Ensuring quality in primary production of meat

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Professional paper

Summary
The paper gives an overview of the importance of setting up a system based on the principles of hazard analysis and critical control points (HACCP). In the Republic of Croatia today, the Food Act (OG 46/07) requires food businesses to establish a quality control system based on the HACCP principles. The system presents the application of preventative measures which reduce the concept of risk analysis to certain levels of probability. Preventive measures, if efficiently applied to known critical points, reduce the likelihood of appearance of risk to an acceptable level.

The HACCP system consists of seven principles, and its implementation is carried out in twelve steps. Directly after the establishment of the system, it is necessary to educate and train the employees. However, a long-term functioning of the system can only be ensured through the regular revision of documentation and the HACCP plans in order to keep it up to date with any changes that have taken place.

Key words: quality, quality control, HACCP

Introduction
The term “food safety” becomes more frequent every day and it im- plements health safety and suitability of food for human nutrition in accord- ance with its purpose. Considering the given definition, safe food is pos-sible to be produced by ensuring adequate hygienic conditions in the production plant and a complete monitoring of the production process in order to enable a timely response at possible appearance of a prob- lem. Therefore, many legal regula-tions whose implementation should ensure the production of safe food have been adopted in the Republic of Croatia in the last couple of years in the aim of their approximation with the ones in force in the EU countries. In doing so, a commitment often ap- pears to establish and implement a system based on the principles of hazard analysis and critical control points (Hazard Analysis Critical Control Points - HACCP) by all food busi- ness entities (FBE), except for those on the level of primary production.

A proper application of HACCP sys- tem requires existing scientifically documented procedures and pre- sentative measures to be efficiently applied to the known critical control points (CCPs). Defining critical control points in the aim of imple- mentation at the level of primary pro- duction/farms is possible for chemi- cal, physical and certain biological dangers, but it is considered to be insufficient for all microbiological dangers. Therefore, most of the ac- tivities which are carried out on farms are based on prior programs which offer basic environmental com- conditions and businesses necessary for the production of safe food.

The first legal requirement for the introduction of procedures based on the principles of HACCP system in the Republic of Croatia has been prescribed by the Regulation on the implementation of obligatory meas- ures in approved facilities in order to reduce microbial and other con- tamination of meat, meat products and other products of animal origin intended for human consumption (Anonymous, 1997). By provisions of the Food Act 2003 (Anonymous, 2003), this requirement has been expanded to all food business enti- ties (FBE), but since it was impossible to be enforced, the intended date of entry into force (15 July 2006) was postponed up to 1 January 2009. A legal framework which, among other things, defines application, monitor- ing of the implementation and the revi- sion of procedures based on the prin- ciples of HACCP system, has in the meantime been approximated with the acquis communautaire of the EU in the Food Act 2007 (Anonymous, 2007a), the Ordinance on the hygiene of food (Anonymous, 2007b), the Ordinance on official con- trols performed to ensure the verifica- tion of compliance with food and feed laws, as well as animal health and animal welfare rules, and the Ordinance on official controls of prod-

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The effects of refrigeration on sensory characteristics of oysters (Ostrea edulis)

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Znanstveno stručni rad

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Livestock production has experienced significant changes during the last couple of decades. Due to the fact that economic margins between costs and revenues were decreasing, the process of production intensification in conjunction with the application of new technologies and the ways animals are kept for farming purposes, has increased the productivity. Such developmental changes are especially expressed in countries like the Netherlands, which is a great exporter of livestock and products of animal origin (Noordhuizen et al., 1983). Still, along with the positive effects of intensive production, the unwanted ones are also noted; for example, the increase in the risk of disease outbreak and its fast spreading within a farm because of kept animal density, as well as the increase in the general sensitivity of animals to diseases and the effect of factors (Broom, 1990). The appearance of a disease represents an economic question in the process of transforming resources or factors of production into products, goods and services available to consumers related to production demands and interests of consumers. Considering those markedly contagious diseases, as well as the increase in the general susceptibility of animals to diseases and the effect of factors (Broom, 1990), it seems logical that the appearance of the disease instead of vaccination or control measures, has become a reality.

The significance of livestock production is triple:

- Economic – productivity achieved through the revenue of agricultural farms and a national product with establishing an export status.
- Public health – ensuring quality of products and health safety of food in the entire chain of production.
- Sociological – meeting different demands and interests of consumers related to production modes, animal health and welfare, and environmental issues.

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Livestock health status

Causative component of veterinary medicine was, and is still it, the main approach of veterinary profession when it comes to individual cases of animal disease. It is of crucial importance in the arm of recognizing and making a timely diagnosis, treatment or eradication of a disease, especially considering those markedly contagious and exotic ones which are a threat to large geographical areas. During decades, such purely curative approach was being replaced by the preventive one which doesn’t leave individual animals in focus, but a herd/ flock. So, a preventative approach is noticeable in markedly intensive farming through conducting schemes of vaccination and medicament.

