KAPITEL 6 / *CHAPTER 6* [7]
APPLICATION OF THE SWIFT METHOD FOR RISK ASSESSMENT IN THE PRODUCTION OF COTTAGE CHEESE

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Introduction

In the context of the development of international trade, the success of individual enterprises and industries in foreign and domestic markets depends entirely on the extent to which their products or services comply with quality and safety standards [1, 2].

High quality and safety of food products can and should be ensured by a well-organized system of production and supply of food raw materials, technological processes of their processing into food and restaurant products [3, 4].

Milk and dairy products play a significant role in human nutrition [5, 6], and therefore their quality and safety must be of a high standard.

These products are highly perishable. Infection of dairy products with pathogenic bacteria and fungi can occur during processing, storage or transportation.

Cottage cheese is a traditional fermented milk product with high nutritional, health and dietary properties [7]. It is produced by fermenting pasteurized whole or skimmed milk and removing some whey from the resulting clot [8]. Cottage cheese contains 14-17% protein, up to 18% fat, and 2.4-2.8% milk sugar. It is rich in calcium, phosphorus, iron, magnesium – substances that are essential for the growth and proper development of a young body. Eating cottage cheese and cheese products promotes proper metabolism in the body and maintains osmotic pressure at the required level. Methionine and choline contained in the components of cottage cheese prevent atherosclerosis. Its high nutritional value and dietary properties make cottage cheese one of the foods that are essential for all ages.

In order to produce a high-quality and safe product, enterprises have introduced food safety management systems that analyze the risks of hazards at each stage of the production process [9].

In this paper, a structured «what-if» method (swift) is used to assess and prevent risks in the production of cottage cheese.

[7]***Authors:*** *Melnyk Oksana Petrivna, Kuzmin Oleh Volodymyrovych, Niemirich Oleksandra Volodymyrivna, Mamchenko Liudmyla Yevhenivna, Dudarev Igor Mykolaiovych, Lytovchenko Oleksandr Mykhailovych*

Materials and Methods

The swift (structured what-if technique) is a systematic exploration using a series of auxiliary words or phrases that are used by a coordinator in risk identification meetings with group members [10, 11]. The coordinator and the group use standard phrases such as « What if...?» to explore how a system, production unit, or procedure would be affected by a deviation from normal operation. Typically, the process step is broken down into its components or key elements to simplify the analysis. Figure 1 illustrates the what-if continuous improvement risk reduction process. The following steps detail this process.

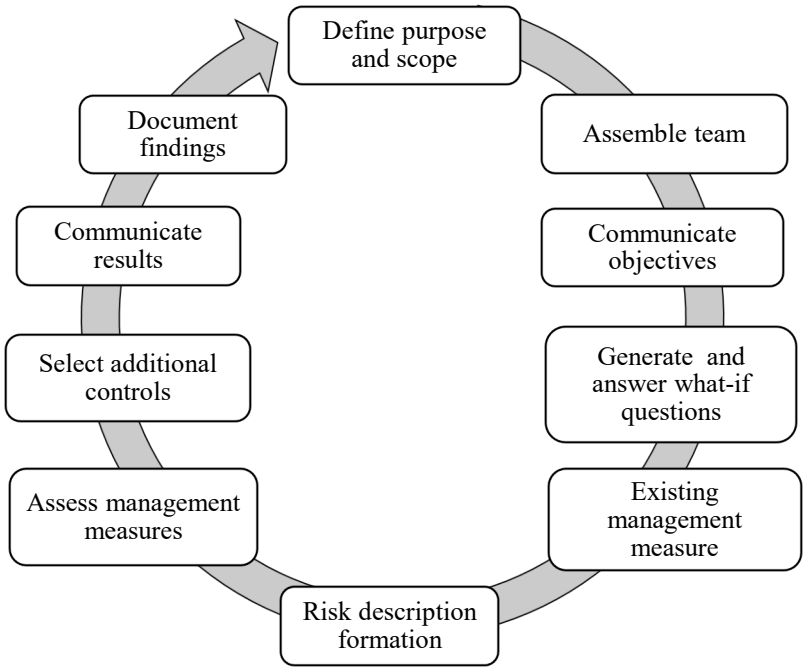

Figure 1 – What-if risk reduction process

1) *Define purpose and scope*. At the meeting of the working group, the external and internal factors (context) for the facility are discussed and approved;

2) *Assemble team.* The coordinator prepares an appropriate list of guiding words or phrases to ensure a comprehensive analysis of hazards or risks;

3) *Communicate objectives*. The coordinator invites participants to consider and discuss the following

– known risks and hazards;

– previous experience and incidents;

– known and existing control measures and protective equipment;

– mandatory requirements and limitations.

4) *Generate and answer what-if questions*. The discussion at the working group meetings is coordinated by questions formulated using the phrase «What happens if...?». The aim is to encourage the working group to explore possible scenarios, their causes, consequences and impacts.

5) *Existing management measures*. The identified risks and hazards are summarized and a team of specialists reviews the existing management measures.

6) *Risk description formation.* The team prepares a description of the risk/hazard, its causes, consequences and possible management measures and records them.

7) *Assess management measures*. The group considers the adequacy and effectiveness of the management measures. If the effectiveness is not satisfactory, the group considers further the risk processing tasks and identifies potential management measures.

8) *Select additional controls*. Follow-up questions such as «What if...?» are asked to identify further risks and hazards.

9) *Communicate results.* The coordinator uses a list of supporting phrases to keep track of the discussion and suggests additional questions and scenarios for the group to consider.

10) *Document findings.* A qualitative or semi-quantitative risk assessment method is usually used to rank potential actions in order of priority. This assessment of the risk or hazard is usually done with reference to existing management measures and their effectiveness.

