Approaches to safety and quality of foodstuffs in the European Union and Russia

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Abstract. This article is devoted to argumentation of the use of best practices of EU countries in Russia in improving its own regulatory and legislative framework with the aim of empowering the elimination of threats of safety of food raw materials and food products. This will allow enables enterprises operating in Russia: to Minimize, to reduce to an acceptable level the risks of contamination of food products at all stages from production to sales, thereby guaranteeing the end user safety of food products; to Demonstrate their ability to produce food products that meet international standards for quality assurance and safety; to deliver their products to large chain company, such as "Metro", "Auchan", etc.; to Bring their products to foreign markets; To comply with the requirements of Technical Regulations of the Customs Union 021/2011 "On food safety" in terms of organization of production on the HACCP principles.

1. Introduction
Providing food safety is currently one of the priority directions of activity of the state. The state's role in ensuring food safety lies primarily on an active legislative and regulatory activities.

Food safety is a condition of food products indicating the absence of unacceptable risk associated with the harmful effects on humans and future generations. People's desire for a healthy lifestyle, sharpens the importance of the quality and safety of food products and affects the functioning of society and the economy [1, 2].

The main priority of all countries are the safety of food products (both domestically produced and imported) and consumer protection from possible food poisoning associated with consumption of poor quality products [3]. Currently, the global deterioration of the environmental situation in almost all regions of the world reflected on the qualitative and quantitative composition of food and its security. A variety of natural and man-made foreign substances determines the severity of the problems they identify and define the maximum allowable concentrations in raw materials and food products [4]. It is known that defective and dangerous in veterinary and sanitary relation food has a potential danger to the health and life of man. In this regard, today food has special requirements at the state level [5].

In the European Union countries determine the safety of the food acts of direct action Rules and Regulations. The main is the Regulation N 178/2002 of the objective to ensure the free circulation of safe food and feed in the EU, health and well-being of citizens. In the rules there is said about food safety, not its quality. The regulation carries a ban on the introduction into circulation of dangerous foods. In order to determine whether the food product, are considered: normal conditions of use of the food product by the consumer and at each stage of production, processing and marketing, as well as...
provided consumer information, including that contained on the label or other generally available to
the consumer concerning the prevention of harmful consequences, peculiar to a particular product or a
particular category of products.

To establish whether the product is harmful to health, are taken into account: the possible
immediate and/or temporary and/or long-term impact of the food for the health of not only consumers
but also on subsequent generations; possible cumulative toxic effects; special health susceptibility
associated with the health of certain groups of consumers, in case if the product is intended for this
group of consumers.

General principles of food law of the EU are built on four principles:

- Risk analysis
- The precautionary principle
- Protection of consumer interests,
- The principle of transparency.

The operator of the food business in the EU provides security, not only which food products
provide but also products that are imported and supply to the EU market, but also tracking it at all
stages of production, processing and marketing of food and feed. In the EU, the Principle of "from
farm to table" (from farm to fork), which means the approach which guarantees the transparency and
traceability along the whole line of food production, from the sourcing of food raw materials to sales
of products to the final consumer.

In Russia the problem of traceability of quality, safety of the products is no less relevant. The
experts recommend the introduction on the enterprises the integrated system csb-system on all the way
of its production – from raw-material producer to the final consumer [6]. As in the European Union,
Russian scientists believe that the management of the quality and safety of agricultural products
cannot be effective after it has already been made. All the targeted activities must be of the preventive
character in its nature and should be carried out during the manufacturing process, which ensures the
implementation of safety management System of food production on enterprises [7]. Over the past
decade Russia has developed a modern high-efficiency and precision analytical methods for
determining the quality and safety of food products based on application of the latest scientific
achievements. Innovation and total quality control in production processes and food storage allow, on
the one hand, to expand the range of food products to extend shelf life and ensure the satisfaction of
customer requirements, on the other hand, are forming a new threat to human health factors [8].

At the intergovernmental level between Russia, Kazakhstan and Belarus (countries belonging to the
customs Union) developed the technical regulations fixing the mandatory requirements for product
safety [9]. This is the Technical regulations of the Customs Union TR CU 021"On food safety", TR
CU 033 "On safety of milk and dairy products", TR CU 034 "On safety of meat and meat products".

