Part 2. Veterinary medicine

UDC 619:616:636.5:637.05:608.3:331.4

HACCP SYSTEM AS PASS FOR QUALITY AND SAFETY OF POULTRY PRODUCTS

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Summary. The article provides data about monitor of harmful agents of food toxicoses and toxicoinfections in the poultry farms in Ukraine for the first Principle of HACCP performance. Microbiological surveillance was conducted by test systems of R-Biopharm Company: RIDA® COUNT, RIDA CHECK. LumitesterPD-20; LuciPacPen, RIDASCREEN Verotoxin, RIDASCREEN SETA, B, C, D, RIDACREEN Salmonella AFNOR (ENISO 16140), RIDACREEN Listeria, RIDASCREEN Campylobacter, SureFoodBAC. These tests allow quick and efficient rapid diagnosis and determination of microorganisms presence, and also the number of these microorganisms.

Analysis of critical points in the poultry farms of various technological direction was conducted according to HACCP principles. Microbiological testing demonstrated: *S. aureus, S. faecalis, C. fetus, S. pneumoniae, C. perfringens, E. coli, K. pneumoniae, P. aeruginosa, P. mirabilis, P. vulgaris, E. agglomerans, S. enteritidis, S. pullorum-gallinarum, M. gallisepticum, P. multocida, Y. Enterocolitica, A. fumigatus* presense in tested materials associated with poultry breeding. *E. coli* was presented by O2, O4, O8, O78, O157. Similar microflora was isolated from all chains of poultry production. The most dangerous among them are *S. enteritidis* and *C. jeuni*. It was proved that it is necessary to provide HACCP for prevention the identification and control of potential food safety hazards that may occur in a food production.

Keywords: harmful agents HACCP, food markets, food safety, legislation, disinfectants, fertilizers

Introduction. The globalization of food markets is led for the needing to decide the problem of food safety risks and it is necessary to reduce the risks of their negative impact on human health (Arvanitoyanuis, 2009). Foodborne diseases are the significant and growing problems. The control of foodborne disease is the responsibility of food handlers, food production operators and agencies developing and implementing national food control systems. This problem has very serious and large scale character and that is why governments and leading association of food manufacturers are discussing the question of food safety and looking for ways how to support and control this problem. The main effective decision is introduction of common international standards and requirements for food safety (Bauman, 1990; Bunčić, 2009). Ukrainian production industry has to test products the effects of the international requirements of World Trade Organization (WTO). Members states of the WTO restrict access to its market for Ukrainian goods that are not fit the requirements of these countries for safety. Our companies for receiving competitive advantage in the market should introduce high development according to providing food safety. Ignoring of international normatives could negatively impact on competitiveness of Ukrainian food products and could cause damage the internal producers, both on the internal and foreign markets. Currently, the system of food safety management are using almost everywhere as the consumers protection from the dangers that can affect food. Legislation of the European Union, USA, Canada, Japan, New Zealand and of many other countries is required the introduction of food safety management. (Perović and Krivokapić, 2007). Therefore, the Ukrainian effort to access to the European Union, declares that all companies involved in food production and distribution should implement and apply the principles of HACCP, which are considered the foundation of GHP Good Hygiene Practice and Good Manufacturing Practice GMP (Curcic, Milunovic and Djuric, 2009). The HACCP system is recognized as the most effective tool to ensure that food is not contaminated or polluted, and it is safe for the consumes. Since July 1, 2003 in Ukraine the national standard ISO 4161-2003 'Systems of food safety. Requirements' and since the August 1, 2007 has entered into force the national standard of ISO 22000:2007 (identical to ISO 22000:2005) are implemented. There are some difficulties and that is why it is not easy for Ukrainian enterprises to perform requirements

