# DEVELOPMENT OF TECHNOLOGIES FOR FUNCTIONAL AND SPECIALIZED ANIMAL-BASED FOOD PRODUCTS

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#### Abstract

The article considers the development of technologies for the production of functional and specialized food products of animal origin. The historical development of this industry is analyzed, key stages and trends are highlighted. Modern technologies and approaches used in various countries are considered. Attention is paid to the use of biotechnology, micronutrients and innovative processing methods to create products with improved properties. The article summarizes foreign experience and discusses the prospects for introducing such technologies into production.

**Keywords**: Functional products, specialized products, animal origin, biotechnology, food industry, processing technologies, health, nutrition.

# РАЗВИТИЕ ТЕХНОЛОГИЙ ФУНКЦИОНАЛЬНЫХ И СПЕЦИАЛИЗИРОВАННЫХ ПРОДУКТОВ ПИТАНИЯ ЖИВОТНОГО ПРОИСХОЖДЕНИЯ

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#### Аннотация:

В статье рассматривается развитие технологий производства функциональных и специализированных продуктов питания животного происхождения. Анализируется историческое развитие данной отрасли, выделяются ключевые этапы и тенденции. Рассмотрены современные технологии и подходы, применяемые в различных странах. Уделено внимание использованию биотехнологий, микронутриентов и инновационных методов переработки для создания продуктов с улучшенными свойствами. Статья обобщает зарубежный опыт и обсуждает перспективы внедрения таких технологий в производство.

**Ключевые слова:** Функциональные продукты, специализированные продукты, животное происхождение, биотехнологии, пищевая промышленность, технологии переработки, здоровье, питание.



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#### Introduction

In the context of global changes, including population growth, urbanization, and increased life expectancy, nutrition issues have become a key factor in ensuring health and well-being. Animalbased food products have traditionally played an important role in human diets, providing essential nutrients. However, modern challenges necessitate a shift from traditional production methods to the creation of functional and specialized products that meet the individual needs of various population groups.



Functional foods are enriched with biologically active components and are designed to positively impact the human body, preventing diseases and promoting health. Specialized foods are tailored to meet the needs of specific population groups, such as children, the elderly, or athletes.

The aim of this article is to examine the historical aspects, modern technologies, and prospects for the development of functional and specialized animal-based food products, as well as to study international practices and the possibilities of their application in domestic settings.

#### Main Part

The history of technologies for producing functional and specialized animal-based food products dates back to ancient times. In Ancient Egypt and Mesopotamia, fermentation methods for milk were used to extend the shelf life of products and improve their flavor. These technologies laid the foundation for the production of modern dairy products, such as cheeses and yogurts.

In ancient times, the Romans and Greeks widely employed salting and smoking methods for meat, ensuring its preservation and ease of transport. These early technologies became the basis for the development of modern methods of processing animal-based products.

The medieval period saw improvements in milk and meat processing technologies. During this time in Europe, traditions of producing hard and soft cheeses emerged. In Asia, fermentation technologies advanced, allowing for the creation of unique products such as kimchi, fermented fish, and dairy beverages.

The Industrial Revolution of the 18th-19th centuries brought significant changes to food production. Mechanization and process standardization increased production volumes and



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ensured higher product safety levels. However, during this period, the focus was mainly on productivity, while functional and specialized properties of products remained secondary.

The 20th century marked a turning point in the development of functional products. With advances in nutrition science, it became evident that animal-based products could serve as sources of biologically active components, such as vitamins, minerals, and probiotics. This realization led to the creation of the first functional dairy products enriched with vitamins and minerals. For example, milk fortified with vitamin D became an essential tool in combating rickets among children.

# **Product Management Lifecycle**



Modern technologies for producing functional food products integrate biotechnologies, micronutrients, and innovative processing methods. Biotechnologies, in particular, open new possibilities for modifying the composition of food products. For instance, genetic engineering allows for the creation of lactose-free dairy products, making them accessible to people with lactose intolerance.

International practices demonstrate a wide range of approaches to developing and producing functional and specialized animal-based food products. For example, in European Union countries, probiotics and prebiotics are actively used to improve the composition of dairy products. Germany, France, and the Netherlands lead in producing cheeses and yogurts with probiotic bacteria that enhance gut microbiota and strengthen the immune system.

In the United States, significant attention is given to creating food products for people with chronic diseases. For example, dairy products enriched with phytosterols help lower cholesterol levels and prevent cardiovascular diseases.

In Japan and South Korea, fermentation technologies are being actively developed to create products rich in antioxidants, B vitamins, and other beneficial substances. Products such as fermented dairy beverages and meat snacks are gaining popularity due to their positive impact on health.

Special attention is given to producing specialized products for children, the elderly, and athletes. For children, milk formulas enriched with iron, calcium, and vitamins promote normal growth and development. For the elderly, products with high protein content help prevent sarcopenia

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and maintain muscle mass. Athletes actively use specialized protein products, such as whey protein, to enhance endurance and facilitate quick recovery after workouts.



Modern processing technologies for animal-based products allow not only the preservation but also the enhancement of their functional properties. For example, membrane filtration technologies are used to remove excess fats and lactose from milk. Ultrasonic processing and high-pressure technologies help preserve biologically active components, improving the texture and flavor of products.

Meat processing has also become increasingly innovative. The use of enzymes such as papain and bromelain improve meat texture and digestibility. Modern processing methods allow the creation of meat products with reduced fat content and increased levels of beneficial trace elements, such as iron and zinc.

Eggs, as a source of protein and micronutrients, are also the focus of innovation. Modern technologies allow for the enrichment of eggs with omega-3 fatty acids, selenium, and vitamins, making them particularly valuable for human health.

Technologies for personalized nutrition represent a new stage in the development of functional products. Using genome analysis, products can be created that cater to individual organism needs. For example, dairy products can be adapted for individuals genetically predisposed to osteoporosis, while meat products can be tailored for those requiring higher iron intake.





Ecological aspects also play a significant role in developing new technologies. Food production must be sustainable, reducing the environmental footprint. This includes using renewable energy sources, recycling waste, and minimizing carbon emissions.

#### Discussion

The development of technologies for functional and specialized animal-based food products reflects changes in societal needs. Amidst the growing prevalence of diseases associated with poor nutrition and increasing demand for healthy products, such technologies are becoming strategically important. International experience demonstrates that integrating science, business, and government is key to successfully implementing such projects.

## Conclusion

Functional and specialized animal-based food products represent a vital direction in modern food production. Historical experience, international practices, and contemporary technologies open new prospects for this industry. Innovations in biotechnology, sustainable development, and personalized approaches to nutrition will ensure population health and improve quality of life.

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