



Bord Iascaigh Mhara  
Irish Sea Fisheries Board

## **Information Note**

# **Microbiological Testing and Shelf life Studies for Seafood Processors**

## **Background**

### **Shelf life**

The Codex Alimentarius defines shelf-life as the period during which a food product maintains its microbiological safety and suitability at a specified storage temperature and where appropriate, under specified storage and handling conditions. Shelf-life is defined in European legislation as the “date of minimum durability”.

**The Date of Minimum Durability** of a foodstuff is defined as the date until which a foodstuff retains its specific properties when properly stored.

At the end of a food’s shelf-life, the food begins to develop characteristics that are unacceptable or undesirable. These unacceptable or undesirable characteristics can be microbiological, chemical or physical.

For the Seafood Processor, shelf-life is a guide for the consumer of the period of time that the product which they produce can be kept before it starts to deteriorate, provided that any stated storage conditions have been followed.

### **Other Terminology used in relation to shelf life**

A **‘best-before’ date** is described as the date up until which a food can reasonably be expected to retain its optimum conditions i.e. the specific properties that are normally associated with that food).

A **‘use-by’ date** which is defined under Directive 2000/13/EC is required for foods which from a microbiological point of view are highly perishable and are therefore likely after a short period to constitute an immediate danger to human health and is the date up to which the food may be used safely i.e. consumed, cooked or processed, once it has been stored correctly. Most fresh, ready-to-eat and chilled foods fall into this category and require a ‘use-by’ date.

### **Legislative Requirements in relation to Shelf Life**

**Regulation 852/2004/EC on the Hygiene of Foodstuffs** states that *the primary responsibility for food safety rests with the food business operator. Therefore, it is the legal responsibility of the food business producing the food to determine the date of minimum durability, ensuring that the food is safe for that period of time under stated storage conditions, and label their food products accordingly*

**Regulation (EC) No 2073/2005 on the Microbiological Criteria for Foodstuffs**  
(*Consolidated version Regulation (EC) No 2073/2005 as at 19th May 2010*)

This regulation applies to all food business operators involved in the processing, manufacturing, handling and distribution of food, and includes retailers and caterers and states that *Food business operators must ensure that foodstuffs comply with the relevant*

*microbiological criteria and to comply with the regulation fully, they must also take the required action if a product is found to fail any of the criteria.*

The regulation does not specify minimum requirements for testing (except for carcasses, minced meat, meat preparations and mechanically separated meat, where harmonized minimum sample frequencies are specified); Nor does it require food business operators to carry out routine microbiological testing or to wait for the results of any testing carried out before the food is placed on the market. The criteria should be used to ensure that the food safety procedures are functioning correctly. Where testing is appropriate, the FBO can use their food safety management procedures to establish an appropriate sampling regime.

### **Microbiological Criteria**

There are 2 types of Microbiological Criteria:

**Food Safety Criteria** which should be used to assess the safety of a product or batch of foodstuffs. These apply throughout the shelf-life of the product.

**Process Hygiene Criteria** which help show that the production processes are working properly. These apply throughout every stage of manufacturing and handling.  
For Microbiological and Chemical limits please refer to Annex 1 of the above regulation

Food business operators involved in the processing, manufacturing, handling and distribution of food, including retailers and caterers must consider in what circumstances it is appropriate to use microbiological testing for products within their procedures based on HACCP principles and the general requirements of the hygiene regulations.

These can be used to validate and verify that these procedures are functioning correctly. They may also help with assessing the acceptability of foodstuffs and their manufacturing, handling and distribution processes.

Where testing is appropriate, the regulation allows food business operators to use their food safety management procedures to establish an appropriate sampling regime. The level of sampling required will depend on considerations such as the procedures in place, the risk associated with the product, and the nature and size of the business.

Where microbiological testing is considered appropriate, the Regulation allows a number of flexibilities in terms of **Sampling and Testing Frequency**. For example, food businesses that carry out regular microbiological testing will not need to test every batch against the microbiological criteria to demonstrate compliance.

