

A REVIEW OF THE QUALITY STANDARDS FOR FROZEN BEEF MEAT AND FISH

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Abstract

One of the fastest growing sectors in food service industries is that of frozen foods. Beside the volume, the effective management of interdependent operations regarding the production, storage, distribution and retailing of frozen foods ("the cold chain") is a key factor of success and a must for preserving the safety and quality of frozen foods. Therefore, the main concern is to regulate the aspects regarding safety, identification, quality, labelling and advertising of foods, in order to inform and protect the consumer, establish the traceability of the product and also to sustain a fair-trading. The final goal of this research is to presents the relevant standards for two categories of foods, related to hygiene, food additives, pesticide residues, contaminants, labelling and presentation, along with the proper methods for sampling and analysis. The paper will present key recommendations for processing, handling, distribution and storage of frozen beef meat and fish.

Key words: frozen fish, frozen beef meat, quality standards.

INTRODUCTION

Based on legislation, food represents any processed, partially processed or unprocessed product, designed for human consumption. As referring to quality, food laws deal with:

- *safety issues*: hygiene standards are implemented; undesirable substances, additives and contaminants are restricted and controlled;
- *composition issues*: producers must declare the nutritional and energetic value of food, as well as the presence of allergenic factors;
- *fair trade and consumer protection*: the consumer is protected against fraud by preventing the sale of altered, short-weighted, impure or low quality foods, along with preventing any false claims being made on labels and advertisements.

Food quality is a concept associated to the requirements that products must meet in order to be in compliance with their specifications, standards and consumer's expectations.

Also, the concept of *fair trading* statutes that labeling, advertising, packaging and food presentation, including the way food is arranged and displayed as well as promoted in any media, shall not mislead consumers (EuroIMM).

Beef meat and fish are products with a high nutritional value, containing good quality proteins and lipids (fish, especially), vitamins and minerals. The issue associated with these foods is the preservation of their qualities along the distribution chain. Refrigeration and freezing are the main preservation techniques used in meat technology, but these methods also determine the decreasing of the nutritional value of products (ISO/TC 34/SC 6).

MATERIALS AND METHODS

This research is part of a project that investigates the influence of freezing on beef meat and fish sensorial and physicochemical properties.

The present paper presents an overview of the literature and legal resources related to food quality and legislation (printed and/or available online) that apply to frozen beef meat and fish.

RESULTS AND DISCUSSIONS

Human health and wellbeing protection is mainly based on risk analysis in three different but interconnected areas:

- *risk assessment*- a scientifically based process consisting of:

- hazards identification;
- hazards types assessment;
- assessment of hazards exposure;
- risk assessment.

- *risk management*- the process of selecting appropriate prevention and control options.

- *risk communication*- the interactive exchange of information and opinions through the risk analysis process.

European Union and its Members are working tightly with the main international organizations for standardization and legislation involved in the area of food and feed, such as:

- Codex Alimentarius Commission (CODEX);
- World Organisation for Animal Health (OIE);
- IPPC International Plant Protection Convention (WOAH, Codex Alimentarius Commission).

The Romanian national stakeholder responsible for standardization is the Standards Association of Romania (ASRO). ASRO is a private, non-profit, non-governmental and apolitical entity of public concern, recognized as the only national standardization body by GD 985 of 7 July 2004, organized and existing under GO no. 39/1998 on the national standardization activity in Romania, approved with amendments by Law no. 355/2002(GD 985/2004, ASRO).

National standardization in Romania, similarly to standardization in most of the European countries, defines its duties as follows:

- Adoption of the European and international standards as national standards;
- Development, approval, revision and revocation of national standards;
- Providing public information by editing, publishing and disseminating of the new adopted standards;
- Romania's representation and involvement in the activities of international standardization bodies, regional and European;
- Ensuring the functioning of inquiry point for technical regulations and standards;
- Provision of consultancy services and training in standardization.

Thus, in Romania there are several technical committees aimed at standardization of different fields (CT committees). For example,

CT 95 - Food products and methods of analysis (EuroIMM) is the Romanian technical committee to perform standardization of:

- methods of microbiological analysis and sampling;
- terminology;
- guidelines for food and biological products in terms of production, processing, packaging, labeling and storage.

International technical committees on agriculture and food are ISO committees. In the area of foodstuffs there is TC 34 / SC 6 Committee to perform standardization for meat, chicken, fish, eggs products and their derivatives.