After all the steps in the structured swift method, a risk register is produced with actions or tasks ranked by risk or hazard. These tasks can then form the basis for a risk and hazard handling plan.

The advantages of this method are:

– it is short in time and the main hazards and risks are quickly identified during the group meeting; the analysis is system-oriented and allows participants to consider the system's response to deviations rather than the consequences of individual component failure;

– can be used to identify opportunities for improving processes and systems, in general, to identify actions that lead to the desired result and increase its probability;

– involves the participation in meetings of persons responsible for existing management measures and for further actions to handle risks, and strengthens their responsibility;

– allows to compile a register of risks and hazards, with minor modifications;

– allows for the identification of risks and hazards in such a way that the results can be used for quantitative research.

The disadvantages of the structured method include:

– an experienced and qualified coordinator is required for effective application;

– careful preparation is needed to avoid wasting time in the group meetings;

– if the team does not have sufficiently extensive experience or if the system of auxiliary phrases is not complete, some risks or hazards may not be identified;

– applying the methodology at a high level of generalization may not allow for the identification of complex, detailed or interrelated causes.

Results and Discussion

The results of using the swift risk identification and assessment method for the production of cottage cheese are presented in Table 1.

The hazard identification process takes into account elements that are essential, such as work with suppliers, staff experience and qualifications, equipment operation, etc. In other words, potential threats of both internal and external origin are analyzed.

The following assessment criteria are used to evaluate human health hazards (Tables 2-3).

Table 1 – Identification of hazardous factors at the main stages of cottage cheese production

Technological stage	What if (swift)	Corrective actions	Emerging factors
Milk acceptance	What if the company receives low-quality and dangerous raw materials?	– return of raw materials to the supplier, – analyzing certificates from suppliers – performing incoming quality control of each batch of milk.	**Biological factors (B):** – changes in the fat fraction of milk; – extraneous microflora **Physical factors (Ph):** – foreign impurities.
Milk pasteurization	What if the temperature regimes are not observed?	– training of employees, – scheduled preventive	**B:** – survival of pathogenic microflora. **Chemical factors(Ch):**

Technological stage	What if (swift)	Corrective actions	Emerging factors
	What if the equipment is not washed properly?	maintenance of equipment, – control of the technological process, – control over the sanitary condition of equipment.	– residues of detergents in pasteurization and cooling equipment
Adding a sourdough starter, calcium chloride, rennet	What if the technology is not followed? What if the sanitary and hygienic requirements for raw materials are violated? What if the equipment is not washed properly?	– compliance with production technology, – strict control of the quality of water used in the production process, – treatment and disinfection of equipment, hands, clothing and footwear of employees.	**B:** – pathogenic microorganisms. **Ch:** – detergent residues **Ph**: – foreign impurities
Fermenting milk	What if the process conditions are disrupted? What if the equipment is not washed properly?	– control of the technological process of fermenting – high-quality washing and disinfection of equipment; – control over the sanitary condition of the equipment.	**B:** – cheese with a hard consistency (under-fermentation of the curd), – pathogenic microorganisms. **Ch:** – detergent residues
Whey separation	What if the process modes are disrupted? What if the equipment does not work correctly? What if the equipment is not cleaned properly?	– control of the technological process, – high-quality washing and disinfection of equipment; – control over the sanitary condition of the equipment.	**B:** – increasing the acidity of the curd mass, – foreign microflora.. **Ch**: – detergent residues **Ph**: – foreign impurities

Technological stage	What if (swift)	Corrective actions	Emerging factors
Cheese packaging	What if the hygiene requirements for packaging are inadequate? What if the technological requirements for packaging are inadequate? What if the equipment is not cleaned properly or does not work properly?	– working with suppliers of packaging materials, – high-quality washing and disinfection of equipment, – carrying out scheduled preventive maintenance of equipment.	**B:** – extraneous microflora **X:** – residues detergents on the cheese packaging machine **Ph**: – foreign impurities
All production stages	What if there are employees who intentionally want to harm the company?	– installation of video surveillance cameras at the enterprise; – control of employees, – motivation and training of employees	**B:** – formation of foreign microflora **Ch:** – adding hazardous substances to the product **Ph:** – addition of foreign mechanical impurities

Table 2 – Criteria for assessing the possible significance of negative impacts of hazardous factors on human health

Effects on human health	Degree of materiality of the impact	Rating scale, points
Fatal outcome	Critical	4
A serious illness that requires hospitalization or threatens disability	High	3
An illness that leads to temporary disability	Medium	2
Mild deterioration of health	Low	1

Table 3 – Criteria for assessing the probability of occurrence of dangerous factors

Probability of occurrence	Degree of probability	Rating scale, points
There is a probability of occurrence from 1 time per shift	high	4
There is a probability of an incident occurring at the enterprise from several times a month to 1 time per shift	medium	3
The product is microbiologically sensitive or there is a possibility of violation of the formulation, procedures, control measures for introduction or contamination from several times a year to 1 time per month	insignificant	2
Practical experience in the production and control of products and scientific data indicate a low probability of the occurrence or increase of a dangerous factor from once a year or less often	almost zero	1

Upon completion of the hazard analysis, the working group considers the preventive action procedures that can be applied to control each hazard.

Conclusions

Thus, in order to produce and increase the competitiveness of products, strengthen the innovative orientation of the enterprise, safety management systems have been introduced that ensure product safety at all stages of its production cycle and increase the efficiency of enterprises. The HACCP system is a food safety management system that has proven its effectiveness and is widely used internationally.

This is a continuous system, as potentially hazardous factors are analyzed and identified on a continuous basis, before and during their occurrence, and corrective actions are always ready to be taken.