# ANNOTATION

**For the dissertation work of Amirkhanov Shyngys Amirzhanuly on the topic « Technology development of meat products with reduced transfat content», for the degree of Doctor of Philosophy Ph.D. in the specialty 8D07201 – «Food technology»**

**Relevance of the dissertation work.** In the process of development of the food industry, along with useful products, types of food products that have a negative impact on the human body have appeared in the world. Products with a high content of trans isomers of fatty acids are among the products that negatively affect human health. The main harm that the consumption of trans fats can cause to the human body is associated with an increased risk of coronary heart disease.

As a result of studies of products containing trans fats, it turned out that daily consumption of trans-isomers of fatty acids that make up 2% of the total caloric content of the diet increases the risk of coronary heart disease by 2 times, and mortality rates from sudden cardiovascular diseases by 1.5 times.

According to the authors, natural trans fats are formed as a result of the vital activity of bacteria in the multicameral stomach of ruminants, and it is known that their amount is preserved in meat and dairy products of animal origin up to 5-8%. Considering that according to the latest data in Kazakhstan, the consumption of meat products is growing and one person consumes 77.9 kg of meat products per year, we are convinced that this issue is very relevant among consumers of our country. In this regard, one of the current urgent problems is the development of technologies aimed at reducing the content of trans fats in meat products in order to prevent harm to the health of consumers.

Studying the question of the content of trans fats in meat products, scientists have come to the conclusion that they need to be controlled. The reasons for this are an increase in the proportion of trans fats during storage of natural raw materials, heat treatment and the addition of various enzymes. Also, the use of various stimulants, metabolic regulators of growth and development of animals can lead to an increase in trans fats.

President of the Republic of Kazakhstan Kassym-Jomart Tokayev in his message to the people of Kazakhstan "A fair state. One Nation. Prosperous Society" in 2022 noted that the development of agriculture is one of the main problems, that the situation in this area directly affects the food security of our state and it is necessary to increase the volume of agricultural products of the country, its added value. The solution of these issues is designated in the message as a strategic task.

According to the indicators of exports and imports of meat products in the Republic of Kazakhstan for 2022, the shape of imports is approaching equality with exports. In the domestic market of the country, 39.7% of consumer' demand for sausage products falls on products exported from foreign countries. Based on

these data, it is possible to see the need for a significant increase in trends in the development of the meat production sector in Kazakhstan.

Since meat products are one of the most consumed types of food in the world, ensuring their production in accordance with the requirements imposed from the point of view of safety leads to the need to develop technologies for meat products with a reduced content of trans fats and makes this area of research in demand in the food industry.

The dissertation work is aimed at addressing the interests of consumers in achieving global rejection or reduction of foods containing transisomers of fatty acids and saving lives. The implementation of the work corresponds to the REPLACE package of measures developed by WHO, designed to ensure the rapid, complete and final removal of industrially produced trans fats from food products, namely:

Review – research of sources of industrial trans fats in the diet and analysis of the current situation in terms of necessary policy changes;

Promote – promotion of the replacement of industrial trans fats with healthy fats and vegetable oils;

Legislate – legislative registration or introduction of regulatory measures for the purpose of decommissioning of trans fats of industrial production;

Assess – assessment and monitoring of the content of trans fats in the supplied food products and trends in their consumption by the population;

Create awareness – raising awareness of politicians, manufacturers, suppliers and the public about the negative impact of trans fats on health;

Enforce – monitoring compliance with policy principles and regulatory measures.

Also, the dissertation work will contribute to the development of the food industry and the agro-industrial complex of Kazakhstan, will lead to an increase in production in some related industries.

The results obtained on the dissertation will increase the level of competence of domestic scientists in some areas not fully studied in Kazakhstan, and in the future may become the basis for the creation of scientific schools in these areas.

For Kazakhstan, as a country with a large agricultural potential, monitoring of harmful compounds in food and the implementation of work on the creation of safe products is a priority area of science and technology in the field of food production. Enterprises producing meat products are particularly interested in the implementation of this work.

**The purpose** of the dissertation work is to develop technologies for meat products with a reduced content of trans fats using animal fat substitute (oleogel).

To achieve this goal , the following **tasks** were defined:

- monitoring of fatty acid composition in meat products;
- survey of consumers in order to identify the demand for meat products with a reduced content of trans fats;
- justification of the use of modern technologies in reducing the content of trans fats in meat products;

- substantiation of the optimal formulation and types of oleogel ingredients used to reduce the content of trans fats in meat products;

- development of a new formulation and technology of a meat product with a reduced content of trans fats;

- determination of chemical, physico-chemical, structural-mechanical, microbiological parameters and biological values of a meat product with a reduced content of trans fats;

- determination of the economic efficiency of the new technology;

- development of regulatory technical documents for new meat products.

