. These hazards may be compounded by improper use or incorrect combination of incompatible substances. Since 2019, the use of disinfectants has increased due to the COVID-19 pandemic. Many cases of poisoning and allergic manifestations have been registered with the use of disinfectants [19].

The results of studies showed that a single oral administration of the disinfectant in all the above-mentioned doses did not cause toxic effects on the animal body. No deaths of experimental rats and mice were recorded (Table 3).

***Table 3**. Results of determining the acute toxicity of an experimental disinfectant*

Dose of the preparation administered, mg/kg of body weight	Animal deaths (died / total number in the experiment)	
	Rats	Mice
1,250	0/5	0/10
2,500	0/5	0/10
5,000	0/5	0/10

Due to the low toxicity of the disinfectant and the absence of death of laboratory animals after single oral administration, the calculation of toxicological parameters (LD_{50}) of the preparation was not performed.

During the entire experiment, no clinical manifestations of intoxication or side effects were recorded in experimental animals after a single oral administration of an experimental disinfectant in doses of 1,250, 2,500, and 5,000 mg/kg of body weight. The type of disinfectant selected depends on the sensitivity of microorganisms, the method of application and the structure of the material to be disinfected. There are also concerns about the safety of disinfectants for animals and farm maintenance personnel. In addition, the issue of the effectiveness of disinfectants and the prevention of the occurrence of resistant pathogenic microorganisms remains relevant [20; 21]. Therefore, the concentration of the experimental disinfectant should be sufficient to kill microorganisms and safe for its use in the presence of humans and animals.

Based on the conducted studies, it can be concluded that the maximum dose of an experimental disinfectant that does not cause the death of experimental rats and mice with a single oral administration (LD_0) is more than a dose of 5,000 mg/kg of body weight. Accordingly, LD_{50} of the preparation with a single oral administration to rats and mice will exceed the dose of 5,000 mg/kg of body weight, and therefore the experimental disinfectant can be classified as Hazard Class 4 according to the international standard GOST 12.1.007-76 [22], or as Category 5 according to the International global classification Global Harmonised System, (GHS) [23] (LD_{50} with a single oral administration exceeding 5,000 mg/kg of body weight).

Results of studying the toxicity of an experimental disinfectant with prolonged oral administration

Disinfection with chemical reagents is undoubtedly an important element of measures in the fight against animal pathogens. There are different classes of chemical disinfectants that have different effectiveness in the specific conditions of each farm. The choice of disinfectant should be based on the expected result. All types of disinfectants have advantages and disadvantages, and each has its own scope of application [24; 25]. With prolonged use of disinfectants, there is a possibility of a gradual cumulative effect in the body. It is clear that the effect of chronic toxicity of the preparation depends on the components and their concentrations. The most dangerous substances that have an evapouration effect are esters. The experimental disinfectant uses the only substance that contains essential oils – thymol, but it is of natural origin and is contained in low concentrations.

The study of the toxicity of the disinfectant with prolonged oral administration showed that administration of the preparation at a dose of 2,500 mg/kg of body weight for 30 days did not affect the clinical condition and behaviour of rats. During the entire experiment, no visible extraneous or negative effects of the preparation were recorded. The animals willingly consumed food and water, were mobile, and responded adequately to sound and tactile stimuli.

In addition, there was no significant negative effect of the experimental disinfectant, which was administered to rats for 30 days in a dose of 2,500 mg/kg of body weight, on the growth and relative weight gain of rats during the experiment compared to the weight of control rats (Table 4).

***Table 4**. Dynamics of changes in rat body weight during oral administration of an experimental disinfectant for 30 days*

Research period	Animal groups	
	Preparation was administered orally at a dose of 2,500 mg/kg	Control group
Before administration of the preparation	186.90±1.73	187.10±2.30
10	225.40±2.63	225.40±3.66
31	289.26±3.33	288.89±3.66

When dissecting animals of the experimental group, no visible pathological changes were observed in the internal organs and tissues of rats. There were also no significant changes in the comparison of the relative mass coefficients of internal organs of experimental and control rats (Table 5).

***Table 5**. Mass coefficients of internal organs to bodyweight of slaughtered experimental and control rats after 30 days of administration of experimental disinfectant*

Internal organs	Animal groups and dosage	
	Rats received the preparation at a dose of 2,500 mg/kg	Control
Liver	5.23±0.09	5.31±0.90
Lungs	0.96±0.17	0.97±0.16
Heart	0.41±0.09	0.42±0.07
Kidneys	0.77±0.05	0.78±0.06
Spleen	0.56±0.14	0.57±0.15

During haematological studies, there was no significant difference in the indicators of the experimental and control groups (Table 6). Thus, oral administration of an experimental disinfectant for 30 days at a dose of 2,500 mg/kg of body weight did not cause a significant negative effect on the body of rats in all the studied indicators.