The main purpose of these regulations the developers appealed the protection of life and human
health, the environment, and the prevention of consumer fraud. The regulations contain detailed
instructions on how should be organized the territory of processing companies and the work of
separate sections; the requirements for water supply, sewerage, heating, lighting, ventilation, and air
conditioning, industrial premises. A lot of pages are devoted to the description of the rules governing
the process of production of meat and dairy products and canned goods, industrial control,
refrigeration and cold storage, transporting, personal hygiene of employees. As an Annex to the
regulations there are the lists of safety indices permissible levels of harmful substances, particularly
strict standards of content of toxic elements in food raw materials and finished products and their
maximum allowable concentrations. These include natural toxicants (biogenic amines — serotonin,
tyramine, histamine, have vasoconstrictor effect; cyanogenic glycosides; coumarins) and contaminants
that appear in food as a result of exposure to the polluted environment or in violation of the rules of
growing plants or feeding animals, as well as violation of technological processing or storage
conditions.
Using the experience of EU countries in the field of safety and quality of food in Russia at legislative and regulatory level will accumulate the best practices for exception from circulation products that are dangerous or harmful to human health.

2. Experimental part

The European Union and Russia at present together comprise the international food code, taking part in the work of the joint Committee of the Code Alimentarius world food organization, World Health Organization, together with the other 130 countries. The structure of the Codex Alimentarius include: international code committees for specific food products (hygiene of meat, processing of poultry meat), joint Committee of governments experts (milk and dairy products), expert committees on food supplements, the use of irradiation in the food industry, etc. Together worked out 237 of product standard and 42 hygienic codes for the production of specific food products, which generally constitute the international food code. The world trade organization (WTO) uses Codex standards to resolve international trade disputes among the members of this global organization and, therefore, insisting to take them as a basis for national standards.

However, all these documents are voluntary and each state to determine criteria of quality and food safety. This leads to inter-state problems associated with the mismatch of certain quality standards and distinction of levels of safety performance in the same products.

The article presents an analysis of potential danger to the health and lives of people, manifested at the use in food of substandard products. Dangers may arise during their production, processing, transportation, storage and implementation in the laboratory of Biological Safety of Food Systems of the Department of Meat and Dairy Products Technology of FSBEI of Higher Education “Mari State University”.

3. Results of researches

In Russia the final to realization product passes through the control for the absence of harmful chemicals, give a certificate and assign a special label which is applied on the product label as a guarantee of its "purity".

In the development of international trade and of competition in the domestic market of Russia for assessment of food quality there were developed 4 criteria:

- Customer’s SATISFACTION in the taste sensations.
- Service, i.e. variety of choice, method of transportation and storage, ease of preparation.
- Health benefits.
- Safety for the consumer.

The first 2 criteria evaluated by the consumer, and the last 2 – using expertise. And experts not only control the quality of final products, but also through active controls provide the required values of indicators of quality in the technological process.

Contaminants of toxic effects are toxic elements (mercury, lead, cadmium, arsenic, zinc, copper, tin, iron), mycotoxins, pesticides, nitrates, nitrites. The most dangerous are heavy metals - mercury, lead and cadmium. There are such pollutants, which are inherited only in animal products. It is antibiotics. In recent years, they are widely used for the treatment of animals. The presence of antibiotics in foods causing a variety of allergic diseases. The use of food supplements is acceptable only if they even after long use do not threaten human health.

We analyzed the content of lead, cadmium and dioxins in food products of animal origin by analysis methods based on their extraction from samples by organic solvents, purification on multilayer columns with various mineral sorbents, and subsequent analysis by gas chromatography with mass-selective detection. More than 100 samples of different producers of meat and dairy products were operated in the territory of Mari El Republic (table 1).
The maximum level of lead in milk is regulated by Regulation No. 1881/2006 at the level of up to 0.020 mg / kg, in meat (beef, pork and chicken) at 0.01 mg / kg of wet weight (figure 1).

The level of lead in milk was 0.017 ± 0.0006 mg / kg, and was far from the critical point. This indicates a successful choice of pastures for pasturing cows in places where the ground and, accordingly, the grass are not contaminated with lead. The content of lead in meat is less than 0.1 mg / kg, and particular 0.057 ± 0.0003 mg / kg in beef; 0.038 ± 0.0009 mg / kg in pork; 0.041 ± 0.0004 mg/kg in the meat of broiler chickens indicates the using of environmentally friendly feeds, not enriched with lead.

Table 1: The content of toxic elements in food products, mg / kg from the raw mass.

| Products    | Lead          | Cadmium        | Dioxins       |
|-------------|---------------|----------------|---------------|
| beef        | 0.057±0.0003  | 0.0347±0.0014  | 0.216±0.0024  |
| pork        | 0.038±0.0009  | 0.0257±0.0012  | 0.437±0.0011  |
| chicken     | 0.041±0.0004  | 0.0238±0.0011  | 1.172±0.0053  |
| liver       | -             | 0.2588±0.0164  | 4.472±0.0079  |
| kidneys     | -             | 0.7560±0.0102  | -             |
| milk        | 0.017±0.0006  | -              | 1.352±0.0028  |
| chicken eggs| -             | -              | 1.782±0.0045  |

Figure 1. Level of lead in food products of animal origin.

