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INNOVATIVE DEVELOPMENT IN THE DISINFECTION TECHNOLOGY OF HATCHING EGG

Abstract

The article deals with the study of the effect of pre-incubation disinfection of chicken eggs with Monclavit-1 on the quality of incubation, hatching and viability of chickens.

While incubation bactericidal properties of the Monklavitis-1 has shown high prolonged and antiseptic properties. As in control group blood ring was by 1,2%, in frozen by 1,4% and in dead by 2,0% more than in expert groups. Monklavitis-1 contributed to high percentage (84,4%) of the healthy young chickens. In the industrial poultry breeding, for the reduction of microbial contamination of the surfaces of the egg shell, internal surface of incubatory, hatchers and air environment of the incubator we recommend to use Monklavitis-1 for the disinfection of the hatching egg. It will help to increase the hatching and survival of the younger generation of farming.

Keywords: *eggshell, disinfection, eruption, aerosol, egg, incubation, Monclavit-1*

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İnkubasiya yumurtasının dezinfeksiya texnologiyasında innovativ inkişafı

Xülasə

Məqalədə, toyuq yumurtalarının inkubasiyadan əvvəl Monklavit-1 preparatı ilə edilən dezinfeksiyanın inkubasiya keyfiyyətinə, cücə çıxımına və cücələrin yaşama qabiliyyətinə təsirinin öyrənilməsindən bəhs edilir.

İnkubasiya yumurtalarının Monklavit-1 preparatı ilə dezinfeksiyası yumurtaların keyfiyyətinə, inkubasiya prosesinə, həmçinin rüşeymin inkişafına mənfi təsir göstərmir. Yumurtaların inkubasiyasında bakterisid tərkibli Monklavit-1 preparatı uzunmüddətli antiseptik təsirə malikdir. Belə ki, təcrübə qrupuna nisbətən, qan həlqəli yumurtalar kontrol qrupda 1,2%, inkişafını dayandırmış embrionlar 1,4%, boğulanlar isə 2,0% çoxdur. Monklavit-1 preparatı cücə çıxımının daha yüksək (84,4%) alınmasına kömək etdi. Təklif olunan dezinfektant cücələrin postembrional inkişafına uzunmüddətli stimullaşdırıcı təsir göstərir. Quşçuluq sənayesində yumurta səthindəki mikrob birləşmələrinin səviyyəsinin aşağı salınması üçün inkubasiya və çıxım şkaflarının daxili səthlərinin, inkubatoriyanın hava mühitinin və inkubasiya yumurtalarının dezinfeksiyasında Monklavit-1 preparatından istifadə edilməsini təklif edirik. Bu, kənd təsərrüfatı quşlarında cücələrin çıxma qabiliyyətinin və salamat saxlanılmasının yüksədilməsinə kömək edir.

Açar sözlər*: yumurta qabığı, dezinfeksiya, püskürmə, aerozol, yumurta, inkubasiya, Monklavit-1*

Introduction

It is known that the incubation qualities of eggs are determined by the origin of the parent flock (breed, line, cross), as well as the conditions of their feeding and maintenance (technological factors), the health of laying hens, their age, and many other factors (Brake, Sheldon, 1990: 517-525).

Technological factors have a special influence on the quality of eggs, which include: the type of equipment, the design of cage batteries and floor keeping mechanisms, environmental conditions – temperature, humidity, air gas composition, intensity and duration of lighting, herd (community) size (Brein, 1979: 9).

The authors note that due to the imperfection of the design of modern cell batteries, in particular egg-collecting devices, as well as a violation of feeding technology and poultry keeping, the shell is significantly contaminated (Burtov, Goldin, Krivopishin, 1990: 239). At the same time, the number of contaminated eggs in some farms reaches 20%. According to other data, when keeping meat chickens in cage batteries, there is virtually no contamination of eggs, while when kept on a litter, it reaches 37,5%.

There is an opinion that for each chicken egg with a cellular content, on average, there are 240 thousand enterobacteria (Escherichia coli), with outdoor –4.7 million (Burtov, Sergeeva, 1981: 29-30).

The number of microorganisms on the surface of the egg shell varies depending on the zoohygienic state of the poultry house and the time spent in it. Thus, 10 thousand microbial cells were found 1 hour after laying, after 1,5 hours this figure was 410 thousand. On the surface of the shell of eggs laid outside the nest and contaminated, the number of microorganisms reaches 800 thousand. The number of microorganisms on the surface of the egg shell after 24-72 hours of stay in the poultry house is on average 4 times higher than on the surface of eggs collected immediately after laying (Dyadichkina, 2010: 23-25).