***Table 6**. Hematological parameters in rats after administration of an experimental disinfectant on day 30*

Indicators		Animal groups and dosage		Reference value
		Rats received the preparation at a dose of 2,500 mg/kg	Control	
Haemoglobin, g/l		114.20±6.13	120.11±6.96	108.5-133.0
Red blood cells, T/l		7.02±0.76	7.06±0.83	6.50-8.25
Platelets, 10^9/l		530.6±15.6	529.7±15.1	520.0-590.0
White blood cells, 10^9/l		8.34±0.93	8.52±0.66	8.6-12.0
Leukocytal formula, %	Neutrophils	27.00±2.33	25.20±1.66	25.00-35.00
	Monocytes	1.00±0.35	1.80±0.37	1.00-5.00
	Eosinophils	0.50±0.16	0.50±0.22	0.30-0.50
	Lymphocytes	71.50±2.33	72.50±2.66	71.00-77.00

Study of skin-resorptive and local irritant effects

Experimental mice practically did not differ from the control individuals during the entire experiment, and the clinical picture of intoxication was not observed (Table 7).

***Table 7**. Indicators of the state of the body of mice after applying an experimental disinfectant to the skin of the tail*

Group	Body weight, g		TTI, relative units	Blood			Performance, min.
	Before activity	After activity		Haemoglobin, g/l	White blood cells, 10^9/l	Red blood cells, 10^{12}/l	
Control	20.2±0.81	21.8±0.79	4.5±0.23	8.5±0.50	8.610±0.48	8.960±0.60	28.3±0.79
Experiment	20.0±0.68	20.8±0.81	4.4±0.40	9.4±0.60	8.400±0.70	8.790±0.50	27.9±0.40

After processing the tails, the animals were slightly dishevelled, which can be explained by stress, and after 1 hour these signs disappeared. During daily examination, erythema and dry skin were noted in the mice of the experimental group. After stopping the experiment for another 3-4 days, a slight dryness of the tail skin remained. A slight decrease in the value of the total threshold indicator (TTI) and performance according to the "swimming" method (27.9±0.40 min against 28.3±0.79 min in the control) indicated the manifestation of inhibition processes in their central nervous system.

The use of safe disinfectants is an important vital aspect, especially in the context of an epidemic. But choosing the right tool is difficult, because there is a wide variety on the market. Therefore, before choosing a disinfectant, it is necessary to determine which pathogens should be destroyed and under what conditions [26].

One of the last considerations is the effect of disinfectants on indoor animals. Potential animal health risks pose similar threats to humans, including the risk of contact dermatitis and mucosal irritation. In addition, disinfectants can create unpleasant odours that can have a negative impact on the behaviour and well-being of animals and people. Regardless of whether the disinfectant is intended for use only on surfaces that come into contact with animals, or as a universal indoor agent, it is important that it does not cause irritation or immediately when used at the recommended concentration [27].

The results of testing the irritating effect of a 10% working solution of an experimental disinfectant on the skin of rabbits are presented in Table 8.

***Table 8**. Results of studying the irritating effect of a 10% solution of an experimental disinfectant on the skin of rabbits*

No. of animal	Weight, kg	Amount of preparation, ml	Total stimulus index, score
1	2.82	2.82	2.34
2	2.84	2.84	2.44
3	2.87	2.87	2.46
4	2.94	2.94	2.46
5	2.97	2.97	2.46
6	2.95	2.95	2.5
7	2.83	2.83	2.54
8	3.08	3.08	2.46
9	2.87	2.87	2.46
10	3.0	3.0	2.5
Average in the group	2.92±0.09	2.92±0.09	2.46±0.02

The experimental product contains chloramine, which is used to disinfect biological materials, equipment, medical supplies, and various surfaces. The ideal disinfectant for clinical practice must meet several criteria, including water solubility, bactericidal ability, and economical efficiency, depending on the purpose of disinfection and ambient temperature. However, a 5% solution of chloramine causes metal corrosion and irritates the skin and mucous membranes. Studies have shown that the average manifestation of erythema in rabbits is 2.46. According to the classification of toxicity, the experimental agent has a moderate irritating effect and belongs to the 4th hazard class [28].

Indicators that characterise the irritating effect of the experimental disinfectant solution in the maximum permissible concentration of 60 mg/m^3 on the mucous membranes of the eyes of rabbits, presented in Table 9.

