

## HACCP SYSTEM AND TRACEABILITY OF RAW MATERIALS AND PRODUCTS OF MEAT INDUSTRY

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**Abstract:** *An important concept of HACCP systems in the raw material and product chains of meat production is to ensure proper traceability by identifying farm animals and monitoring the safety and quality indicators of raw materials in accordance with the regulations in force. For the proper functioning of a traceability system, both external and internal traceability should be ensured in livestock production and processing enterprises.*

**Ключевые слова:** *HACCP systems, products of animal origin, food products, safety, quality, traceability*

**Introduction.** Among the most important tasks, the solution of which is within the competence of the state, is the provision of consumers with foods of the proper safety and quality. An effective, cost-effective solution to these problems allows the implementation of food safety systems HACCP (Hazard Analysis and Critical Control Points). This has been proven by world practice, according to which typical problems with food safety are caused by poor quality of raw materials and errors in its technological processing, unauthorized changes in formulations established by technological documents, non-compliance with the requirements for the sanitary state of personnel, technological equipment and production facilities. Therefore, the basis of each of the HACCP systems introduced in the agro-industrial complex is a thorough analysis of possible biological, chemical and physical risk factors, thereby minimizing the possibility of incidents at the established critical control points [1].

Food products made from raw materials of animal origin are the most important source of proteins and other nutrients necessary for the normal development of humans. Although various types of imitation meat from plant raw materials are becoming more widespread, animal husbandry and meat production still remains an indispensable part of the agro-industrial complex. Thus, the issues of ensuring the food safety of raw meats and products made from them through the development and effective implementation of HACCP systems does not lose its

relevance. One of the most important concepts of HACCP systems is to ensure traceability of products throughout the entire raw material and product chain.

Processed foods have already become an integral part of the human food chain, providing a varied and sufficient calorie diet. Unfortunately, traceability systems for processed foods can be quite complex due to the variety of ingredients used, mixing of products from different batches, constant transformation of resources, etc. [2]. Critical points of meat production identified in the framework of HACCP systems are raw meats, bone inclusions, heat treatment, packaging and storage. The necessary prerequisites for the implementation of HACCP are compliance with GMP (Good Manufacturing Practice) and principles of food hygiene, and the obligatory elements are documentation of flow diagrams, maps, product identification, determination of threshold parameters at critical points, monitoring and correction of actions.

Traceability can be defined as the ability to track and trace vegetable and animal products, food and feed, the animal or plant from which the food is obtained, a substance intended or expected to be found in food and feed, throughout all stages of production, processing and distribution. Traceability covers all stages from primary production to final consumer sales, including production and distribution stages, and aims to protect human health at the highest level in the relevant food. The traceability system is a system that starts with the exit of a certain product or input from the enterprise, and then follows the intermediate stages, transactions, and the new products into which they are transformed until they reach the consumer. The basic elements of a traceability system are: identification of all products and inputs, units or lots; collecting and storing information about their transfers; finally – the establishment of a system mutually associating the above features [3].

In Ukraine, the harmonized international standard DSTU ISO 22005:2009 is in force. According to its norms traceability is the ability to trace the movement of feed or food product through a certain stage of production, processing and distribution.