In order for a "Recommended International Standard" to be agreed it must pass through a complicated 10-step procedure. Thus, a typical standard document will include the following:

1. *Name of standard* - should be clear and concise, and should normally be the common name by which the commodity is known;
2. *Scope* - should contain a clear statement as to the food or foods to which the standard is applicable;
3. *Description* - should contain a definition of the product, with an indication of the raw materials, processing, types and styles, and form of pack;
4. *Essential composition and quality factors* - should give detailed quality specifications of all controllable quality factors, with tolerances where appropriate, e.g. odor, flavor, texture, size designation etc.;
5. *Food additives* - should give names of additives permitted and, where appropriate, maximum amounts permitted;
6. *Contaminants* - may highlight special problems. Should refer to the acceptable limits for contaminants;
7. *Hygiene* - the product should be prepared in accordance with the appropriate sections of the General Principles of Food Hygiene as recommended by the Codex Committee on Food Hygiene;
8. *Weights and Measures* - should give minimum total fill and minimum drained weight;
9. *Labelling* - should be in accordance with the "Recommended International General Standard for the Labelling of Pre-packaged Foods";
10. *Methods of analysis and sampling* - all

methods should be endorsed by the Codex Committee on Analyses and Sampling.

STANDARDS REVIEW FOR FROZEN BEEF MEAT

1. Determination of total ash (ISO 936/1998)

Scope: the determination of the total ash;

Definition: total ash from meat and meat products mass of the residue obtained after incineration at a temperature of $(550 \pm 25)^\circ\text{C}$ under the operating conditions specified in this International Standard, divided by the mass of the test portion;

Principle: a test portion is dried, carbonized and then incinerated at $(550 \pm 25)^\circ\text{C}$. After cooling, the mass of the residue is determined.

2. Determination of nitrogen content (ISO 937/1978)

Scope: determination of the nitrogen content of meat and meat products.

Definition: the quantity of nitrogen corresponding to the ammonia.

Principle: digestion of a test portion with concentrated sulfuric acid, using copper sulfate as a catalyst, to convert organic nitrogen to ammonium ions; alkalisation, distillation of the liberated ammonia into an excess of boric acid solution, titration with hydrochloric acid to determine the ammonia bound by the boric acid, and calculation of the nitrogen content of the sample from the amount of ammonia produced.

3. Determination of moisture content (ISO 1442/1997)

Scope: determination of the moisture content of meat and meat products.

Definition: loss in mass obtained under the operating conditions specified in the standard, divided by the mass of the test portion. Moisture content is expressed as a percentage of mass.

Principle: through mixing of the test portion with sand and drying to constant mass at $103^\circ\text{C} \pm 2^\circ\text{C}$.

4. Determination of total fat content (ISO 1443/1973)

Scope: determination of the total fat content of meat and meat products.

Definition: total fat content as a percentage of mass.

Principle: boiling of the test free the occluded the resulting mass, light petroleum, of portion with dilute hydrochloric acid to and bound lipid fractions, filtration of drying, and extraction with n-hexane or the fat retained on the filter.

5. pH value (ISO 2917/1999)

Scope: pH value of all kinds of meat and meat products, including poultry, applicable to products which may be homogenized and also to non-destructive measurements on carcass meat, quarters and muscles.

Definition: result of measurements performed in accordance with the procedure specified in this International Standard.

Principle: the potential difference is measured between a glass electrode and a reference electrode, which are placed in a sample or a sample extract of the meat or meat product.

6. Determination of chloride content (ISO 1841-1/1946)

Scope: determination of the chloride content, with sodium chloride contents $\geq 1.0\%$ (m/m).

Definition: total chloride content expressed as sodium chloride as a percentage of mass.

Principle: extraction of a test portion with hot water and precipitation of the proteins. After filtration and acidification, it adds of an excess of silver nitrate solution to the extract, and titration of this excess with potassium thiocyanate solution.

7. Determination of total phosphorus content (ISO 2294/1974)

Scope: determination of the total phosphorus content of meat and meat products.

Definition: the phosphorus content, expressed as a percentage of mass of phosphorus pentaoxide.

Principle: mineralization of a sample with sulfuric and nitric acids. Precipitation of the phosphorus as quinoline phosphomolybdate. Drying and weighing of the precipitate.

8. Determination of the sensorial characteristics of frozen beef meat (ASTM E1871/2010, ASTM E1885-04/2004)

Scope: sensory evaluation of beef meat (fresh, refrigerated and frozen).

Definition: standards show the protocol for sensory evaluation, sensorial descriptive analysis, standard test method for sensory analysis—triangle test.

STANDARDS REVIEW FOR FROZEN FISH

1. Standard for quick frozen blocks of fish fillet, minced fish flesh and mixtures of fillets and minced fish flesh (Codex Stan 165/1989)

Scope: applies to quick frozen blocks of cohering fish flesh, prepared from fillets or minced fish flesh or a mixture of fillets and minced fish flesh, which are intended for further processing.

