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## Microbiological Contamination of Eggs in the Shopping Centers of Nor Nork Administrative District in Yerevan

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### ABSTRACT

Bacteria belonging to the genus *Staphylococcus* and *Salmonella* are released as conditional causative agents, which can lead to the development of an infectious process with reduced general resistance of the human body.

Egg surfaces of all the studied groups are infected with bacteria of the genus *Staphylococcus*, while the surfaces of the eggs in the 3rd group and factory eggs are infected with *Salmonella*. Studies confirm that before using eggs, it is necessary to wash them, especially when preparing fried eggs or soft-boiled eggs, since in these cases the yolk isn't subjected to full thermal treatment. So, bacteria from outside can easily penetrate into the egg when breaking its shell.

### Introduction

The role of eggs in the human diet is indispensable. It is known that in average a person consumes about 200 eggs per year. Well-assimilated egg protein promotes muscle growth in the human body, strengthens bones, maintains tissue integrity, stimulates functional activity of the brain, and prevents the development of hypertension. Egg white contains alpha-amino acids that have high antioxidant activity and suppress the growth of cancer cells. One of the most valuable amino acids in egg white is lecithin, which prevents vascular thrombosis and the development of dystrophic processes in the liver. Egg yolk also contains a number of nutrients for the human body: omega-3 fatty acids, vitamins *A*, *K*, *E*, *B12*, selenium, calcium and phosphorus (GOST 26670-91). At the same

time, the eggs can be contaminated with pathogenic bacteria, causing toxicosis or toxic infections in consumers, if the necessary sanitary rules are not observed during storage and transportation. Studies have shown that high humidity promotes the growth of bacteria and fungi on the surface of an eggshell and their subsequent penetration into the egg. Infected eggs with pathogenic bacteria, most often lead to salmonellosis or staphylococcal toxicosis (Baydevlyatov, et al., 1980). Dietary eggs should be clean, intact, without traces of blood or bird droppings. *Salmonella* is an acute intestinal infectious disease of humans, animals and birds. There are over 2500 *salmonella* serotypes (<https://www.who.int>, 2018). Salmonellosis is widespread throughout the world. The main source of infection is sick animals and birds, as well as people's poor compliance with hygiene rules.

Pathogens are excreted from the body of birds through faeces, vomiting and urine. In this case, it is likely that we will find salmonella and staphylococci on fresh farm eggs. The number of pathogens is important for infection, but children can be infected even from a small number of pathogens. One can be infected via food (meat, meat products, fish, milk and dairy products, egg and egg powder), as well as via contact (dirty hands, various objects, dust, especially in children's institutions, hospitals, sanatoriums, maternity hospitals). The hidden period of salmonellosis lasts from a couple of hours to 2-3 days. The disease begins acutely. The main symptoms are vomiting, severe nausea, chills, fever, headache, abdominal and muscle pain, often accompanied by diarrhea, severe dehydration and severe intoxication (Slyusarenko, 1984). The clinical picture of salmonellosis is very diverse. After recovering, the parasite lives from few weeks to 6-8 years.

The treatment can be organized through gastric washing, consumption of a large amount of warm liquid, in severe cases, administration of saline solutions, spasmolytics, antibiotics and diet. It is always easier to prevent than to cure, so prevention is important and it can be realized through the following activities:

- Veterinary sanitary control, compliance with sanitary regulations at slaughterhouses, processing, storage, transportation of food products,
- Application of personal hygiene rules in food institutions, children's institutions and households.

As to staphylococci, they are present almost everywhere. The most dangerous of them are golden staphylococci. Staphylococcus lives in intestines, genitals and airways. If placed in the intestine, external symptoms may not appear until the body's immunity decreases. This may lead to diarrhea, purulent skin inflammation, pneumonia and intestinal infections.

Staphylococcus itself is not as dangerous to the body as toxins caused by its biological activity, which can cause severe poisoning and severe pain in humans (Kuzmin, Sefershaev, 1959). Diseases that can occur through staphylococcus infection are pneumonia, osteomyelitis, angina, laryngitis, stomatitis and other respiratory diseases, as well as meningitis.

Bacteria belonging to the genera Staphylococcus and Salmonella are known to exhibit themselves as a conditional pathogen, which can lead to the development of an infectious process with reduced general resistance of a human body.

Our goal was to study the bacterial contamination of eggs sold in the stores of Nor Nork administrative district with

microorganisms of the mentioned species. The eggs were bought in the Yerevan City supermarket, in the market of the 2nd microdistrict at Nor Nork, as well as from individuals in the surrounding areas.