Food businesses may also satisfy the criteria through their own controls and develop procedures that use alternative indicators, such as time/temperature profiles, which demonstrate that the same end result is achieved. Where testing is appropriate, sampling frequency should be based on risk, taking account of instructions for use of the foodstuff (e.g. ready-to-eat, intended to be eaten after cooking or other processing).

Other ways to demonstrate compliance with the criteria could include operation of good hygiene practices and good manufacturing practices demonstrating, for example, procedures to monitor that food is being cooked thoroughly, to ensure the cold chain is maintained, to ensure raw foods are stored separately from cooked foods and to ensure that an effective cleaning system is in operation.

Chapter I of the Regulation provides the minimum level to be observed when specifically assessing the acceptability of foodstuffs or a process. However, food business operators may reduce the number of sample units in sampling plans from that specified in Chapter I of the Regulations based on risk, as long as they are able to provide evidence to support the proposed sampling plan and satisfy the competent authority that effective procedures based on HACCP principles and GHP are in place.

Other sampling or testing procedures may be used if it can be demonstrated that they provide at least equivalent guarantees.

### **Hazard Analysis Critical Control Point (HACCP) in relation to Shelf Life**

All Food Business Operators carrying out any stage of production, processing, or distribution of food after primary production, must legally develop a Food Safety Management System based on the principles of HACCP. A HACCP system will identify potential hazards and will monitor and control these hazards. If applied systematically it will allow Food Business Operators to determine and maintain accurate product shelf life.

#### **Shelf life study**

A shelf life study is a methodical means to determine how long a food product can reasonably be expected to keep for, without any appreciable change in quality.

There are 2 methods used in determining shelf life:

