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# RISKS ASSESSMENT IN ROMANIAN FOOD SAFETY SYSTEMS: OPPORTUNITIES AND CONSTRAINS

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## Abstract

*The major purpose of the products made in Romania is to penetrate the European market. At this time, the entire Romanian Industry now finds itself under pressure in order to cope with the European competition and manage efficiently the risk management and safety from farm to fork. Foods can be potentially contaminated with various pathogens. End-product testing is time consuming, expensive, and often ineffective in ensuring the appropriate level of protection. Risk Assessment is a technique used to improve the microbiological safety of foods. The major purpose of the technique is to promote the responsibility for public health protection. Food industry can use the concept of food safety objectives to estimate the risk that includes an expression of the level of a hazard in food that is acceptable in relation to an appropriate level of consumer's protection. This paper emphasizes some opportunities and constrains in establishing food safety objectives in Romanian Food Safety Systems.*
***Keywords*: *Food safety, risks, risks assessment, food safety objectives.***

## Introduction

*Food safety* is the assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use (Codex Alimentarius, FAO/WHO, 2001) and generally refers to the content of various chemical and microbiological elements in food. Many pathogens can potentially contaminate foods and there are many more ways in which contamination can arise. Nowadays consumer's requirements regarding products are more diverse, thus challenging the food industry to produce minimally processed yet safe foods that are perfectly tuned to the wishes of individual person. End-product testing is

time consuming, expensive, and often ineffective in ensuring the appropriate level of protection.

While hazard analysis takes part implicitly in the HACCP system, there is no formal procedure within HACCP for differentiation of trivial or unlikely hazards in foods from those that pose serious threat to public health (Ross, 2002).

Risk Assessment is one of three different aspects of Risk Analysis (Figure 1). Risk Assessment is the scientific aspect, Risk Management the managerial one and Risk Communication assures the interaction between risk assessors, managers and other interested parties (consumer organizations, industries, etc.).

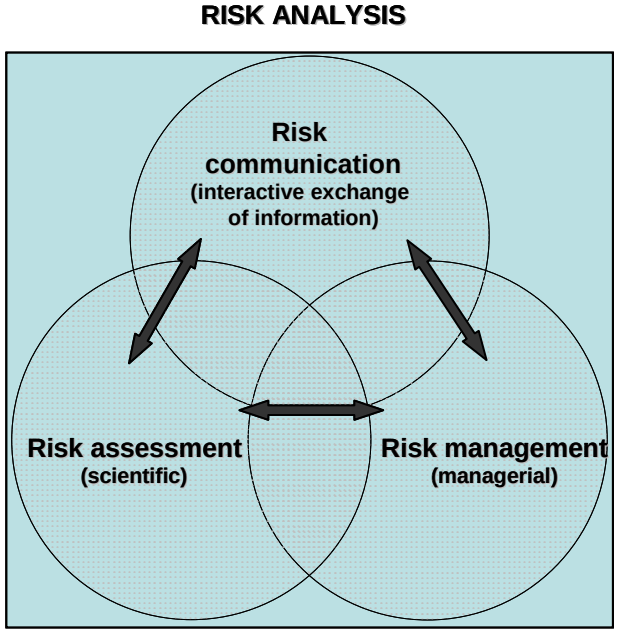


**Figure 1. The Components of Risk Analysis (adopted from van Schothorst, 2002)**

Risk Assessment (RA) is a technique used to improve the microbiological safety of foods associated with specific activities. The major purpose of the technique is to promote the responsibility for public health protection.

RA use of scientific data to identify, characterize and measure hazards; assess exposure and characterize the risks involved with food.

In terms of foodborne illness, risk is a function of the probability of an adverse health effect and the severity of that effect (SR EN ISO 22 000:2005). In other words, risk is a measure of the likelihood that illness will occur within a population as a result of an exposure to a hazard in food and the severity of that illness (Buchanan, 1998).