***Table 9**. Results of the conjunctival test on rabbits*

No. of animal	Evaluation criteria	Research period after treatment, h				Average total reaction severity score	Degree of severity of the effect
		1	24	48	72		
1	Conjunctival and corneal hyperaemia	3	2	1	0	3.25	Moderate
	Palpebral oedema	2	1	0	0		
	Exudation	3	1	1	0		
2	Conjunctival and corneal hyperaemia	1	1	1	1	2.75	Weak
	Palpebral oedema	1	1	1	0		
	Exudation	1	1	1	1		
3	Conjunctival and corneal hyperaemia	2	1	1	0	3.25	Moderate
	Palpebral oedema	2	2	1	0		
	Exudation	3	1	0	0		
4	Conjunctival and corneal hyperaemia	2	2	1	1	3.5	Moderate
	Palpebral oedema	1	1	0	0		
	Exudation	3	1	1	1		
5	Conjunctival and corneal hyperaemia	2	1	1	1	2.75	Weak
	Palpebral oedema	1	1	0	0		
	Exudation	3	1	0	0		

Immediately after treatment with the preparation, the rabbits showed anxiety, scratched their eyes. At the same time, narrowing of the eye slit, noticeable redness of the tear duct and sclera towards the cornea, palpebral oedema, significant exudation with moistening of the eyelids and hair around the eyes were observed. These signs disappeared on their own within 72-96 hours. This fact indicates a moderate irritating effect of the experimental disinfectant on the mucous membranes of the eyes of rabbits.

CONCLUSIONS

1. Experimental disinfectant at doses of 1,250, 2,500, and 5,000 mg/kg of body weight, did not cause the death of experimental mice and rats. On this basis, the product can be classified as Hazard Class 4 according to the international standard GOST 12.1.007-76, or Category 5 according to the International global classification Global Harmonised System (GHS) (LD_{50} oral administration exceeds 5,000 mg/kg of body weight).

2. With oral administration of an experimental disinfectant for 30 days at a dose of 2,500 mg/kg of body weight, it did not cause any negative and toxic effects on the body of experimental rats, did not affect their growth and development, did not cause changes in the relative mass of internal organs, and did not lead to changes in the haematological parameters of experimental animals.

3. Disinfectant for skin applications has a weak effect on the degree of response (erythema and oedema) in rabbits.

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Визначення токсичності експериментального дезінфікуючого засобу

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Анотація. Надмірне використання та зловживання дезінфікуючими засобами протягом минулого століття створило проблеми, пов'язані з появою стійких мікроорганізмів. Крім того, завжди є потенційний ризик для здоров'я людей і тварин, оскільки використання агресивних дезінфікуючих засобів може призвести до захворювань. Метою роботи було дослідження токсичності експериментального дезінфікуючого засобу для визначення можливості використання в присутності людей і тварин. Матеріали дослідження – експериментальний засіб (порошок для дезінфекції водорозчинний). Експериментальні дослідження проводили в умовах атестованого віварію Регіонального центру РЦ «ЕКОМЕДХІМ» Сумського державного університету та Сумського національного аграрного університету. Гостру токсичність засобу вивчали на 30 білих мишах масою 19,5±1,0 та 15 білих щурах масою 200±15,0 г. Визначення токсичності при тривалому пероральному введенні вивчали на двох, підібраних за принципом аналогів, групах білих щурів по 6 тварин у кожній з масою тіла 185±10,0 г. Вплив препарату на стан внутрішніх органів оцінювали шляхом порівняння відносних масових коефіцієнтів. Місцеву подразнюючу дію засобу визначали методом нашкірних аплікацій на 10 кролях масою тіла 2,97±0,3 кг. Дезінфікуючий засіб при пероральному одноразовому введенні в дозах 1250, 2500 та 5000 мг/кг маси тіла не викликав загибелі піддослідних мишей і щурів. При пероральному введенні засобу впродовж 30 діб у дозі 2500 мг/кг маси тіла не спричиняв будь-якої негативної та токсичної дії на організм дослідних щурів, не впливав на ріст і розвиток щурів, не спричиняв змін відносної маси внутрішніх органів. Встановлено, що в середньому прояв еритеми у кролів становить 2,46 бали. За результатами дослідження встановлено, що дезінфікуючий засіб можна віднести до 4 класу небезпеки відповідно до Міжнародного стандарту ГОСТ 12.1.007-76, або до категорії 5 за Міжнародною глобальною класифікацією Global Harmonized System, (GHS) ($ЛД_{50}$ при пероральному надходженні перевищує 5000 мг/кг маси тіла). Отримані результати дають підставу стверджувати про можливість застосування експериментального дезінфікуючого засобу в присутності людей і тварин

Ключові слова: дезінфектант, гостра токсичність, шкірно-резорбтивна дія, лабораторні тварини, еритема, набряк