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Identification of Biological Risks While Manufacturing Food Products

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Abstract

Over the last 5 years, a growing trend in the number of cases of parasitosis has been observed in the territory of Khachmaz district, reaching 338 cases per year. Regular monitoring of information on biological risk factors in the production and processing of livestock products is necessary to prevent or minimize the risk situation based on the analysis of information on morphophysiological characteristics of causative agents of parasitic diseases. Being as peroral zoonoses, among biohelminthiasis, these are echinococcosis (hydatidose and alveolar) opisthorchis, trichinellosis and fasciolosis. Among geohelminthiasis, these are ascaridosis and trichocephalosis. Strongyloidosis belongs to geohelminthic anthroponoses with a percutaneous invasion way (the larva penetrates through the skin or mucous membranes during the contact with long-contaminated soil, water, aquatic plants). The group of contagious helminthioses, oral anthroponoses, includes hymenolepidosis and enterobiosis. This is an article on how pathogens negatively affect food.

Keywords: biological risks, parasites, livestock products

Introduction

High sensitivity to forces is typical for eggs of *Numeroleris nana*, tissue stages of *Tochorlasma gondii;* medium - for eggs and larvae of *Strogoides stercoralis,* eggs of *Enterobius vermicularis*, plerocercoids of the *Diphyllobothrium* genus; low – for cysts of *Entamoeba histolytica* and *Lamblia intestinalis*, metacercariae of opisthorchids and helminth eggs of *Echinososinae* subfamilies, *Trichocephalus trichiuris, Ascaris Iumbricoides, Fasciola spp;* for oocytes of *Toxoplasma gondii;* very low - for oocysts of *Cryptosporidium parvum*, for larvae of helminths of the

Trichinella genus, for eggs of *Taepiaghupshis saginatus* and *Taenia solium (*Callejón, 2015). In order to ensure the food safety for humans, analysis conduction is necessary not only for the biological risks that cause diseases, but also on veterinary, raw materials and technological risks that arise at the stages of production and sale of finished products (Kozak, 2013).

In the territory of Khachmaz district, the number of invasive diseases of people is growing annually. A general trend of an increase in the number of cases has been observed over the past 10 years, which during this period reached 340 cases per year. Considering the characteristics of parasites, it is necessary to regularly monitor information about biological risk factors in order to prevent or minimize the risk situation based on the collection and analysis of information on the morphophysiological characteristics of causative agents.

Materials and methods

The analysis of medical and veterinary statistics has been performed. The normative and technical documentation of scientific articles and guidelines have been considered (Callejón, 2015).

Research outcomes

In the production of livestock products, the most significant biological risk factors among the protozoa are *Toxoplasma gondii*, *Cryptosporidium parvum*, *Entamoeba histolytica*, *Giardia intestinalis*. The main mechanism of transmission of all the protozoa presented is fecal-oral (Sbareta J, 2012).

For *C. parvum, E. histolytica*, *G. intestinalis*, the predominant route of transmission is aquatic, while for *T.*gondii is alimentary. For human, both asexual and sexual stages of *T.gondii* development are invasive. Causative agents of toxoplasmosis can get into the human body with milk and meat from invasive intermediate hosts (tachyzoites and bradyzoites), and from the external environment (oocysts from feces of felines) as well. Oocysts of *C. parvum* and cysts of *E.histolytica, G.intestinalis* can contaminate food when washed with contaminated water, and while food is being cooked by a person infected with these species (GOST, R 51901.1, 2002).

In recent years, there has been recorded an increase in the spread of helminths among people. As a consequence of large-scale hydraulic engineering, the risk of infection

with opisthorchides and diphyllobothrides increases. The situation worsens with helminthiasis, in which the larval stages are localized in the muscles of farm animals (trichinellosis, teniidosis).

In the Republic of Azerbaijan, one of the most common parasites are trematodes from the family of *Opisthorchidae (Opisthochis felineus, Clonorchis sinensis, Pseudamphistomum truncatum, etc.), Fascila hepatica, F.gigantika;* cestodes of the *Echinoccinae (E.grnulosus, E.multilocularis)* subfamily, *Diphyllobothrium latum, Taeniarhynchus saginatus, Taenia solium, Hymenolepis:* nematodes of *Ascaris lumbricoides, Trichocephalus trichiuris, Strongyloides stercoralis, Enterobius vermicularis, Trichinella spiralis, Ascaridosis, Fasiola*.

The biological features of helminths consist of the stages of development, different ecological needs at different stages of development, features of reproduction in the adult and larval stages, long duration of ontogenesis and high adaptability. The life cycles of helminths are extremely diverse, but the main stages of development have common patterns. Helminths go through a number of successive stages: eggs (except trichinella) → larvae → eugamic (Lysenko, 2002).

Depending on the peculiarities of the helminth, a different number of hosts are required for the completion of development cycle: for nematodes (with the exception of trichinella), dwarf tenia requires one host: for trichinella, bovine and pork tenia, echinococci, fascioles-two hosts; for opisthorchids and broad tapeworm - three hosts.

Pathogens of most helminthiasis are well adapted to the protective mechanisms of the host organism. Infection occurs mainly when eggs or larvae of helminths get into the body. The mechanism of infection and transmission factors determines the division into geohelminths and biohelminthiasis and contagious helminthiasis (Abdel-Hafeez et.al., 2009; Dorny et.al, 2015).