RA plays an important role in European and international trade by ensuring an appropriate level of protection between countries. That implies that countries establish food safety requirements that are scientifically sound. In that point of view, the major purpose of the products made in Romania is to penetrate the European market. At this time, the entire Romanian Industry now finds itself under pressure in order to cope with the European competition and manage efficiently the risk management and safety from farm to fork. Without systematic risk assessment through entire food chain, Romania could set requirements unrelated to food safety, thus creating barriers to trade.

Recognizing the major importance of science-based approach of food safety measure, the Codex Alimentarius Commission (Codex) has developed principles and guidelines for conducting RA (CAC, 1999).

## The components of Risk Assessment Techniques

According to Codex (1999), RA is considered to consist of four main components (figure 2):

- Hazard identification;
- Hazard characterization or dose-response assessment;
- Exposure assessment;
- Risk characterization.

*Hazard identification* consists in identifying realistic microbiological hazards and characterizing them according to the severity of their effects on consumers. This implies the nature of the hazard, known or potential, and the individuals at risk from the hazard. In the scientific and medical literature there is a clear epidemiological and medical evidence of the hazard associated with many foodborne microbial pathogens.

*Exposure assessment* describes the degree of exposure to the hazard likely to occur from consumption of the product. Exposure assessment models require data for pathogen occurrence, distribution of densities or levels in food, parameters for growth and decline, and consumption

information (Coleman and Marks, 1999). This includes quantification of inactivation, concentration, dilution or amplification of the frequency and concentration of pathogens in foods and their ingredients. If we consider only this step, in our country the availability of farm-to-table exposure data are limited.

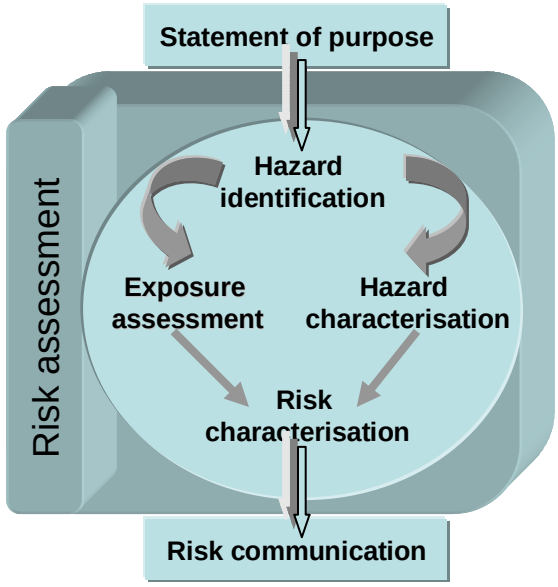


**Figure 2.** The Codex Almentarius Risk Assessment components

*Hazard characterization or dose-response assessment* explores the relationship between the exposure level and the nature of the adverse effects, considering both frequency and severity. Data are limited from controlled human studies with healthy volunteers (typically prison inmates or soldiers) to describe dose-response relationships.

*Risk characterization* identifies the likelihood that a population of individuals would experience an adverse health effect outcome from exposure to the food that might contain the pathogen. This programme facilitates comparative risk assessment and risk communication, because it can show how a range of variables influences the risks of pathogen infection associated with the consumption of a food.

To assess food safety risk requires knowledge of the number of organisms in foods at the time of consumption. Clearly, this information

is rarely available, especially in Romania. To estimate the numbers of microorganisms present at the time of eating from levels known at some earlier time in the product's history requires a sound and quantitative knowledge of the responses of microorganisms to the environmental conditions (temperature, nutrients, chemicals, preservatives, other microorganisms) they experience in the foods and for how long.

To translate the agreed level of safety (expressed as Food Safety Objectives) into practical actions, the mechanism of HACCP is currently used. As it known, HACCP and RA contain both a hazard identification step, which probably contributes to the confusion between the two processes. The HACCP concept involves a systematic approach to food safety based on hazard identification and control and is based on identifying and evaluating key steps in the food production chain which have the greatest effect on risk associated with hazards (Ross and McMeekin, 2002). Specifically, HACCP involves the identification of critical control points of processing, and processing parameters for these that if met would assure that the produced product meets specified standards that imply a safe product.