of ISO 22000 (for example leased, but not their own production facilities) (Al-Kandari and Jukes, 2009) The implementation process of ISO 22000 for enterprises, where the system of food safety is functioning with ISO 4161-2003 will be easier if they will be taken into account in the beginning of manufacturing design. Standard ISO 22000:2007 combines generally recognized elements: interactive communication; system of management; and necessary conditions for program — HACCP principles. (Počuča and Radovanović, 2004; Al-Qassemi et al., 2011). Requirements of the standard can be used to create a food safety management system by all organizations, that directly or indirectly involved in the food chain, for example: feed manufacturers, farmers, producers of ingredients and additives manufacturers and suppliers of food, retail and wholesale trade, catering and organizations that provide services for the transportation, storage and distribution services for cleaning and disinfection, etc. Although manufacturers and suppliers of equipment for the food industry, detergents and disinfectants, fertilizers, pesticides and veterinary drugs, packaging and other materials could be in contact with food, etc. We should note, that the introduction of food safety management in the company — a lengthy process that applies to all services and all staff. It is not just the development of documents. It is very necessary to do training for professionals working groups and for persons that are responsible for the operational control, correction process of documentation, equipment replacement and alterations to the premises, to implement the system of food safety (Mortimore and Wallace, 2013). The HACCP — is scientifically — grounded system to ensure the production of product safety by identifying and controlling of the hazards. HACCP — Hazard Analysis and Critical Control Point system is scientifically based, rational and systematic approach for identification, assess and risks control in the process of production, processing, preparation and use of food, in order to ensure that food is safe for consumers, that it does not represent an unacceptable risk to human health (Vucinic and Milanov, 2006). The main goal of the HACCP concept is to produce a safe product. The microorganisms, causing various diseases, as well as a number of harmful chemicals, are the examples of the hazards that the HACCP concept can reduce or eliminate completely. There are no processes, that have 100% safety, but constant effort for avoiding errors must always be present (Hall et al., 2003). HACCP system provides: — identification and assessment of any physical, chemical or biological risk at all stages of food production, including all mid-processes and distribution; — it also is responsible for determination of the necessary measures for their prevention and control; — ensuring that these measures will be successfully and effectively implemented. HACCP concept as a preventive system ensures food safety in every step of the production process. Food producers and processors have implemented the HACCP program in their operation to reduce the possibility of food-borne pathogens. The Hazard Analysis Critical Control Point (HACCP) program is used to monitor and control the production process by identifying food safety hazards. Additionally, critical control points in production, processing and marketing are identified. Critical limits for each of these points are determined and surveilled for food quality and safety achievement. It is applied to the meat, egg and poultry reproduction industries. It is developed specifically for each product, product group or process and must be defined to fit the specific conditions of production and distribution of each product separately. This concept attempts to reduce the need for testing of the final product. HACCP system is the only system to ensure food safety, which proved effective and accepted by international organizations. HACCP concept as a preventive system ensures food safety in every step of the production process. It is developed specifically for each product/product group or process and must be defined to fit the specific conditions of production and distribution of each product separately. This concept attempts to reduce the need for testing of the final product. Before this system was developed, many manufacturers could find out whether their product meets certain standards only after the testing of the final product. The testing of final product can be extremely time-consuming, and can lead to the loss of a portion of the product, since some forms of the testing are extremely destructive (Bauman, 1990). HACCP concept is trying to reduce the need for testing of the final product by conducting a series of checks during the process. With the current pace range of food products are expanding, new technologies in the production and storage of food are improving or implementing, nutrition is changing, most of food is changing and spoiling. This phenomen has set before veterinary sanitary examination very responsible and challenging tasks that require strict adherence to quality control and food safety during their production, transportation and storage (Kosar and Raseta, 2005). Animal products contaminated by microorganisms such as *E. coli* O157:H7, *Listeria monocytogenes*, *Campylobacter jejuni*, *Campylobacter fetus*, *Vibrio vulnificus*, *Vibrio parahaemolyticus*, genus *Salmonella*, etc., has biological danger for the health of consumers. And they had antibiotic resistance as well (Mayes and Mortimore, 2001). Resistance to antibiotics is a problem for most countries of the world. The infections

are caused by resistant strains of *Salmonella, E. coli and Campylobacter* cause serious diseases and can be lethal for animals and humans.

The aim of our research was to monitor harmful agents of food toxicosis and food toxicoinfection for the first Principle of HACCP performance (Swanson and Anderson, 2000).

Materials and methods. Research were carried out in lab of Sumy National Agrarian University and Ukrainian poultry production farms. Microbiological surveillance was carried out with using R-biopharm's test systems, such as: RIDA® COUNT, RIDA CHECK. LumitesterPD-20; LuciPacPen, RIDASCREEN Verotoxin, RIDASCREEN SETA, B, C, D, RIDACREEN Salmonella AFNOR (ENISO 16140), RIDACREEN Listeria, RIDASCREEN Campylobacter, SureFoodBAC, that allow to conduct quickly and efficiently express diagnostics and to determine not only the presence of microorganisms, but also to estimate their quantity. Express check of surface's and liquid's cleanliness through a set RIDA®ATP was used for determining conditional-pathogenic microorganisms in poultry farms. RIDA®COUNT cards were used for express control of sanitary indicator and conditional-pathogenic microorganisms. The unique characteristics of the patented test card RIDA®COUNT make them indispensable for testing of sanitation effectiveness to any company (within HACCP) or for inspection (Stevenson, 1990).