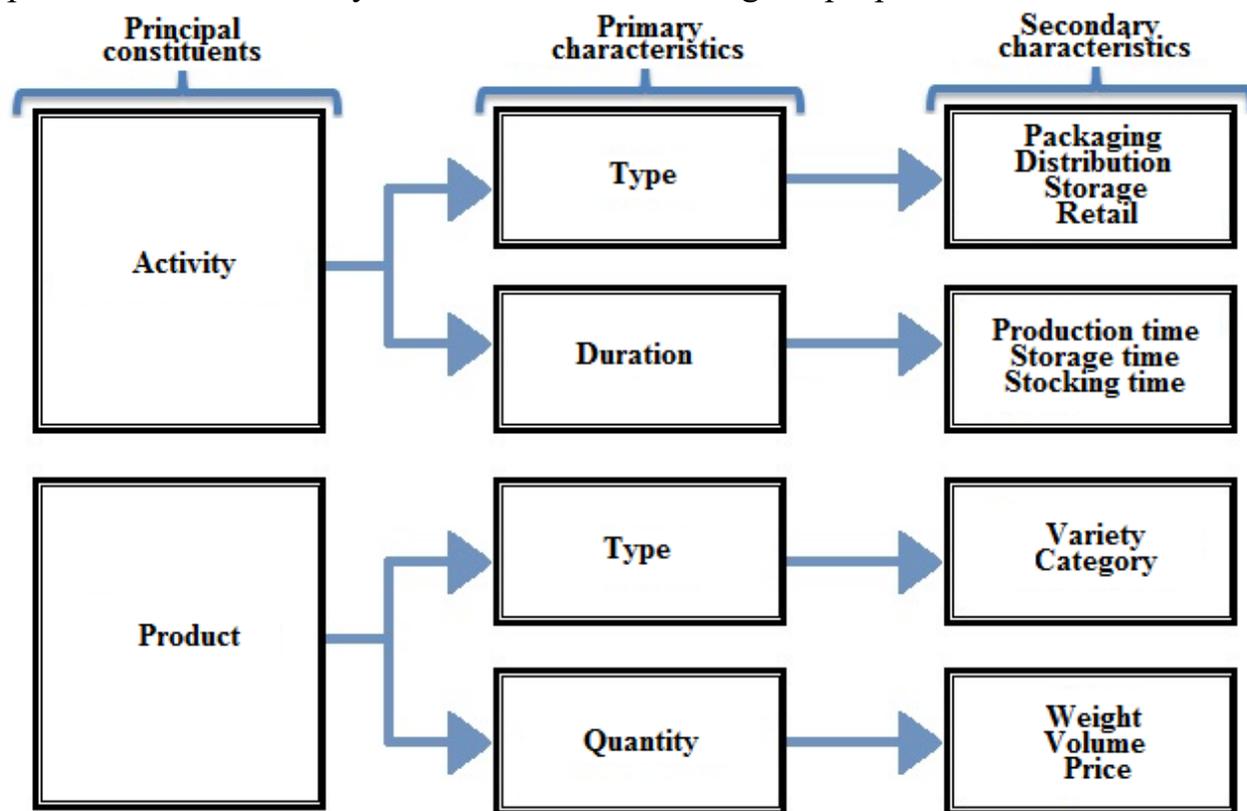
In the particular case of the meat industry, product traceability refers to the ability to follow the history of an animal since it is born thus informing on date and place of birth, sex, breed, data of the owner and the livestock establishment, movements and transfers etc. to the slaughter and further processes of transformation of muscle into meat and the obtaining of the different products. The traceability of products is currently a requirement to enter the most demanding markets. Traceability of processes refers to the production methods used and everything related to their sanitary state, acts as a criterion of the quality of the final product [4].

**Purpose.** The purpose of the article is analyzing the concept of raw material and product traceability within the HACCP systems in the meat industry.

**Materials and methods.** Within the research fulfilled, the principles of a systematic approach to the study of factual materials, normative acts, as well as technical and commercial information were used as well as abstract logical approach to the generalization of research results and the formulation of conclusions made.

**Results and discussion.** A traceability system consists of two main constituents: products and activities, namely production, distribution and retail, which characterize the flows of products (Fig. 1). For constituents, a group of primary

characteristics is determined: type, quantity, duration. Each primary characteristic is described by secondary ones. The degree of traceability is determined by the type/number of secondary characteristics describing the properties of the constituents.



**Figure 1 – Structure of the traceability system objects**

Traceability systems in the production of meat and meat products help to reduce the cost of solving problems related to food safety and/or animal disease. These systems facilitate the allocation of responsibility for food safety violations. Traceability systems also help to provide consumers with objective information about the quality of products. Traceability systems in the production of meat and meat products in terms of the scope of supply chains are: international, national and individual (at the company level often being the objects of intellectual property) [5].