According to other data, the air of poultry houses contains from 1,5 to 5,0 million/m^3 of microorganisms that accumulate on the shell, their number can vary from 300 thousand to 3 million or more.

The health status of laying hens also affects the incubation qualities.

As a rule, a freshly laid egg is outwardly sterile, but with some infectious diseases of birds, their pathogens penetrate the endogenous way, and a sick bird lays infected eggs. The transmission of infectious agents through hatching eggs is one of the main reasons for the spread of viral infections. Endogenous infection occurs in the ovary and oviduct of laying hens with paratyphoid, typhoid, mycoplasmosis, pullorosis and tuberculosis. In this case, the embryo dies or a sick chicken is hatched –a source of infection for young animals. The infection is transmitted through fluff, the smallest particles of mucus and litter, which remain on the shell and in the tray, and, when dried, infect the air. Therefore, it is necessary to cull sick or recovered birds from the parent flocks, as well as to carry out sanitary and preventive measures in a timely manner.

A fresh full-fledged egg is reliably protected from the penetration of microbes into it, and their distribution is limited by the ducts of the pores and the shell membranes. It is known that the shell and shell membrane of the egg contain an antibiotic substance –lysozyme, which, interacting with the protein coat protein (ovomucin) through salt bridges, increases the viscosity of the protein and physically protects the egg from microorganisms. Lysozyme is a universal protective enzyme that has the basic properties of a protein and is able to destroy polysaccharides that make up the walls of bacteria. The thickness of the shell, the length and configuration of the pores determine the resistance to the penetration of foreign elements through the shell. In an egg with a thinner shell, bacteria penetrate more easily.

Exogenous eggs are infected through the shell, or rather through micro and macropores. In the first 1-2 hours after laying, the eggs cool down and the mucus covering the shell, together with the microflora, is most actively drawn into the pores.

The causes of exogenous infection of eggs are as follows: contamination of eggs with droppings or bedding; dust and gas content in the air of the poultry house; poor hygienic condition of nests; contaminated containers for eggs and poultry; storage in conditions of high temperature and humidity; large temperature fluctuations in the egg store; irregular collection of eggs; lack of necessary conditions for cooling and storing eggs, especially in summer.

An additional factor of shell contamination can be a room for storing eggs and a car transporting them to the incubator, as well as service personnel who do not comply with sanitary and hygienic rules.

With the increase in the age of the bird, the number of infected eggs usually increases to 37,5%, which is associated with a decrease in the thickness of the shell and an increase in its permeability.

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According to a number of authors, a huge number of microorganisms are found on contaminated shells: E. coli, Salmonella, Staphylococcus aureus and white staphylococci, spore forms of bacteria and various types of fungi (Orlov, 1987: 223).

Molds include Aspergillus, Penicilum, Mucor, as well as numerous representatives of actinomycetes. Fungal spores, in turn, penetrating through the pores of the shell, germinate, and a mold colony forms on the shell membrane.

Back in 1953, researchers Lancaster and Crabb discovered that formalin at a dose of 45 ml per 1 m^3 with an exposure of 20 minutes and a temperature of 210°C can be used to kill S. pullorum on the eggshell. Active research on this topic was carried out and presented by various scientists back in the 60-80s of the last century.

However, repeated and uncontrolled fumigation with formaldehyde can lead to pathological changes in the internal organs of the embryo and an increase in embryonic mortality in the second half of the incubation period (Orlov, Bykhovets, Zlochevskaya, 1982: 225). Formaldehyde destroys the outer shell of the egg (cuticle) and inactivates lysozyme, exposing the pores. As a result, the carrying capacity of their protective barrier in relation to pathogenic microflora increases. The drug has no residual activity and does not prevent recontamination.

In the United States, in experiments on chickens, it was found that formaldehyde vapor causes clear changes in the cells of the trachea, loss of motor activity of the cilia of the epithelium of the respiratory tract, which perform a protective function, trapping microorganisms and dust particles. It was also noted that exceeding the critical threshold of formaldehyde content in the air adversely affects the gain in live weight of broilers and their viability.

Only in recent years, you can pick up several hundred scientific papers, which convincingly shows the danger of this substance.

Formalin is corrosive. In addition, it is demanding on the conditions of use, does not have a prolonged action and is inactivated by organic contaminants. That is, if even a little contamination remains on the hatching eggs, then formalin will no longer give the expected effect. But if, subject to all the rules, the expected result is achieved, then seeding is possible after the disinfection chamber.

In this regard, more effective and safe disinfectants are needed to prevent or at least reduce the accumulation of microflora in hatcheries (Otryganev, Otryganeva, 1989: 189).