The development of programs related to reproduction and health problems in intensive farming of cattle and pigs begins with the application of preventative approach, and they primarily address farm management. The development of programs related to reproduction and health problems in intensive farming of cattle and pigs, which are primarily addressed to farm management, begins with the application of the preventative approach. The role of veterinarians in such programs is mostly advisory; they collect, monitor and analyse data on the condition and achievements of the herd by paying special attention to those animals or groups of animals which do not achieve expected results (De Kruijff, 1975). Ekborg & Åkerström, 1979/30); Osterbruggen et al., 1979; Baars et al., 1987; Noordhuis and Frankena, 1998.

One of such programs of farm production management was presented in the book by Brand et al. (1996). That program’s characteristic is to centre all predicted veterinary and zootechnical activity around the standard protocol. The main elements of the procedure consist of the set targets, collected data (anamnesis, clinical examination and actions, inspection of the farm), calculations and estimation of the data on achievements, aberration determination and conducted routine activities, whereas following measures represent an analytic cyclic process of problem determination, the analysis of possible causes, the total synthesis and evaluation. Figure 1 presents a general standard protocol.

In modern pig farming in the Republic of Croatia, such example has been shown in the Croatian reference book. Basics of pig farming in family farming for farmers. Professional literature (Jukić, 2002). The handbook describes the basics of pig farming production, pig breeds, the problems which appear in such farming related to reproduction, feeding, diseases and zoo-hygienic.

Qualitative data on the most significant factors which took part in disease appearance are obtained by using an inspection, whereas in order to obtain quantitative data, it is necessary to conduct additional epidemiological researches on a higher breeding population in order to identify risk factors which contributed to the appearance of the disease (Noordhuis et al., 1992).

It is obvious from the listed that “search” for the causative agents of the appearing anomalies starts only after they are noticed, and that a real preventative approach focused on the risk management of the appearance of the disease instead of vaccination or control measures, has become a reality.

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Applying quality management system in the improvement of animal health status

Causative component of veterinary medicine was, and is still it, the main approach of veterinary profession when it comes to individual cases of animal disease. It is of crucial importance in the arm of recognizing and making a timely diagnosis, treatment or eradication of a disease, especially considering those markedly contagious and exotic ones which are a threat to large geographical areas. During decades, such purely curative approach was being replaced by the preventative one which doesn’t leave individual animals in focus, but a herd/ flock. So, a preventative approach is noticeable in markedly intensive farming through conducting schemes of vaccination and medicament.

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Considering the fact that health condition of a herd/flock has a direct influence on the quality of animal and products after slaughter (Tieke, 1979; Van Oeijk et al., 1986; Den Ouden, 1996), it seems logical that the problem area of animal health at the level of primary production has to be included in procedures of ensuring quality in a further food production chain. Animal health management in relation to the quality of products consists of three functions: planning, control and improvement. The instrument of quality management have been described in professional literature (Jukić, 2002). The choice of management system depends on the goals, and differences between these systems relate to the focus of quality management on production, i.e. process lev...
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All different subjects can use it and it can ask for it to be done by its end commission.

HACCP concept appeared in 1960 during cooperation of NASA and USA military laboratories with the Pillsbury Company. The reason was production of healthy food for astronauts. Since storage conditions are very specific, all food produced for the astronauts was tested for safety in conditions providing special space missions, due to which very small quantities of such food remained for its actual consumption. Therefore, it was important to think of a new proactive approach in risk control and risk management, so HACCP appeared. Since 1974, HACCP has been used widely in food industry, and it is internationally acknowledged nowadays as one of the best systems which enable the production of safe food (Goodrich et al., 2001). It is included in Codex Alimentarius and FDA/USDA and the EU have approved it as a standard for prevention of microbiological risks (Gensik and Ekkelenkamp, 1994). Some of the previously mentioned advantages of HACCP system over traditional control systems are the simplicity of control over control parameters and work control on the spot which enables identification and timely removal of evident and predicted risks. By using such an approach, introduction of health safety is already ensured in the stage of product development and composition of measures are conducted in a precise way, i.e. before serious problems appear. Still, HACCP system doesn’t exist for itself, so it requires meeting the requests contained in precaution programs before its implementation.

HACCP system is composed of seven principles, out of which the first five relate to making a flow diagram which contains all steps of the production process, risk identification, their complexity and probable quantity of risks included, choice of critical control points for individual risks and their connection into a joint monitoring system:

- Principle 1 – to identify risks which have to be prevented, removed or decreased to an acceptable level;
- Principle 2 – to identify the critical control points (CCP) in places where control is important for prevention or removal of risks or for their decrease to an acceptable level;
- Principle 3 – to determine critical limits for CCP which separate unacceptable from the unacceptability for prevention, removal or a decrease of identified risks;
- Principle 4 – to identify and conduct efficient monitoring system of CCP;
- Principle 5 – to determine corrective measures when monitoring system warns that CCP is not under control;
- Principle 6 – to determine procedures of evaluation and verification in order to determine effectiveness of implementing measures listed in Principles from 1 to 5;
- Principle 7 – to establish documentation concerning all procedures and records appropriate to these principles and their application.

