

## VETERINARY RESEARCH

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## EFFECTIVENESS OF ENVIRONMENTALLY SAFE PRODUCTS «VETOKS-1000», «SUMERIAN SILVER» FOR THE PREVENTION OF PSEUDOMONOSIS OF POULTRY EMBRYOS ASSOCIATED WITH BACTERIOSIS

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**The aim:** study of the effectiveness of environmentally safe means «Vetoks-1000», «Sumerian silver» for the prevention of pseudomonosis of poultry embryos, associated with bacteriosis.

**Materials and methods.** The effectiveness of the preparations «VetOks-1000», «Sumerian silver» in relation to *E. coli*, *P. aeruginosa*, *S. aureus*, *S. typhimurium* was determined by the method of researching antimicrobial activity on test objects: galvanized iron, wooden bars (painted and unpainted), red brick and plaster cut-outs, 10 x 10 cm, and a hatching egg.

The effectiveness of «VetOks-1000», «Sumerian silver» solutions compared to formaldehyde for disinfection of hatching eggs and incubation cabinets for the purpose of preventing pseudomonosis of poultry embryos was carried out in the production conditions of the hatchery, where *P. aeruginosa*, *E. coli*, *S. aureus*, were periodically isolated from asphyxiated embryos and from the carcasses of chicks of the first 10 days of life by comparing the hatching rate of chicks in the experimental and control groups.

**Results.** It was established that the «Sumerian silver» had an antimicrobial effect against the causative agents of pseudomonosis and the main bacterioses of poultry in concentrations of 1–3 %, and the drug «VetOx-1000» was effective in concentrations of 0.024 %–0.03 % after exposure for 1–4 hours in depending on the type of surface.

The number of conditioned young birds, obtained with the use of environmentally safe means «VetOks-1000», «Sumerian silver», was higher by (1.1–1.7) % compared to the number of young birds in the control group using formalin.

**Conclusions.** The proposed method of prevention of associated pseudomonosis of poultry embryos by rotation of environmentally safe means in established bactericidal concentrations (3 % «Sumerian silver» solution and 0.03 % «VetOks 1000» solution) ensures a 1.1–1.7 % higher hatching of young birds compared to control using formalin

**Keywords:** «VetOks-1000», «Sumerian silver», *P. aeruginosa*, *E. coli*, *S. aureus*, pseudomonosis of poultry embryos, disinfection of the hatching egg

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**1. Introduction**

Bacterial infections occupy a significant place in the pathology of farm poultry and are among the current veterinary problems of poultry farming. Out of the total number of infectious diseases of birds, colibacteriosis accounts for an average of 60 %, salmonellosis – 5 %. For comparison, the incidence of pasteurellosis is 0.5 %, aspergillosis – 0.6 %, leukemia – 2.3 %, infectious bursal disease – 4.3 %, Marek's disease – 4.5 %, other infectious diseases – 22.8 %.

Poultry bacterial pathogens in the form of mono- or associated infections cause uneven and low body weight gains during broiler fattening, increased sensitivity to stress, reduced laying and hatchability of chickens, deterioration of biological qualities and early death of embryos,

death of young birds, contribute to poor assimilation of feed and reduce post-vaccination immunity [1, 2].

One of the features of the epizootology of bacterial diseases of poultry in industrial poultry farms is their course, associated with the manifestation of respiratory syndrome. During bacteriological studies, as a rule, *Escherichia*, *Staphylococci*, *Pseudomonas aeruginosa* (*P. aeruginosa*), *Mycoplasma*, *Pasteurella spp* of weakened virulence, *Ornithobacteria* are isolated, mostly in association with pneumovirus, which greatly complicates timely and objective diagnosis and the development of control measures [3, 4].

Poultry pseudomonosis is an infectious disease, caused by *P. aeruginosa*, and has a course in the form of

septicemia and toxemia, with significant mortality of young birds, as well as poultry embryos of all species, mainly at the end of incubation.

Considering *P. aeruginosa* as a representative of the priority group of bacteria with multiple antibiotic resistance [5] and taking into account the fact of the ability of this bacterium to rapidly develop resistance to disinfectants, the search for new environmentally safe means [6–9] to combat *P. aeruginosa* is relevant today in the field of veterinary and humane medicine.

**The aim of the research** was study of the effectiveness of environmentally safe means «Vetoks-1000», «Sumerian silver» for the prevention of pseudomonosis of poultry embryos, associated with bacteriosis.

## 2. Materials and methods

The research was carried out during 2019–2021 on the basis of the laboratories «Innovative technologies and safety and quality of livestock products» and «Veterinary pharmacy» of the department of microbiology, veterinary and sanitary examination, animal hygiene and quality and safety of livestock products of the Faculty of Veterinary Medicine of Sumy National Agrarian University. Необхідно також вказати роки проведення дослідження

In order to realize the set goal, we conducted a study of the effectiveness of modern ecologically safe means of production of NVF «BROVAFARMA» LLC (Kyiv) for the prevention of pseudomonosis and associated bacterioses of poultry embryos.