Regulation No. 1881/2006 defines the maximum permissible level of cadmium contaminant in cattle, pigs and chicken meat to 0.050 mg / kg, respectively, in liver 0.05 and in kidneys 1.0 mg / kg from wet weight (figure 2).
The content of cadmium in meat of different animal species did not exceed 0.050 mg / kg from the raw mass and was in beef 0.0347 ± 0.0014, in pork 0.0257 ± 0.0012, in chicken 0.0238 ± 0.0011 mg / kg. The elevated cadmium content is allowed in the liver and kidneys, which is related to the specificity of the activity of these organs. The maximum level of cadmium is fixed in the kidneys of 0.7560 ± 0.0102 mg / kg and in liver 0.2588 ± 0.0164, which is significantly lower than the admissible dose according to Regulation No. 1881. This indicates that there is no possibility of entering a toxic element of cadmium from the environment, during the cultivation of crops and animals, and the territories of Mari El Republic are not contaminated with cadmium.

The Mari El Republic is one of the most ecologically clean regions of Russia. Therefore, conducted studies of raw materials from different producers confirmed the safety of its consumption in terms of the level of toxicity of heavy metals - lead and cadmium.

Dioxins come in the human body with foods of animal origin, which have fatty tissues or fat components in their composition. Their content is high in meat, raw milk and dairy products, chicken eggs. In this regard, the maximum level of dioxins is regulated by Regulation No. 1881 in the following way:

- in beef - 3.0 picograms per gram of fat;
- in chicken - 2.0 picograms per gram of fat;
- in pork - 1.0 picogram per gram of fat;
- in liver - 6.0 picograms per gram of fat;
- in raw milk and dairy products, including butter fat - 3.0 picograms per gram of fat;
- in chicken eggs and egg products - 3.0 picograms per gram of fat.

The results of studies of dioxins in food products of animal origin are presented in figure 3.

![Figure 3](image)  
**Figure 3.** Dioxin level in food products of animal origin.

For food it is better to choose lean meat. The research data confirmed that in low-fat beef the dioxin content is the least 0.216 ± 0.0024 mg / kg from the raw mass. In chicken meat and pork the greatest - 1.172 ± 0.0053 and 0.437 ± 0.0011 mg / kg, respectively, but less than the maximum allowable level and correspond to the safety requirements for meat products. The content of dioxins in pasteurized milk and eggs produced in the republic is at the level of 1.352 ± 0.0028 and 1.782 ± 0.0045, which does not exceed acceptable levels.

We believe that the analysis of raw materials and products for the presence of contaminants is an important tool to help food business operators at all stages of the food chain to achieve food hygiene compliance and apply the principles of HACCP.

In many European countries, at the state level, have set standards of Organic goods and a system of monitoring of implementation and compliance with these standards was created. In Russia there are no mandatory standards, only the following recommendations on producing environmentally friendly meat products: use environmentally friendly food, for growing cattle for meat, Organic do not use
antibiotics and growth hormones; farmers should record any treatment of animals; the use of radiation and genetic engineering in the production of Organic products is strictly prohibited; at the stage of processing of meat raw materials into finished products do not use foreign chemicals: dyes, flavor enhancers, preservatives; you must use environmentally-friendly packaging.

Of course, the shelf life of such products is less than conventional, and the cost is 30-50 % above the cost of conventional products.

Currently, in Russia, intensive works on improvement of system of safety of food based standards and production control ISO, HACCP. At the same time, the ISO in the EU is not recognized, but is being introduced in Russia at every enterprise, because in accordance with the Federal law "On technical regulation" by reducing the amount of state control and supervision in the sphere of food production and voluntary technical requirements of responsibility for quality and safety lies with the manufacturer. If the EU considered sufficient mandatory certification according to HACCP, in Russia it is recommended to implement on a voluntary basis for two quality management system based on standards ISO 9001 - 9003, 22000 and HACCP principles with the aim of issue is obviously high quality and safe products, which is believed will allow them to be leaders in the Russian market, will facilitate the supply of products in Europe and will enable to label it a prestigious and respected consumer marks the availability of these systems.

4. Summary
To summarize the above, note. Unfortunately, there is still a potential danger to the health and lives of people, manifested at the use in food of substandard products Dangers may arise during their production, processing, transportation, storage and implementation. Therefore, for maximum quality assurance and food safety at every stage of product movement from the raw materials manufacturer to the processor and consumer, it is necessary to improve the normative-technical and legal base. Including through the establishment of requirements, rules and regulations of the real safety indicators, to complement the missing documents and change date according to the best practices of EU countries. The current conditions this is a high priority for the state and society to improve the quality of life of citizens.

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