Definition: quick frozen blocks are rectangular or other uniformly shaped masses of cohering fish fillets, minced fish or a mixture thereof, which are suitable for human consumption, comprising single or mixture of species with similar sensory characteristics. Fillets are slices of fish of irregular size and shape that are removed from the carcass by cuts made parallel to the backbone and pieces of such fillets, with or without the skin. Minced fish flesh used in the manufacture of blocks is particles separated skeletal muscle, free from bones, viscera and skin.

Principle: the freezing process shall be carried out so the temperature of maximum crystallization is passed quickly. The quick freezing process shall not be regarded as complete unless and until the product temperature has reached -18°C or colder at the thermal center after thermal stabilization. The product shall be kept deep frozen so as to maintain the quality during transportation, storage and distribution.

2. Standard for quick frozen finfish, uneviscerated and eviscerated (Codex Stan 36/1981)

Scope: frozen finfish uneviscerated and eviscerated.

Definition: frozen finfish suitable for human consumption, with or without the head, from which the viscera or other organs may have been completely or partially removed.

Principle: the product, after any suitable preparation, shall be subjected to a freezing process carried out in such a way that the range

of temperature of maximum crystallization is passed quickly. The quick freezing process shall not be regarded as complete unless and until the product temperature has reached -18°C or colder at the thermal center after thermal stabilization. The product shall be kept deep frozen so as to maintain the quality during transportation, storage and distribution.

3. Standard for quick frozen fish sticks, fish portions and fish fillets (Codex Stan 166/1989)

Scope: quick frozen fish sticks (fish fingers) and fish portions cut from quick frozen fish flesh blocks, or formed from fish flesh, and to natural fish fillets, breaded or batter coatings, singly or in combination, raw or partially cooked and offered for direct human consumption without further industrial processing;

Definition: A fish stick (fish finger) is the product including the coating weighing not less than 20 g and not more than 50 g shaped so that the length is not less than three times the greatest width. Each stick shall be not less than 10 mm thick. A fish portion including the coating may be of any shape, weight or size. Fish sticks or portions may be prepared from a single species of fish or from a mixture of species with similar sensory properties.

Fillets are slices of fish of irregular size and shape that are removed from the carcass by cuts made parallel to the backbone and pieces of such fillets, with or without the skin.

Principle: the product shall be subjected to a freezing process carried out in appropriate equipment in such a way that the range of temperature of maximum crystallization is passed quickly. The quick freezing process shall not be regarded as complete unless and until the product temperature has reached -18°C or colder at the thermal center after thermal stabilization. The product shall be kept deep frozen so as to maintain the quality during transportation, storage and distribution.

4. Determination of total inorganic and organic mercury (Codex Alimentarius 7-1991, EC Regulation 221/2002)

Scope: fish and fishery products can be infested with mercury, from the pollution agents in oceans and seas.

Principle: The tissue sample is digested at 100°C using a 45 % NaOH solution containing cysteine as a mercury binder(EC, 12.05.2004). .

5. Determination of the organoleptic characteristics of frozen fish (ASTM, 1983, STAS 9736-85)

Scope: establishes the technical conditions that frozen fish (entire, eviscerated, non-eviscerated or portioned) must comply before putting on the market.

Definition: standard shows the protocol for evaluation of the aspect, color, smell, aroma, consistency and texture for frozen fish.

Sanitary veterinary norm that establishes further requirements on sanitary veterinary control of frozen fishery products intended for direct sale to the final consumer (SVN, 9.11.2004)

– The products weighing over 3 kg are frozen individually. The products weighing less than 3 kg are frozen in a form of coated briquettes. The packaging must bear a label stating assortment, species, and date of freezing. Fresh frozen fish can be kept for 6 months in cold storage rooms at -18 °C, and for 10-15 days at a temperature of -12 °C;

– When the frozen products are to be sold at a temperature that will not maintain the preservation, the label will state clearly and prominently that the product has been defrosted, with respect to the official labeling and advertising related to food (Seafood Edu-online).

CONCLUSIONS

Standardization is an important criteria for assessing the progress made by Romania in the integration process to the European Union. Although the compliance with standards is not mandatory (the standards are not laws but rules, guidelines and characteristics for activities and their results), "*being in compliance*" certifies that the products, services and processes "in compliance" have the best quality while delivering the highest possible safety levels to the consumers (EC Reg.1169/2011).

The acceptance of European standards as national standards in EU countries aims primarily to fade away of technical barriers to

trade, so the countries will not deal with different requirements for the same products. The implementation of European standards helps to achieve the main principle of the European single market, namely the free movement of goods and services.

To meet these criteria, over 80% of European standards were adopted into the national legislation. Therefore, in Romania, in recent years, standardization activity was focused on the adoption of international ISO standards (especially the European standards) as EN Romanian standards.

While it is likely that national and European standards will always coexist in Europe, it is estimated that, over time, national standards of a Member State will be reduced to a share of 10% of all standards (EuroIMM).

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