The active substance of the drug «VetOks-1000» is sodium hypochlorite. The composition of 1 dm<sup>3</sup> of the drug: sodium hypochlorite (1.1–1.3) g; sodium chloride (16.0–18.0) g; pyrogenic water – up to 1 dm<sup>3</sup>. In the process of its use, atomic oxygen is formed, which is a strong oxidizer. It exhibits pronounced bactericidal, virulicidal, fungicidal, detoxifying and deodorizing properties.

«Sumerian silver» disinfectant: 1 ml of solution contains silver citrate – 0.5 mg, copper citrate – 0.5 mg. «Sumerian Silver» is an effective disinfectant against most types of pathogenic microorganisms and has a pronounced disinfection effect. It is characterized by a significant prolonged effect, when it is used, resistant strains are not formed.

The effectiveness of the preparations «VetOks-1000», «Sumerian silver» in relation to *E. coli*, *P. aeruginos*, *S. aureus*, *S. typhimurium* was determined by the method of researching antimicrobial activity on test objects: galvanized iron, wooden bars (painted and unpainted), red brick and plaster cut-outs, 10 x 10 cm, and a hatching egg. The surface of the egg was disinfected with a 70 % solution of ethyl alcohol. After preliminary application of a 1-billion mixture of the above-mentioned bacterial cultures, aerosols of disinfectant solutions were sprayed on the test objects at the rate of 10 cm<sup>3</sup> per 10 cm<sup>2</sup> for an exposure of 1 hour up to 1 day. Working solutions were prepared ex tempore and used in the following concentrations: «VetOks-1000» – (0.02–0.06) %; «Sumerian silver» – (0.005–3) % solution.

Experimental studies on determining the effectiveness of prevention of pseudomonosis in poultry embryos using solutions «VetOx-1000», «Sumerian silver»

were carried out in the production conditions of the hatchery, where *P. aeruginosa*, *E. coli*, *S. aureus* were periodically isolated from from dead embryos and from chicken in the first 10 days of life.

To conduct experimental research, 3 groups were created: a control group and 2 experimental groups – 1,000 hatching eggs in each group. Eggs for experimental studies were taken from one batch. Incubation of eggs in the experimental and control groups was carried out under the same microclimate parameters in the same room of the hatchery in different incubators.

In the control group, the incubation egg and the incubator were disinfected before placing in the incubator with formaldehyde vapors by the gassing method (with chlorine) according to DSTU 4655:2006 "Incubation eggs. Pre-incubation processing technology. Main parameters".

In the experimental groups, the hatching egg was disinfected by irrigation: after laying the eggs (up to 2 hours) and immediately before placing them in the incubator, again for 7 days during hatching. Disinfection of the incubator was carried out before laying eggs and hatching after exposure for 2 hours.

In the first experimental group, the drug «Sumerian silver» was used in a concentration of 3 % for exposure of 60 minutes, in the second experimental group, the drug «VetOx-1000» was used in a concentration of 0.03 % for exposure of 1 hour.

According to the number of obtained conditioned young animals, the indicator of hatching was established in the three groups.

## 3. Research results

The effectiveness of the environmentally safe means «VetOks-1000», «Sumerian silver» for the prevention of pseudomonosis of poultry embryos, associated with bacteriosis, was studied in relation to *P. aeruginosa*, *E. coli*, *S. aureus*, *S. typhimurium* in laboratory and industrial conditions.

It was established that the «Sumerian silver» agent showed an antimicrobial effect against the causative agents of pseudomonosis and the main bacterial diseases of poultry on smooth surfaces in concentrations of 2 % and higher after exposure for 1 hour; on rough surfaces – in a concentration of 3 % for exposure of 1 hour. Increasing the exposure time made it possible to reduce the consumption of the agent – the pathogen was neutralized at a concentration of 2 % – for a surface made of brick and plaster and 1 % – for a hatching egg and a surface made of unpainted wood and galvanized iron. 3 % concentration was chosen as the optimal concentration for processing the hatching egg and working surfaces in the hatchery.

The drug «VetOx-1000» showed an antimicrobial effect on smooth surfaces mainly at a concentration of 0.024 % after exposure for 4 hours, on rough surfaces – at 0.03 % and higher concentrations after a similar exposure. In 1 hour exposure, the agent was effective at a concentration of 0.03 % for hatching eggs and surfaces of all types (except brick and plaster, where the bactericidal effect was manifested at a 0.04 % dilution). The results of the study are listed in Table 1.