We were faced with the following tasks:

1. Identifying surface contamination of eggs sold at Nor Nork administrative district
2. Determining the degree of bacteriological contamination of the egg surfaces
3. Making a comparative study of eggs purchased from individuals and purchased in the market and supermarket
4. Developing regulations to avoid possible toxic infections.

### Materials and methods

Various nutrient media have been used for the study, in particular Bismuth sulfite agar, Mannitol salt agar, laboratory utensils, Petri dishes, dyes - crystal violet, iodine, Gram decolorizer, safranin, chemicals, filter paper, disinfectants, syringes, as well as equipment including an autoclave, thermostat, refrigerator, water distillation apparatus, microscope, etc. We used farm chicken eggs, factory eggs of different sizes (50-65 g) and quail eggs.

We purchased nine samples of farm chicken eggs sold by different people and divided them into 3 groups (1, 2, 3). Also, we purchased three samples of quail eggs and three samples of factory eggs, which were purchased from one store and divided into two groups - chicken eggs (factory, one manufacturer) and quail eggs. Washing all eggs separately with 1 ml sterile saline, we took 1 ml from the total washing solution of each group, diluted it with 9 ml sterile saline. Then 0.5 ml of each group was taken from the obtained solution by sowing on Mannitol salt agar to isolate staphylococci and on Bismuth sulfite agar to differentiate salmonella (GOST 26670-91). The medium was placed in a thermostat at 37°C for 48 hours (Baron, 1982). The total amount of bacteria in 1 milliliter of the test solution was determined by the following formula:

$$X = an/(cv),$$

where  $X$  is the number of bacteria in 1 milliliter (gram) of the test sample,  $a$  is the average number of colonies in the nutrient medium,  $n$  is the dilution rate of the test substance,  $c$  is the test sample amount (g (ml)),  $v$  is the volume of material (solution) taken for sowing.

The size of the bacteria was determined using a micrometer

ruler. In coccus, the diameter was determined, and in salmonella we determined the length and width expressed in micrometers.

### Results and discussions

Thus, colonies of staphylococci with white, straight edges were found in all groups growing on Mannitol salt agar, and salmonella was found on Bismuth sulfite agar in household eggs belonging to the 3rd group and on eggs of the factory group. Gram-stained microbiological preparations prepared from cultures were microscopically examined. As a result of microbiological studies, colonies of gram positive staphylococci were found under a microscope in the form of grape-like clusters with a diameter of 0.6 to 1.2  $\mu\text{m}$ , whereas, in the samples of household eggs belonging to group 3 and in factory eggs up to 7  $\mu\text{m}$  long, 0.7  $\mu\text{m}$  wide, gram-negative, single or bunched salmonella were found. In addition to the above-mentioned bacteria, all bacterial preparations subjected to microscopic examination contained fungi and fragments of micelles. The presence of fungi and staphylococcus in samples taken from the surfaces of eggs of all groups indicates non-compliance with sanitary standards during the storage, transportation and sale of eggs.

However, samples of eggs 3 and factory groups indicate the presence of salmonella in laying hens on farms producing these eggs. The presence of salmonella-carrying birds on poultry farms poses a danger not only to maintenance personnel, but also to poultry farms on the whole, which suffer huge losses due to the fall of chickens and a decrease in eggs in infected chickens. Therefore, in order to ensure the safety of birds from salmonellosis, a complex of anti-salmonella measures must be carried out on poultry farms, which includes mass diagnostic, veterinary and sanitary measures, disinfection of poultry farms and incubators, treatment of sick birds and, of course, detection of infected birds.

### Conclusion

According to the results of the study, the following conclusions can be drawn:

1. The surfaces of the eggs belonging to all groups studied are infected with the bacteria of the Micrococcaceae family, the genus Staphylococcus, and the surfaces of the eggs of the factory and 3rd group are infected with bacteria of the Enterobacteriaceae family, the genus Salmonella.
2. The average arithmetic number of staphylococci and salmonella of washed egg is accordingly 2.728 and 280 colony forming units which indicates high contamination rate in the eggs purchased by Nor Nork administrative district.
3. Considering that staphylococcal and fungal infection of eggs is associated with violation of sanitary standards during the storage, transportation and sale of this product, it is recommended to purchase products stored in refrigerators, packed in clean containers, without traces of blood and bird droppings on the external surface.
4. Eggs intended for food should be washed under running water immediately before consumption, which will prevent the penetration of pathogenic and conditionally pathogenic bacteria into the soft-boiled or lightly fried eggs.

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