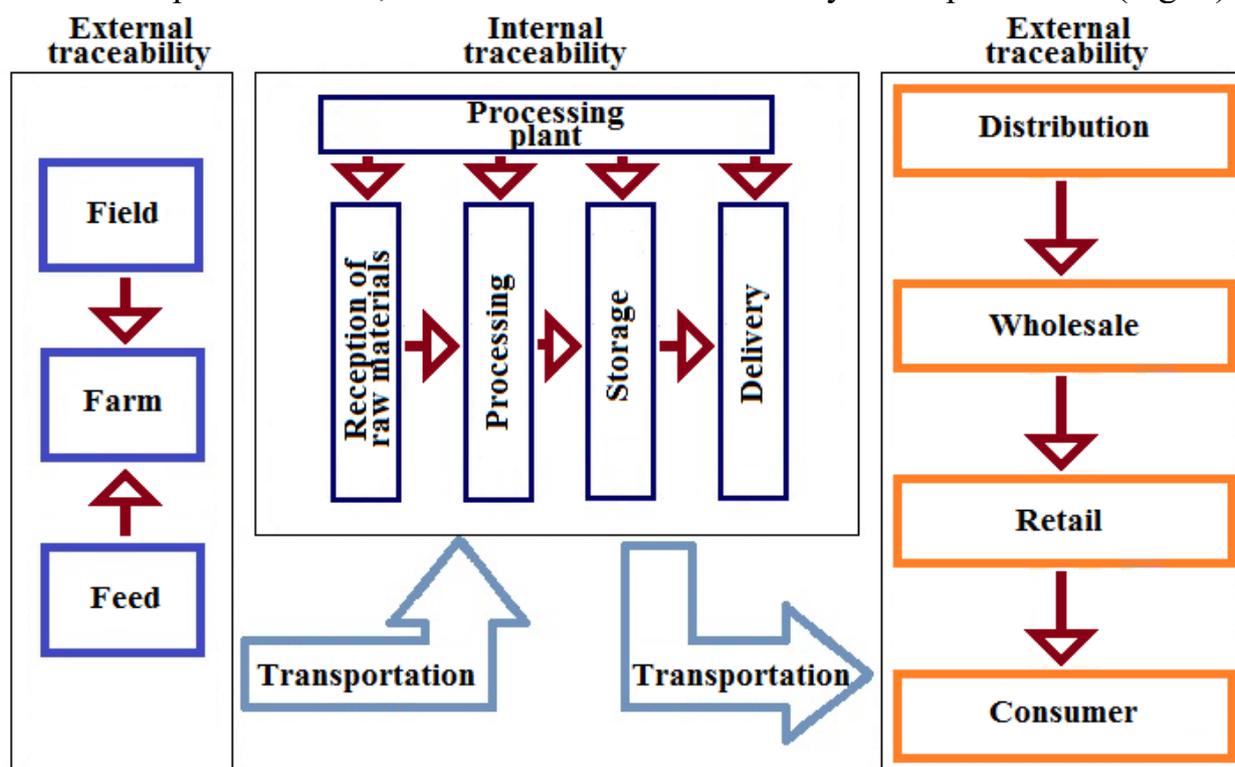
The structure of traceability in meat sector covers the chain from animal identification through process traceability to finished product identification in retail.

The identification of animals is fulfilled by assigning them unique identification numbers using visual, electronic and combined means of identification, depending on the type and purpose of animals and issuing documents for them: passports, veterinary cards, registration certificates, etc. In addition to responding appropriately to emergencies, the livestock database provides information to track and understand the spread of diseases. The marking of animals is carried out in a technically acceptable way: by piercing the ears, marking the horns, ringing, marking with collars, etc. Animal identification and registration cover elements such as branding, farm registration, certification and monitoring system. Branding is carried out so that the animal has a unique serial number registered at its birth. Farmer

registration covers birth lists, imports, movements and deaths. A passport is given to the animal, accompanying it and includes records of all transfers.

Traceability systems based on known means of identification of farm animals have already been sufficiently developed, but the creation of such systems in the chains of processed raw materials and finished food products is associated with a some different cluster of problems, compared to agricultural raw materials, and the reasons for this are the variety of ingredients used, product mixing from different parties, as well as the constant transformation of resources.

The proper implementation and functioning of a traceability system at a processing plant presupposes both external traceability throughout the entire raw material and product chain, as well as internal traceability at the plant itself (Fig. 2).



**Figure 2 – Internal and external traceability**

The requirements for an internal system are: the ability to promptly recall the product and protect the consumer in case of non-compliance with product safety standards; the ability to minimize the number of defective products; reducing the cost of restoring products; information on the efficiency of the production process; the ability to identify problems in production, etc.

In meat production, possible measures to improve raw material and product traceability are: ensuring compliance with the HACCP standards in force; identifying bottlenecks in order to minimize their negative impact; the use of high-tech means of storing and circulating information (barcodes, biomarkers, radio frequency markers, optical systems, magnetic tapes, smart cards, etc.) in order to integrate them into traceability systems and control their functioning.

**Conclusions.** The main stages of the raw material/product chains of the livestock sector of the agro-industrial complex are the production of feed, growing/procurement of raw materials, processing/production of finished products,

storage, transportation and retail. In the food chain, traceability refers to the ability to control food, feed, animals or raw materials at all stages of production and supply.

The starting point for ensuring proper traceability in the raw/food chains of livestock products is the identification of farm animals and the control of the safety and quality indicators of raw materials in accordance with applicable regulations. For the proper functioning of a traceability system, both external and internal traceability should be ensured in livestock production and meat processing enterprises.

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### **Система НАССР и прослеживаемость сырья и продукции мясной промышленности**

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**Аннотация:** Одним из важнейших концептов систем НАССР в сырьевых и продуктовых цепочках мясного производства является обеспечение надлежащей прослеживаемости путем идентификации сельскохозяйственных животных и контроля показателей безопасности и качества сырья в соответствии с действующими нормативными документами. Для надлежащего функционирования системы прослеживаемости на предприятиях по производству и переработке животноводческой продукции следует обеспечивать как внешнюю, так и внутреннюю прослеживаемость.

**Ключевые слова:** системы НАССР, продукция животного происхождения, пищевые продукты, безопасность, качество, прослеживаемость.