By their nature, disinfectants are divided into physical, chemical and biological; according to the method of application of the disinfectant, disinfection can be gas, aerosol and wet. Disinfection by one means or another is used either once before laying eggs in the incubator, or repeatedly during different periods of incubation and up to the sale of young animals.

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To reduce the bacterial contamination of eggs on the shell membranes, the method of deep processing of eggs is used, which can be carried out in various ways: temperature difference of the disinfectant solution, pressure difference, etc.

For deep disinfection of hatching eggs, there are reports of a positive effect of treatment with erythromycin, morphocycline, tetracycline, neomycin, tylosin (Shchedrov, Nikolaenko, 2005: 48-49).

V.D.Sokolov and G.E.Afanasyeva used solutions of chlorhexidine bigluconate (0.02) or 2-B cationate as disinfectants for deep processing of hatching eggs. The results of the experiments showed that deep treatment with these preparations reduces the incidence of respiratory mycoplasmosis, colibacillosis and pullorosis by 3-4 times.

A.F.Kambal studied the effect of deep processing on the morphological parameters of eggs, embryogenesis and natural resistance of embryos and chickens. The author found that deep disinfection of hatching eggs with dioxidine in combination with farmazin in a ratio of 1:1 does not lead to pathological changes in embryogenesis, does not cause deviations in the interior of chickens, and at the same time contributes to the hatching of healthy viable young.

According to other data, deep treatment of eggs obtained from experimentally infected turkeys with a solution of gentamicin disinfects typhimirium relative to Salmonella by 100%, but reduces the hatchability of eggs by 10-12%. Processing eggs in a kanamycin solution increases their hatchability and disinfects them from salmonella.

In recent years, both in our country and abroad, wet processing has become widespread.

Initially, wet disinfection was used mainly with an increased risk of infection and heavily contaminated shells of eggs, mainly duck eggs, since with very dirty shells, dry disinfection methods do not give the desired effect, since some microorganisms survive under a layer of dirt (Shtelle, 1977: 54).

A wet disinfectant, soaking the hard dried layers of dirt on the shell, completely kills microorganisms on the entire surface of the eggs, disinfecting the pores of the shell and penetrating through them, infects the bacteria that have reached the shell membranes.

Wet processing is usually carried out in two stages. First, the dirt is washed off, and then the disinfection is carried out.

When an egg is formed, it is free of germs and acquires them during the ovulation process. The degree of infection depends on the level of air pollution in the cages, floor materials and roofs of birds [1-3]. Eggshells always contain large amounts of germs. It was found that on the surface of the eggshell 1 thousand 25 mln. bacteria, but the rate of their penetration into the egg depends on the level of fecal contamination. The entry of microbes into a fresh, full-fledged egg is tightly protected and their spread is limited by the porous flow and the mucous membrane. Protein prevents the growth of microbes, kills them and dissolves them.

Most of the microorganisms in the eggshell are harmless, but there are also pathogenic, moldy fungi that are dangerous to eggs, embryos and hatching chicks. They develop by passing through the pores of the shell into the egg and forming a colony of microbes consisting of mold and fungi in the cortex.

Microorganisms are sometimes found inside eggs. Eggs are usually sterile, but when birds are infected with several infectious diseases (pullorosis, typhoid, mycoplasmosis), their pathogens enter the ovaries, and sick birds lay infected eggs. During incubation in such eggs, the embryo dies or a sick chick emerges. After hatching, such chickens become a source of infection. The infection is transmitted through chicken feathers. Small particles of sludge and slime contaminate the air by drying in the outlet trays (boxes) and on the shell.

One of the weakest points in poultry farms is the incubator, as microorganisms are able to survive the entire incubation period, passing through the eggshell and becoming a source of infection for embryos, reducing chick production and killing chickens in the first days of breeding. The low survival rate of chicks after hatching is explained by the poor quality of eggs in the incubation, violation of the incubation regime, as well as the poor quality of disinfection carried out before incubation. In this regard, sanitary and hygienic measures, the impact of environmentally safe chemicals and physical factors are an integral part of the technological process in poultry. Disinfectants must be safe for humans. They must reliably destroy the microflora on the surface of the contaminated egg shell, not adversely affect the development of the embryo, and stimulate the viability of the hatched chicks.

It is necessary to disinfect the eggs before incubation, to increase the number of chicks, as well as to prevent infection of embryos with various pathogens. At present, a large amount of information on various disinfectants is being collected to disinfect incubation eggs. A number of authors offer various methods and techniques for the prevention of egg infection (Wilson, 1991: 20, 22, 24, 25).

In poultry, traditionally used iodine, formaldehyde preparations, irradiation and ozonation methods are fully adopted, but because the biocidal effect does not last long, repeated disinfection often occurs. Therefore, the search for new effective and environmentally safe disinfectants that have a long-term effect and increase the embryonic viability of birds is considered economically viable and relevant [4-8].