Using the classification of Pokrovsky V. I. (Pokrovsky, 2007), teniarynchosis, teniosis, diphyllobothriosis are referred to the group of biohelminthiasis, which are peroral anthroponoses (passive, when an egg or larva of a helminth gets into the digestive tract with food, water or is brought into the mouth with dirty hands). Being as peroral zoonoses, among biohelminthiasis, these are echinococcosis (hydatidose and alveolar) opisthorchis, trichinellosis and fasciolosis. As geohelminthiasis, oral anthroponoses are ascaridosis and trichocephalosis. Strongyloidosis belongs to geohelminthic anthroponoses with a percutaneous invasion way (the larva penetrates through the skin or mucous membranes during the contact with long-contaminated soil, water, aquatic plants). Hymenolepidosis and enterobiosis are related to the group of contagious helminthioses, oral anthroponoses.

Sources of infection with biohelminths are meat and fish, with geohelminths contaminated with larvae and eggs are vegetables, berries, fruits: transmission factors are soil, water used in raw form for drinking, washing vegetables, fruits, dishes; mechanical carriers are flies or other insects. Contagious helminthiasis is transmitted through household items. The figure (Figure1) shows possible routes of getting risk factors of parasitic etiology into food products (New Food Security Doctrine Adopted**,** 2020).

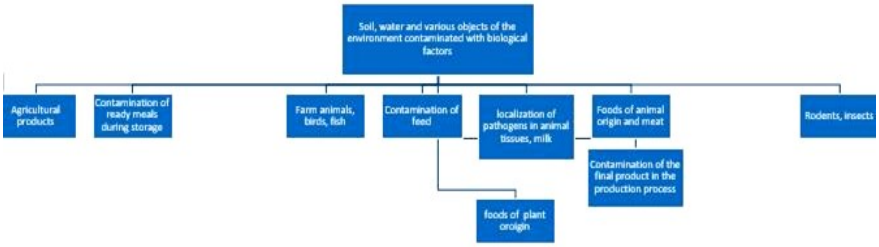

Figure 1. Routes of getting biological risk factors into food products

For a detailed assessment of biological risk factors, it is necessary to take some factors into account, including pathways of pathogen transmission, parameters of resistance in the external environment, persistence in food products, sensitivity to physical influences and disinfectants, as ways for prevention a risky situation.

The highest resistance in the external environment is peculiar to cysts of *Entamoeba histolytica, Lamblia intestinalis*, oocytes of *Cryptosporidium parvum*, *Toxoplasma gondii,* eggs of *Ascaris lumbricoides, Trichocephalus trichiuris, Diphyllobothrium spp., Opisthorchidae* и *Fasciola spp.*

The sensitivity of biological risk factors to physical influences plays an important role in the disinfection of premises in which it is either undesirable to use chemicals, or they are used in low concentrations that do not act on all types of pathogens, or risk factors have very high resistance to chemical agents, and disinfection is carried out mainly by physical methods. Sensitivity to drying can be both the main (spices, tea, dried fruits, dried meat and fish, etc.) and additional (dry fruit concentrates, milk powder, personal powder, etc.) risk reduction measure in the processing of products (Min, 2018).

Sensitivity to temperature conditions is the main criterion for preventing biological risks. Low temperatures play an important role not only in the disinfection of products, but also during their storage, since some risk factors remain viable at

temperatures close to zero. The use of high or low temperatures is the basis of disinfection in the technological processes of products processing (Pozio, 2008; Gould, 2013).

High sensitivity to physical influences is typical for *Hymenolepis nana* eggs, tissue stages of *Toxoplasma gondii.*

Average sensitivity to physical influences is typical for eggs and larvae of *Strongyloides stercoralis*, eggs of *Enterobius vermicularis*, plerocercoids tapeworms of the *Diphyllobothrium* genus.

Low sensitivity to physical impacts is typical for cysts of *Entamoeba histolytica* and *Lamblia intestinalis*, opisthorychid metacercariae and helminth eggs of the *Echinososinae*, *Trichocephalus trichiuris*, *Ascaris lumbricoides*, *Fasciola spp*. Subfamilies, *Toxoplasma gondii* oocytes.

Very low sensitivity to physical influences is tychapical for oocytes of *Cryptosporidium parvum*, larvae of helminths of the *Trichinella* genus, eggs of *Taeniarhynchus saginatus* and *Taenia solium (*Lysenko, 2002; Sbareta, 2012).

The sensitivity of biological risk factors to chemical influences (disinfectants) is also an important criterion in determining measures for reduction of biological risks by disinfection of water (chlorination and other methods), food (pickling, salting), anti-parasitic treatment of equipment, livestock facilities, agricultural equipment and other premises (Kozak,2013; Youn, 2009).

Low sensitivity to chemical influences is characteristic for *Entamoeba histolytica* cysts and *Cryptosporidium parvum* oocytes, helminths of the *Opisthorchis* genus, eggs of *Enterobius vermicularis* and helminths of the *Echinococcinae* subfamily, larvae of helminths of the *Trichinella* genus and plerocercoids of the *Diphyllobothrium* genus. Very low sensitivity to chemicals was recorded for *Lamblia intestinalis* cysts, eggs of helminths of the *Fasciola, Taeniarhynchus saginatus, Trichocephalus trichiuri, Taenia solium, Ascaris lumbricoides* genus (Wadamori, 2017).

Conclusions

In order to ensure the food safety for humans, analysis conduction is necessary not only for the biological risks that cause diseases, but also veterinary, raw materials and technological risks that arise through the stages of production and sale of finished products.

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