In HACCP, hazard analysis is a qualitative process. Qualitative analysis is a valuable method to determine which hazard is significant enough to be included in the HACCP plan. And this is a qualitative decision made by the HACCP team to a local process. A significant disadvantage of the qualitative methods is the inability to compare the extent to which particular control measure can reduce risk. This subjectivity involved in the application of HACCP is predominantly due to the lack of quantitative information available.

RA is a quantitative process in which a numerical degree of risk can be calculated for each hazard (Sperber, 2001) and requires major human and monetary resources. Many factors may influence the decision to conduct a qualitative versus a quantitative risk assessment. Obviously, if no data are available to make inferences from, then a quantitative risk assessment would not be possible. Constraints in data quality, time, personnel, or resources may not permit a full quantitative risk assessment.

RA is a global approach of food safety which can state conclusions or food safety objectives for a single risk assessment to be applied at any food plant. The Codex Committee on Food Hygiene is committed to valuing qualitative information for risk assessment as well as

encouraging the use of quantitative data to the extent possible (CCFH, 1999).

## Risk Assessment methodology

There are 5 basis steps involved in performing a risk assessment:

1. Problem formulation;
2. Data gathering;
3. System description;
4. Data and model synthesis (risk characterization);
5. Model validation/evaluation.

*Problem formulation* – the RA should begin by identifying specifically the problem to be addressed or the decision to be made.

*Data collation* is probably the most time-consuming aspect of RA. Almost in all cases, the data can be collected from the scientific literature. Useful data may also be obtained from industry records, government agencies, etc. many epidemiological data is also available via the Internet (for example, www.hpa.org.uk/cdph/, www.cdc.gov,).

*System description*. Hazard can arise at any stage during the harvest, processing, distribution and preparation of a food. The microbial hazards are also probably affected by subsequent handling step. In hazard analysis is very import to understand there the risk arise, how the risk changes and the interaction between risk and affecting factors.

For a better understanding of RA methodology we developed a quantitative model for *Listeria monocytogenes* in ready to eat (RTE) products. This model is presented in figure 3.

*Data and model synthesis.* In this step, the information obtained is combined to provide an integrated summary. In literature, the qualitative assessment tends to use some descriptors for the level of risk like *low, medium, high.* In quantitative assessment, the risk estimate is presented as a distribution of estimates of cases of human illness (Ross, 2002).

*Model validation.* Currently, it is not possible to develop food safety risk models without making some assumptions, because some data are not available.

The key issues preventing effective risk assessment remain (Brown, 2002): uncertainty (i.e. lack of relevant data); variability (i.e. data available indicates that the variability of a feature may limit effective

assessment of the risks associated with it); accessibility (i.e. the data or conclusions are not available in a form that allows their use by decision-makers); miscommunication (i.e. risk assessments are not presented in a clear and unambiguous way, and at worst including such emotive phrases as 'zero risks').