Table 1

Activity of disinfectants against *P. aeruginosa*, *E. coli*, *S. aureus*, *S. typhimurium* on various test objects

Test objects	Exposition, hours	Growth of bacterial cultures on test objects / concentration of disinfection solution, %									
		«Sumerian silver»					«VetOx-1000»				
		0.005	0.01	1	2	3	0.02	0.024	0.03	0.04	0.06
Incubation egg	1	+	+	+	+	-	+	+	-	-	-
	4	+	+	+	-	-	+	+	-	-	-
	24	+	+	-	-	-	+	-	-	-	-
Galvanized iron	1	+	+	+	-	-	+	+	-	-	-
	4	+	-	-	-	-	+	-	-	-	-
	24	+	-	-	-	-	-	-	-	-	-
Painted wood	1	+	+	+	-	-	+	+	-	-	-
	4	+	-	-	-	-	+	-	-	-	-
	24	+	-	-	-	-	+	-	-	-	-
Unpainted wood	1	+	+	+	+	-	+	+	-	-	-
	4	+	+	+	-	-	+	+	-	-	-
	24	+	+	-	-	-	+	-	-	-	-
Brick	1	+	+	+	+	-	+	+	+	-	-
	4	+	+	+	-	-	+	+	-	-	-
	24	+	+	-	-	-	+	-	-	-	-
Plaster	1	+	+	+	+	-	+	+	+	-	-
	4	+	+	+	-	-	+	+	-	-	-
	24	+	+	-	-	-	+	-	-	-	-

Note: "+" – presence of growth, "-" – absence of growth

The study of the effectiveness of the use of «VetOks-1000», «Sumerian silver» means for the prevention of pseudomonosis and associated bacterioses of poultry embryos in production conditions, where the indicated pathogens were periodically isolated from dead embryos and from the dead of chickens in the first 10 days of life, was conducted.

As a result, the preventive disinfection of the hatching egg and the incubator in the first experimental group using the «Sumerian silver» product ensured the release of

837 young animals. The hatching rate of young birds in this case was 83.7 %. In the second experimental group, the disinfection of the hatching egg and the the incubator with the use of the drug «VetOx-1000» provided the hatching of young birds in the amount of 831 heads. The hatching rate of young birds in this case was 83.1 %. In the control group, 820 heads of conditioned young birds were obtained, the rate of hatching of young birds is 82.0 %. The results of hatching of young birds of the three groups correspond to normative indicators (Table 2).

Table 2

The effectiveness of the use of «VetOks-1000», «Sumerian silver» for the prevention of associated pseudomonosis of poultry embryos

Groups	Laid down eggs, pc	Received young birds, ch.	Output rate, %
control	1000	820	82.0
experimental 1	1000	837	83.7
experimental 2	1000	831	83.1

The rate of hatching of conditioned young birds with the use of environmentally safe means «Sumerian silver», «VetOx-1000» was higher by (1.1–1.7) % for the hatching of young birds compared to the control with the use of formalin.

The obtained results indicate the effectiveness of environmentally safe means «VetOx-1000», «Sumerian silver» for the prevention of associated pseudomonosis of poultry embryos.

#### 4. Discussion of research results

Long-term use of disinfectants of the same chemical group causes the development of microflora resistance to antimicrobial and disinfectant drugs. There is a need to constantly search for new effective antimicrobial substances.

The environmental aspect is important when choosing disinfectants. Effective, but aggressive substances (formalin, caustic soda, chlorine-containing dis-

nfectants, etc.) are recognized by the world as environmentally dangerous, have an irritating and carcinogenic effect, so many countries refuse them [10, 11].

A promising direction of modern scientific research is the study of the properties of nanotechnology products. Metal nanoparticles and drugs, developed on their basis, are introduced for use in diagnostics, treatment and prevention in the field of human and veterinary medicine.

**Advantages and disadvantages of the obtained research results.** The advantage of the obtained results is confirmation of the effectiveness of environmentally safe means for the prevention of associated bacteriosis of poultry embryos. In this case, it minimizes the use of formaldehyde, which is a carcinogen. The disadvantage of the research is that the results may have some differences compared to the data of other authors, because the degree of association of bacteriosis of poultry embryos in different farms may differ compared to the experimental farm.

**Limitations of the study.** Limitation of the study is that most poultry farms in Ukraine are private, so there may be difficulties in access for such studies.

**Prospects for further research.** The purpose of further research is to study the influence of organic acids on the manifestation of associated bacteriosis in chickens.

## 5. Conclusions

The proposed method of prevention of associated pseudomonosis of poultry embryos by rotation of environmentally safe means in established bactericidal concentrations (3 % «Sumerian silver» solution and 0.03 % «VetOks 1000» solution) ensures a 1.1–1.7 % higher hatching of young birds compared to control using formalin.

## Conflict of interest

The authors declare that they have no conflict of interest in relation to this research, whether financial, personal, authorship or otherwise, that could affect the research and its results, presented in this article.

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## Data availability

Manuscript has no associated data.

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