Purpose of the study. Carrying out research work on the development of a new drug Monclavit-1 in the technology of disinfection of hatching eggs in production practice. Study of the effect of the drug Monclavit-1 on the quality of incubation of chicken eggs.

Material and research methodology. The search for ways to treat breeding eggs with environmentally friendly disinfectants before incubation remains a topical issue in poultry today. Currently, a number of drugs with high biological and economic efficiency, for example. ATM, BB-1, Sendotor, Ovasept, bactericidal, Monclavit-1 and others are offered. In this regard, a more promising drug is the main goal of the study.

In order to achieve this goal, we conducted a scientific and economic experiment at the poultry farm "Khamsa LLC" to study the effect of disinfection of chicken eggs with Monklavit-1 before incubation on the quality of incubation, hatching and viability of chickens.

The incubation eggs used in the experiment were obtained from the main herd of Ross-308 crossbreed hens for meat and fully met the requirements.

The eggs of the first group under control were treated with 35 ml of 37% formalin + 20 ml of water + 20 g per 1 m^3 of disinfection chamber according to the generally accepted method. disinfected with formaldehyde vapor in the proportion of potassium permanganate (manganese).

The second (experimental) group of eggs 1-2 seconds before incubation. We disinfected by inoculating with Monclavit-1. Re-disinfection was carried out 6,5 days after incubation as an aerosol by spraying on the eggs from the air exchange area of the incubation cabinet during the first illumination using an SAQ-type device. Consumption of Monclavit-1 is 280-300 ml per incubator (Universal-IUF-45 type). Exposure time 10 minutes. Monclavit-1 has a broad-spectrum effect as an antiseptic and disinfectant drug representing the iodine-based water polymer system and containing vinilamidasyclosulfoyodite in the form of a poly-N complex.

The results of the study. The data obtained and its analysis indicate that the pre-incubation treatment with Monklavit-1 positively affected the incubation results. Thus, the blood ring (0-6 day) was by 1,2%, in frozen (7-19 day) by 1,4% and in dead (20-21 day) by 2,0% more than in expert groups. This is due to the fact that the microbes that were on the surface of the egg shell penetrated into the egg through the pores and killed the embryo. Monklavit-1 was active against gram-positive, gram-negative bacteria, mycobacteria, viruses, fungi, which affected the embryo to a less extent. It is known that embryonic mortality is especially high during periods called critical. This is usually 3-5, 9-11 and 19-20 days of incubation.

Table 1.
Results of incubation

Indicators	Control		Experience	
	Numbers	%	Numbers	%
Incubated	500	100	500	100
Unfertilized eggs	39	7,8	36	7,2
Blood ring	14	2,8	8	1,6
Frozen	17	3,4	10	2,0
Dead	34	6,8	24	4,8
Hatchability of eggs		85,9		90,9
Hatched young chickens	396	79,2	422	84,4

From control incubation trays eggs are transferred to the control hatcher trays, based on which calculations are carried out until the end of incubation. The number of young hatched chickens is presented in Table 1. Biological control after incubation established that in the experts group the young growth was 24 more than in the control. The hatchability in the experts group was 5% higher than in the control group.

The age of the young chicken should be assessed at least 10 hour later after hatching. An earlier assessment may lead to the culling of viable, but still unencumbered young growth, since healthy, but recently hatched young growth has an unsatisfactory appearance: unstable on legs, stomach enlarged, saggy; the fluff is poorly dried out, unsweetened (Table 2.).

Table 2.
Assessment of hatched young chickens

Groups	Standard	Non-Standard (Weak)	Crippled
Control	341	44	11
Experts	388	29	5

The results obtained indicate that the use of Monklavit-1 in the antiseptic treatment of hatching eggs had a positive effect on the quality of hatched young chickens. According to the results obtained standard young chickens in the experts group were more than in the control group by 47. When controlling the quality of young chickens weak and crippled in the control groups were more than in experts group by 15 and 16.

Conclusion

While incubation bactericidal properties of the Monklavit-1 has shown high prolonged and antiseptic properties. As in control group blood ring was by 1,2%, in frozen by 1,4% and in dead by 2,0% more than in expert groups. Monklavitis-1 contributed to high percentage (84.4%) of the healthy young chickens. In the industrial poultry breeding, for the reduction of microbial contamination of the surfaces of the egg shell, internal surface of incubatory, hatchers and air environment of the incubator we recommend to use Monklavit-1 for the disinfection of the hatching egg. It will help to increase the hatching and survival of the younger generation of farming.

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