**Objects of research:** meat products, fatty acids, trans fats, oleogels, technologies of semi-smoked sausage products.

**Scientific novelty.** For the first time, the content of trans fats in the meat of animals grown in the Republic of Kazakhstan and sold food products has been comprehensively investigated and determined. As a substitute for animal fat, a three-component oleogel was developed and its optimal content in the formulation of a semi-smoked sausage product was justified. The formulation and technology of semi-smoked sausages with a reduced content of trans fats have been developed.

**The practical significance of the work.** During the dissertation work, the composition of fatty acids and their trans isomers in the meat of animals grown on the territory of Kazakhstan and ready-made meat products was determined and analyzed.

The technology of three-component oleogel based on vegetable oil has been developed. The formulation and technology of meat products with a reduced content of trans fats using oleogel has been developed.

Regulatory documentation has been approved for semi-smoked sausage products "AGRARKA" with a reduced content of trans fats ("MPK Rakhmet" LLP). In the conditions of production, the production approbation of this product was carried out. The economic efficiency of the new product production technology is calculated.

**Personal contribution of the author.** Formulation of the necessary tasks, planning and implementation of experiments, statistical processing of the results obtained and their publication, industrial testing of the developed technology for the production of meat products with a reduced content of trans fats, development of regulatory documentation.

**The main provisions submitted for protection:**

- justification of the use of three-component oleogel in the production technology of meat products with a reduced content of trans fats;

- formulation and technology of three-component oleogel;

- formulation and technology of semi-smoked sausage with a reduced content of trans fats.

**Approbation of the work.** The technology of semi-smoked sausage with a reduced content of trans fats was tested at the production of "MPK Rakhmet" LLP within the framework of the project "Development of new food products with a reduced content of trans fats based on raw materials of animal and vegetable

origin" of the program "Development of technologies using new strains of beneficial microorganisms, enzymes, nutrients and components in the production of special dietary foods" (BR10764998) program-targeted financing of scientific research of the Ministry of Agriculture of the Republic of Kazakhstan for 2021-2023.

**The results of the study.** 8 (eight) scientific papers have been published on the topic of the dissertation, including 2 articles (percentiles 44% and 75%) in foreign journals with a non-zero impact factor included in the Scopus database, 2 articles in scientific publications recommended by the Committee for Quality Assurance in Science and Higher Education of the MSHE of the Republic of Kazakhstan, 1 article in the collection of materials of a foreign international scientific and practical conference, 2 articles in the collections of domestic international scientific conferences, 1 recommendation for the production of new products has been prepared in the NCJSC "S.Seifullin Kazakh AgroTechnical Research University".

According to the results of the research work, the following conclusions were made:

1. As a result of monitoring the content of fatty acids in meat products, the content of trans fats in the range of 4.2 – 12.1% was established. Studies of animal meat have shown that the largest number of trans fats accounted for lamb (7.98 – 10.92%) and beef (6.20 – 9.64%). Low trans fat content was found in horse meat (1.85 – 3.46%) and pork (0.91 – 1.39%).

2. The conducted sociological survey showed a high consumer demand for a semi-smoked sausage product with a reduced content of trans fats.

3. The application of modern technologies in reducing the content of trans fats in meat products is justified. The content of trans fats is reduced by using a three-component oleogel.

4. The optimal ratio of sunflower oil, monoglyceride and wax in the formulation of oleogel 85 is substantiated:10:5%, respectively. The optimal amount of three-component oleogel added to the meat product was 7%.

5. A formulation model and technology for the production of new meat products with a reduced content of trans fats have been developed. As a result, the regression coefficients of the model indicators were at fairly high (0.8760 - 0.9630) levels. Using modeling, optimal values of moisture binding capacity (65.33%), pH (6.18) and optimal indicators of technological factors affecting them were determined (grade 1 beef – 30%, oleogel – 7%, shelf life of products – 12 days, mixing time of minced meat – 12 minutes).

6. As a result of the study of the quality of semi-smoked sausage products with a reduced content of trans fats, it was determined: 1) according to the organoleptic evaluation, preference was given to the sample with the addition of 7% oleogel; 2) microbiological indicators in all samples corresponded to the norm; 3) according to nutritional, physico-chemical and biological values, structural and mechanical indicators, meat products with the addition of 7% oleogel are most preferred.

7. The economic efficiency of the new technology per 100 kg of finished products was 5% higher than the existing one.

8. The production approbation of a new technology of a meat product with a reduced content of trans fats was carried out in "MPK Rakhmet" LLP, regulatory and technical documentation was developed.

**The volume and structure of the dissertation.** The dissertation work consists of such sections as content, introduction, analytical review of literature, research methods, research results, analysis of research results, conclusion, additional materials. The work consists of computer text presented on 99 pages, 29 tables, 38 figures. The list of references consists of 136 sources of literature.