The latest principles are combined into three managing activities: risk assessment, risk management and documentation.

HACCP plan is implemented through 12 steps:

1. Assemble HACCP team. If possible, HACCP team includes experts in the field of production and animal food technology, veterinary medicine, microbiology and analytical chemistry if there are no such experts in the production facility or a company, expert advice should be asked for from other sources.

2. Describe a product (ingredients, processing, packaging, storage, sustainability). Products should be grouped in categories, provided that differences in composition or production stages are not a source of additional risks.

3. Identify the intended use. Animal species and categories for which the food is intended for should be described, as well as instructions for use (including storage conditions). The intended use should be based on expected use of a product until the end user or consumer. In special cases, sensitive population groups, i.e. institutional food should be taken into account.

Creating a flow diagram. A flow diagram should contain all steps in business which relate to a certain product (a group of products with similar production stage(s), including interactions, and processing).

Confirmation of flow diagram. After creating, three follows assessment in the production process and possible corrections.

Determining risk and risk analysis. In order for the identification and risk analysis to be conducted properly, it is very important that a flow diagram is aligned with the principle of the FMEA (Failure Mode and Effect Analysis) is based on it. HACCP team should settle down all possible risks for each step, according to the extent of production, processing, production and distribution until the point of usage. A risk assessment for the identification of HACCP plan should be conducted when risks are such that their elimination or reduction is impossible or impractical. The HACCP team should settle down all possible risks for each step, according to the extent of production, processing, production and distribution until the point of usage. A risk assessment for the identification of HACCP plan should be conducted when risks are such that their elimination or reduction is impossible or impractical. The included risks are an important part of the production of safe food. Risks can be microbiological, chemical or physical.

Figure 2: Decision-making tree for establishing critical control points.

*compatibility and acceptable levels about the risk level by its application (Goodrich et al., 2001). Its practical application has shown itself to be significantly more efficient, determined and more critical in monitoring microbiological, physical and chemical contamination than traditional control procedures of food inspection.

In terms of relation between the microbiological risk control in food production and the one in primary production, HACCP system is completely appropriate for the identification and control of risks in the process of animal health care, because it is specific for individual breeding, it enables each producer an attestation of health status of herd/ flock. It is simple to apply, doesn’t require additional efforts in keeping records, and it ensures a functional connection with existing quality ensuring programs within an integrated chain of food production (Krohnaizen and Welpeks, 1996).

Good manufacturing practice (GMP) represents general rules (scientifically proven best practices) which are not specific for a process or a product. In food production, they contain instructions on how to produce certain food by respecting hygiene principles; they are a base for further control levels, and an example of the way how productivity and health conditions in the whole production chain are improved by accepting an appropriate attitude.

HACCP system in production

HACCP is a system which is based on conducting a series of procedures of identification and risk assessment related to the process of production, distribution and method of use of a certain food product, with the goal of applying preventive measures which will reduce the risk for food safety to the lowest possible level. Therefore, it is wrong to consider HACCP a system which completely removes a possibility of risk appearance in a product itself, but the possibility of appearance of determined risks is reduced to an acceptable level by its application (Goodrich et al., 2001). Its practical application has shown itself to be significantly more efficient, determined and more critical in monitoring microbiological, physical and chemical contamination than traditional control procedures of food inspection.

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Critical Control Points. It is necessary in this stage to recognize...
Establishing verification procedures of HACCP system. Examples of assessment procedures include inspection of HACCP system and plan, then its records, inspection of aberrations and procedures of solving aberration problems, and confirmation of keeping CCP under supervision.

12. Establishing documentation and keeping records - Efficient and orderly keeping of the records is important for the application of HACCP system. Documentation and keeping records should be appropriate for the nature and size of operating procedures and sufficient to help at business. Examples of such documentation are risk assessment, determining critical control points and their critical levels, time, but also some sensory indicators such as appearance and structure.

9. Implementing a system to control each CCP – Monitoring is a plan of measures or measuring critical control points in relation to its critical limits. Monitoring measures must enable a detection of monitoring loss in critical control points. The data obtained by monitoring must be evaluated by an appointed person who has the knowledge and a permission to initiate corrective activities. All documents and records are signed by the person who conducts monitoring and the person in charge.

10. Establishing corrective measures – For each CCP in HACCP system, special corrective measures/ activities should be planned in order to solve appearing aberrations.

11. Establishing verification procedures – For a grade of correctness and efficiency of HACCP system it is necessary to conduct procedures of assessment and monitoring, as well as taking samples for analysis. Assessment frequency should be enough in order to control appropriately the efficiency of HACCP system. Examples of assessment procedures include inspection of HACCP system and plan.