HAZARD ANALYSIS AND ASSESSMENT – KEY PROCESS IN FOOD SAFETY MANAGEMENT CASE STUDY: MEAT INDUSTRY

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Summary: Food safety is related to the presence of hazards of food origin in food products in the moment of consumption. As these hazards may occur in any stage of food chain, adequate control throughout this one is essential. Due to the fact that most laboratory analyses made on food require some time to be interpreted (it is usually equal or longer than foods' shelf–life) is practically impossible to make these analyses and afterwards to deliver them to consumers. Three types of dangers and hazards respectively are associated with food products: biological, chemical and physical ones. Hazard assessment is made depending on their seriousness and probability of manifestation. To get very good results it is recommended to consider HACCP implementation as a working instrument and not as an objective, especially not as an objective imposed by the control authorities of the state.

Keywords: food safety, hazard analysis, risk analysis, meat industry

Introduction

According to ISO 22000:2005[1] standard, *food safety* is „a concept according to which a food product should not be detrimental to consumers if it is prepared and/or consumed consentaneously with its meant use". According to general requirements specified in SR EN ISO 22000:2005, any company carrying on its activity in the food field must be sure that all possible hazards regarding the safety of a food product launched on the market are identified, assessed and controlled in such a way that the product delivered to consumers is safe, does not harm their health state (directly or indirectly).

Three objectives are reached by hazard analysis and identification of corrective measures as follows:

- Hazard and control measures' identification;
- Possibility of identification the changes needed by the technological process;
- Establishing the assessment basis of critical control points.

The HACCP system[2, 3], developed by CCFH (Codex Committee and Food Hygiene) as part of the General Principles of Food Hygiene (General Principles of Food Hygiene Revised) is a preventive control system referring to the ensuring of food quality (it is based, primarily, on a system of preventive actions taken throughout the economic and technical circuit of the products, namely: supply – reception–storage – manufacturing – delivery).The need to implement the HACCP system derives from the obligation of food business operators to demonstrate that they make and market only products safe for human consumption, in conformity with the specifications of product quality standards or other sanitary rules.

Along with the identification and registration of food safety hazards, there must

also take place the identification of the stages in which the respective dangers can be inserted into the product. It is recommended, whenever possible, to also determine the acceptable level of the identified hazard, depending on the established legal and regulatory requirements, customer requirements related to food safety, intended use by the customer and other relevant data.

Each of the identified hazards must be assessed, so that after this operation there can be established whether elimination or reduction to acceptable levels is essential to obtain a safe product for consumption / use. Based on these evaluations, there shall be established the measures / combination of measures capable of preventing, eliminating or reducing these food safety hazards to acceptable levels defined by the food safety team and their control measures.

The measures must be managed / monitored by preliminary operational programs (PRPO) or The HACCP plan.

The degree of severity / seriousness[4, 5, 6] established risk assessment can be:

- High / High / High – fatal consequences, serious illness, incurable damage with immediate or late manifestation. Examples: *Clostridium botulinum type A, B, E, F, Shigella dysenteriae, Salmonella Paratyphi A, B, Brucella abortus, Brucella suis, Vibrio cholerae 01; Vibrio vulnificus, Trichinella spiralis, Taenia solium.*
- Moderate / average with stretched spreading – determine substantial injury and / or illness. Examples: *Listeria monocytogenes, Salmonella ssp, Shigella ssp, Escheriachia coli enterohaemorrhagic (*especially *E.coli* strain E. *coli O157: H7*), *Streptococcus pyogenes, rotaviruses, Norwalk virus group, Cryptosporidium parvum, Entamoeba hystolitica; Diphyllobotrium latum, Ascaris lumbricoides.*
- Moderate / average with limited spread – causes illness (even serious, sometimes). Examples: *Bacillus cereus, Campylobacter jejuni, Clostridium perfringens, Staphylococcus aureus,*
- Minor – minor injuries and / or illnesses can occur (especially when the consumer is exposed to high doses for prolonged periods of time).

Risk analysis[5, 6] has to be applied specifically: for each enterprise, the raw materials and auxiliary additives be inspected; the technological process (including equipment and utensils with which the process takes place); the operators involved in the realization of production; the environment in which the technological process takes place, including storage.

The aims of this paper it was to establish which hazards could be identifying in meat industry, especially in the slaughtering of cattle. Following this analysis, there were established the hazards for achieving food safety, the required degree of control as well as control measures.

Experimentals

Monitoring is essential in food safety management, especially in the meat products industry since the basic raw material in this case has all kinds of dangers, respectively risks: microbiological, chemical, physical. To ensure the smooth running of the technological process, resulting in obtaining products characterized by a high level of food

safety, the HACCP plan preparation and implementation at all stages of production is recommended.