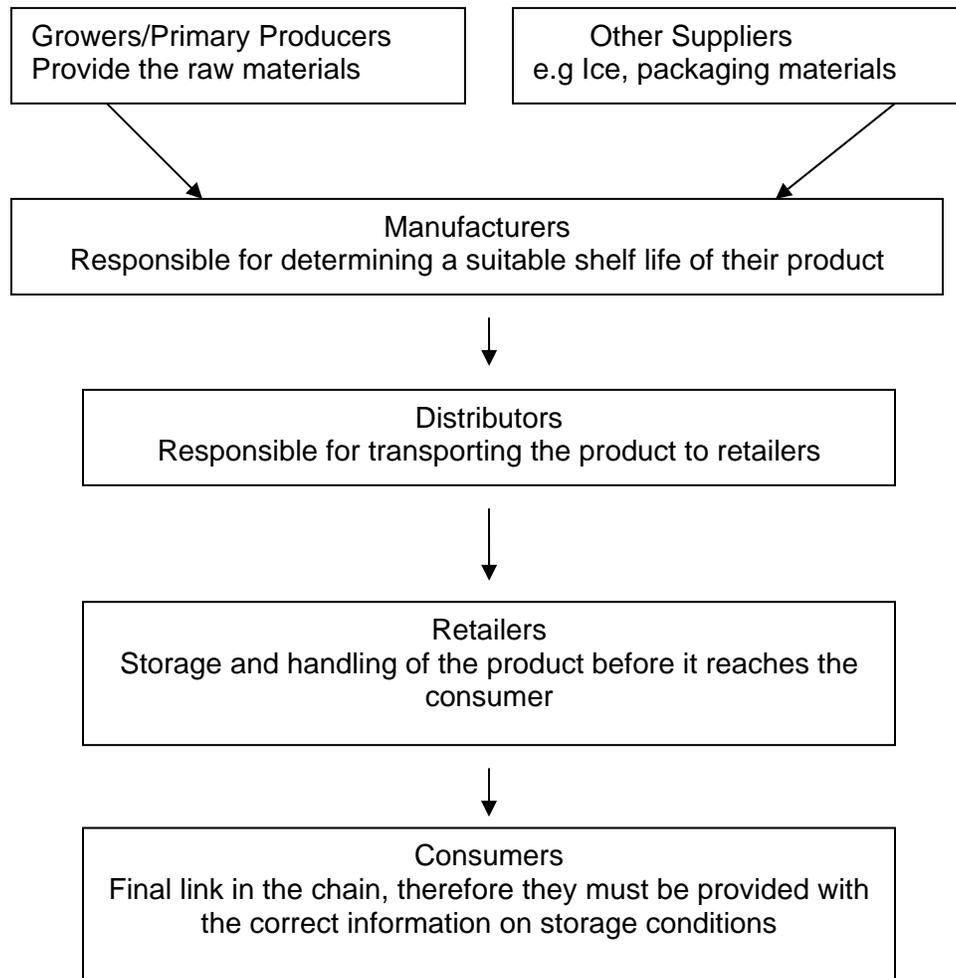
#### **Direct Method**

The product is stored under pre selected conditions for a period of time longer than the expected shelf life and the product is checked at regular intervals to see when it begins to spoil.

#### **Indirect method**

This uses accelerated storage and/or predictive microbiological modelling to determine a shelf life.

## Factors Influencing the Shelf life of your Product



For Seafood Processors, it is essential that raw materials coming into the premises meet with the company's product specification. This applies to all materials, including packaging etc. Supplier control is an essential element of the Company's Food Safety Management system that incorporates HACCP.

The Food Business operator is responsible for ensuring that the product is processed under the correct conditions for processing and storage and that the final product meets with the specified criteria.

### Calculating Shelf life using the Direct Method.

Before placing product on the market, processors should:

1. Identify what may cause their product to spoil or become unsafe.

2. Decide which tests to use.
3. Plan the Shelf life study.
4. Determine the Shelf life.
5. Once product is on the market, continue to monitor its shelf life.

### **Deciding which tests to use**

In general, these can be decided under 4 categories.

1. Sensory evaluation- This assesses the appearance, smell, texture and flavour of the product and must be assessed under the conditions at which it is designed to be stored and consumed and is monitored over time.
2. Microbiological Testing- This is carried out to assess food quality and safety.  
Reference: 2073/2005 Microbiological Criteria
3. Chemical- These tests will detect changes in the products quality throughout its shelf life e.g. pH, Histamine, TVBN.
4. Physical – e.g. packaging, measuring product texture.

### **Calculating Shelf life using indirect methods**

Examples:

1. Accelerated shelf life studies- objective is to shorten the trial period to increase the rate of deterioration. This is usually by increasing storage temperature.
2. Predictive modeling - based on mathematical equations which use information from a database to predict bacterial growth under defined conditions.

**In Planning a Shelf Life Study** -The Food Business Operator needs to decide, in addition to what tests need to be carried out.

How long will the study run for?

How often tests will be carried out?

How many samples will be tested each time? (It is recommended that samples are tested in triplicate.)

When the FBO is running a shelf life study-It must be ensured that the samples being tested are stored under the same conditions as normal. Eventually, a point is reached in the study over time where the product no longer meets with requirements as specified. It

must then be decided how long the product can be kept that it will be safe to eat and that the product quality is still acceptable.

This shelf life can be repeated a number of times until the FBO is satisfied and allowances have been made for storage conditions and temperature abuse that may vary. This can be limited by specifying the storage conditions.

### **Monitoring the Shelf life**

The FBO must monitor the product to ensure it is safe and of good quality throughout its shelf life.

When determining the shelf life of foods, special consideration should be given to high risk foods that will support the growth of:

- *Listeria monocytogenes*.
- Are sold ready to eat
- Are sold refrigerated
- Are stored for long periods of time (>10days)

Where necessary, FBO's may use models, challenge tests or any other type of study appropriate for showing the behaviour of microorganisms of concern, which includes relevant historical product data.

### **In relation to *Listeria monocytogenes***

If shelf life studies show that counts of 100cfu/g of *Listeria monocytogenes* are likely to be exceeded before the end of the shelf life, options include reviewing food safety management procedures, or ensuring absence in 25g before the food leaves the immediate control of the food business operator.

### **Disclaimer**

This information note does not purport to be comprehensive or to be a legal interpretation or to constitute legal or other professional advice. Changes to the legislation may be expected that will necessitate this information note to be further updated.