Results. A wide range of Gram-positive and Gram-negative bacteria were detected during microbiological surveillance of the poultry associated objects. The data of quantitative and microbiological microflora's composition, isolated in farms of various technological direction, is shown in Figure 1.

Analyzing the data, we can note that the highest percentage of microorganisms which were isolated from farms in various technological areas belonged to *Escherichia genus*. Their percentage was 62.3%. Coccal microflora was isolated in 24.2% of cases. A significant numbers of *Proteus, Pseudomonas aeruginosa, Klebsiella, Yersinia, Campylobacter, Enterobacteria, Clostridia* and *Tsytrobakter* were isolated — 13.5% (Fig. 1).

Analysis of critical points in the poultry farms of various technological directions was conducted according to the HACCP principles. It was set that the same microflora was isolated from the poultry slaughter plants. It is important to know that most of the microorganisms' types are pathogens of food poisoning and toxicosis in humans and consumption of poultry products contaminated by these microorganisms dangerous for us.

The most dangerous among circulating in poultry farms pathogenic bacteria are *S. enteritidis* and *C. jeuni*. According to their serotyping salmonella were identified as: *S. enteritidis* — 46.9%, *S. typhimurium* — 14.1%, *S. pullorum* — 10.1%, *S. gallinarum* — 10.0%, *S. virchow* — 6.3%, *S. infantis* — 2.1%, *S. arizona* — 1.2%, *S. jawa* — 0.6%, *S. montevideo* — 0.4%, *S. copenhagen* — 0.4%. We can see that serovar *S. enteritidis* is dominating.

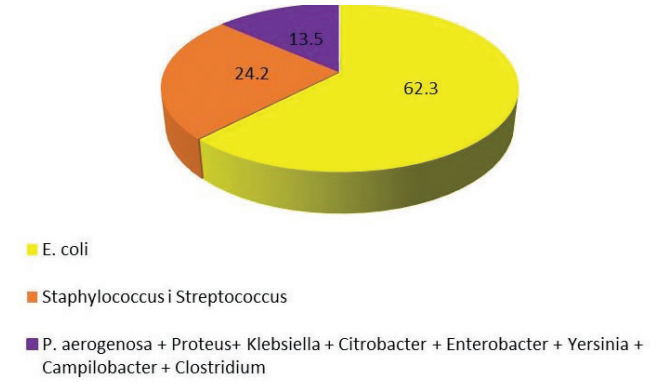

Figure 1. Comparison selection's frequency of different groups conditionally pathogenic bacteria in the poultry farms which was examined (average indicators)

It was proved that respiratory syndrome of poultry is caused most off all by *S. aureus, S. pneumoniae, C. perfringens, E. coli, K. pneumoniae, P. aeruginosa, P. mirabilis, P. vulgaris, S. enteritidis, M. gallisepticum, P. multocida, A. fumigatus.*

S. aureus, S. faecalis, C. fetus, C. jejuni, C. perfringens, E. agglomerans, E. coli, P. aeruginosa, P. mirabilis, P. vulgaris, S. enteritidis, S. pullorum-gallinarum, Y. enterocolitica were isolated at intestinal syndrome. *E. coli* were represented by O2; O4, O8; O78, O157 serovars.

Conclusion. The microbiological surveillance in poultry farms of Ukraine demonstrated that the most part of circulating in poultry farms zoonotic bacteria were represented by *S. enteritidis* and *C. jeuni*. These bacteria are the potential agents of food toxicosis and food toxicoinfection. These bacteria are strongly adopted to poultry. That is why it is necessary to provide strict detection control of infections outbreaks, which caused by bacterial etiology at all critical points of poultry production. And that is why it is necessary to conduct a hazard analysis, determine the Critical Control Points, establish Critical Limits, establish a system to monitor the control of CCPs, and to provide HACCP for prevention the identification and control of potential food safety hazards that may occur in a food production environment.

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