For identifying the risks the analysis of cause effect was used and was applied the decision tree in accordance with SR EN ISO 22000:2005, the complete risk analysis also assumes their fair assessment (depending on the frequency and seriousness), this approach represents a key stage of the HACCP system because an inadequate analysis of the dangers can lead to the design of a HACCP plan, inoperative in practice.

Depending on the severity and frequency of the analyzed risk, the resulting risk class was established and, while taking these into account, the identification, analysis, assessment of hazards and establishment of preventive control measures was made.

Results and discussions

The assessment of the appearance risk of the hazards consists in analyzing the probability of manifestation (frequency) of each identified hazard and their severity (seriousness), at the time of consumption of the food, considering that the control measures (or the preventive ones) have not reached their goal. For the case of cattle slaughter the risks have been identified and CCP have been established. Assessment of risks in CCP and the measures to be taken are summarized in Table 1.

To prevent hazards identified during slaughter are taken:

- Receipt, identification and registration of animals in accordance with the law
- Compliance with good livestock practices and supervision of sanitary – veterinary animal health status;
- Strict observance of codes of good working practices in the meat industry;
- Temperature control in warehouses, cell freezing and cooling deposits;
- Maintaining proper hygiene status of vehicles and paddock rest;
- Use appropriate hygiene practices by trained personnel with a high level of personal hygiene.

These control measures are implemented and monitored and the result is stored records.

Conclusions

HACCP is a very effective way to visualize the process of product development to identify potential hazards and risks that, in order to implement preventive and control measures for these risks and have a plan of correction and corrective action for Critical Control. In this respect, of great importance will be documenting the entire process. A food can be associated respectively three types of hazards and risks: biological, chemical and physical.

Depending on the severity and frequency of the analyzed risk, the resulting risk class was established and, while taking these into account, the identification, analysis, assessment of hazards and establishment of preventive control measures was made. To get good results, you should look at the company implement HACCP as a tool, not as a goal, especially as an objective imposed by the control of the state

Tabel 1. Risck evaluation and preemptive measures in case of cattle slaughter

Stage	**POTENTIAL DANGERS**		**RISK ASSESSMENT**			**PREEMPTIVE MEASURES**
	TYPE	**NAME**	**G**	**F**	**GxF**	
Qualitative reception	B	Pathogenic enterobacteria coming from animals from unsafe sources	2	3	4	Maintaining proper hygiene status of means of transport, unloading ramp and shelter.
Sanitary–veterinary exam	B	Sick animals	1	2	4	Reception, identification and registration of animals in accordance with the law; health – veterinary surveillance of the animal health status and identification of their disease; isolation of animals suspected of certain diseases until the diagnosis and establishing the terms of cutting
Stunning / bleeding	B	Pathogens from animal skin or hair, the blade and the hands or equipment of the operator MRS cross–contamination due to improper sanitation of the stunning gun	2 3 2	2 1 1	3 3 2	Using appropriate hygiene practices by trained personnel with a high level of personal hygiene Full compliance with the codes of good working practices in the meat industry Full compliance with the codes of good working practices in the meat industry
	C	Chemicals used for cleaning and disinfecting utensils	3	1	3	Respecting the cleaning and hygiene of the tools and working environment
Evisceration	B	Pathogens present in the digestive tract, hands or equipment of the operators, the air in the production spaces, meat contact surfaces and improperly cleaned	2	2	3	Using appropriate hygiene practices by trained personnel with a high level of personal hygiene Full compliance with the codes of good working practices in the meat industry Respecting the cleaning and

		equipment				hygiene of the tools and working environment
	C	Chemicals used in the cleaning of equipment and tools, lubricants	2	1	2	Respecting the cleaning and hygiene of the tools and working environment
Storage	B	Growth of microorganisms and the production of toxins	2	3	4	The use of efficient power conditioners; respecting the thermal regime for storage; monitoring and recording temperature in storage areas; proper cleaning of premises and equipment from the storage areas; using appropriate hygiene practices by trained personnel with a high level of personal hygiene

References

1. The SR EN ISO 22000:2005 Standards. ASRO Bucharest, November 2005
2. R. CRACIUNESCU. Food safety management system. The HACCP concept. The SR EN ISO 22000:2005 standard – support for the "HACCP Auditor Training", course, Constanta, September 2007
3. G. ROMAN. Fundamental notions regarding the Food Safety Management System. HACCP – Recommendations and requirements regarding the system's implementation, support for the "Initiation in HACCP implementation", Constanta, September 2007
4. C. BANU (coord.). Food industry treaty. General problems, ASAB Publishing Bucharest, 2008
5. C. BANU. Sovereignty, Security and Food Safety. ASAB Publishing House, New York, 2007.
6. C. SAVU, N. GEORGESCU. Food safety – risks and benefits. Semne Publishing House, Bucharest, 2004.