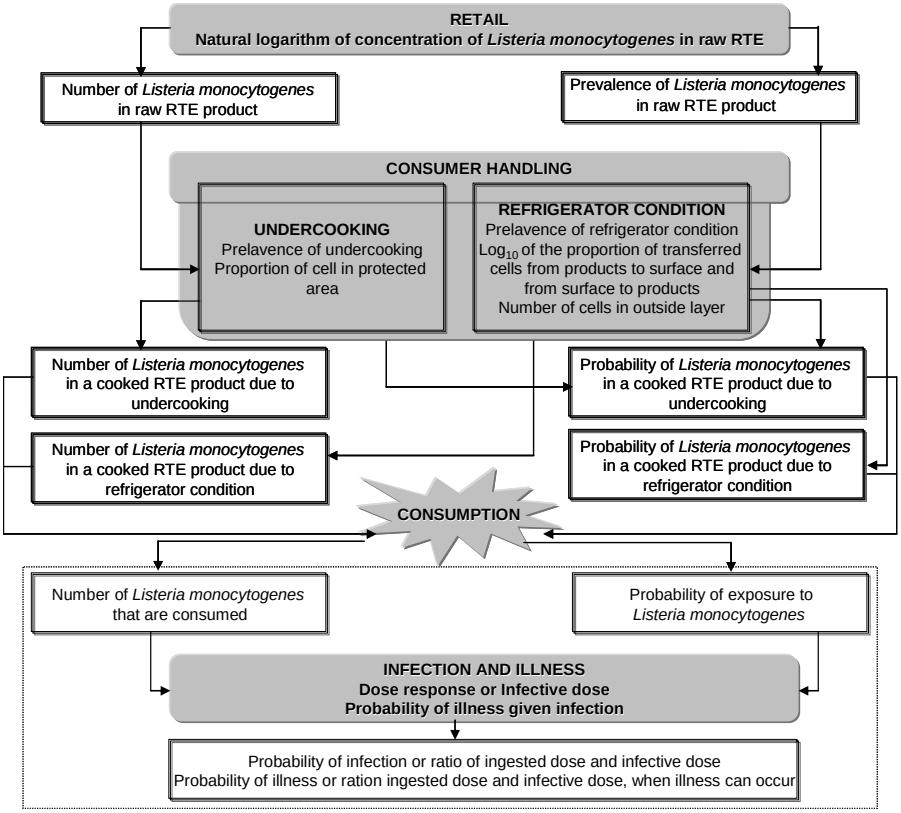


**Figure 3.** Quantitative risk assessment model for *Listeria monocytogenes* in RTE products

## Conclusions

Risk assessment is an important tool for evaluating and communicating the impact of raw material quality, processing and changes on food safety. Although RA is a powerful tool for leveling the playing field of food safety, it is apparent that no food can be considered

to be risk-free and each step in the processing of food from farm to fork has a role in assuring its safety. At the present time, the use of risk assessment in food safety systems by the majority of the food industry is not an option because in general, insufficient data are available. The benefits that will ultimately arise from the use of a more quantitative risk assessment approach in HACCP will be beneficial to the food industry provided that the risk assessment procedures are: simple to use so that they do not increase costs; internationally accepted and transparent in use so that a more quantitative approach does not lead to greater opportunity for disputes; of proven benefit in the HACCP study. Used as a part of food safety system, RA will contribute to the production of safe products as well as encouraging a pro-active approach towards the foods being prepared and cooked, and the handling practices involved.

## References

Brown, M. H. (2002). Quantitative microbiological risk assessment: principles applied to determining the comparative risk of salmonellosis from chicken products. *International Biodeterioration & Biodegradation*, 50, 155 – 160

Buchanan, R.L., Cole, M., Lammerding, A.M., Clarke, I R., van Schothorst, M., Roberts, T.A. (1998). Potential application of risk assessment techniques to microbiological issues related to international trade in food and food products, Journal of Food Protection, 61, 1075–1086

Codex Committee on Food Hygiene. (1999). *Principles and guidelines for the conduct of microbial risk assessment*, Report of 31st session of the Codex Committee on food hygiene, Orlando, Florida

Coleman, M.E., Marks, H.M. (1999). Qualitative and quantitative risk assessment. *Food Control*, 10, 289-297

FAO/WHO. (2001). *Codex Alimentarius - Recommended International Code of Hygienic Practice-General Principles of Food Hygiene* (CAC/RCP 1-1969, Rev. 3 (1997), Amended 1999. FAO/WHO, Rome (http://www.codexalimentarius.net/download/standards/297/CXP_021e.pdf)

Ross, T., McMeekin, T.A. (2003). Modeling microbial growth within food safety risk assessments. *Risk Analysis*, 23(1), 179-197

Ross, T., McMeekin, T.A., (2002), *Risk Assessment and pathogen management*, In Foodborne Pathogens – Hazards, risk analysis and control, Ed. By W. Blackburn and P. McClure, CRC Press

Sperber, W.H., (2001). Hazard identification: from a quantitative to a qualitative approach. *Food Control*, 12, 223-228

van Schothorst, M. (2002). Microbiological Risk Assessment of foods in international trade. *Safety Science*, 40, 359–382