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BEST BEFORE: DEC 2017

INDUSTRY GUIDANCE ON
SETTING PRODUCT SHELF-LIFE

November 2017, Version 1

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FOREWORD

Reducing food waste, without any compromise to the safety of food, is a commitment we at the Food Standards Agency share with the FDF. I welcome the publication of this sensible guidance on setting product shelf life, and explaining what factors affect the expiry date of a food product. This is another welcome step towards preventing safe food from going to waste.

Heather Hancock, Chairman of the Food Standards Agency

BACKGROUND

Food waste is an issue that all parts of society can unite in reducing. The food and drink industry has a pivotal role in ensuring that consumers understand the date marks on food and drink products and use them in support of food safety as well as waste reduction. It is the responsibility of Food Business Operators (FBOs) to set shelf lives such that food safety is assured whilst at the same time ensuring that no safe and high quality food is discarded due to inappropriate date marking. Working with organisations such as WRAP, it is our shared ambition to deliver environmental benefits within a commercial context, bringing long term mutual outcomes for all parties.

However, the shelf life of a food must be assessed carefully and with the full knowledge of the risks involved, to avoid putting the consumer and ultimately the Food Business Operator (FBO) at risk. Setting shelf-life typically involves a number of steps as outlined below. This often includes shelf-life studies which aid in determining the length of time the product will meet certain standards in relation to parameters such as microbiology, taste, appearance, vitamin levels and smell.

To note the EU regulations referenced in this document may be subject to change after the UK exits the EU.

SCOPE

The guidance is designed to help FBOs engaged in the production or sale of any category of food and ingredients to assign the most appropriate expiry date for their product.

It must however be noted that this guidance does not replace the need for technical expertise which should be sought if it is not available within a food business.

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APPLICATION OF MINIMUM DURABILITY

The application of each type of expiry date is laid down in the Food Information to Consumers Regulation (Regulation (EU) No.1169/2011) as well as in other guidance documents and so will not be covered in detail here.

With the exception of a number of designated foods under the Food Information to Consumers Regulation (Regulation (EU) No.1169/2011) it is a mandatory requirement that foods carry a use by date or the date of minimum durability – in the form of a best before date.

However, in summary the terms **Use By** and **Best Before** are not interchangeable and should be applied as follows:

USE BY:

Must be used for those foods which are highly perishable from a microbiological point of view. After a relatively short period, these foods are likely to present a risk of food poisoning, and so this relates to the safety of the food. 'Use By' expires at midnight on the date shown. Typically, this form of date coding is found on fresh and ready to eat foods such as cream cakes or cooked meat. After the 'use by' date food is deemed unsafe and it is a criminal offence to sell it.

BEST BEFORE/BEST BEFORE END:

This kind of expiry date is used to indicate the period for which a food can reasonably be expected to retain its optimal condition and so relates to the quality of the food. This is the point at which the taste or eating quality may begin to decline. The food will still be safe to eat beyond this point but it will not be at its best. Legally food that has passed the best before date and is still fit for human consumption can be sold. Commonly it will therefore be found on items such as ambient, dried or frozen foods. In view of the vast range of food products, the expected shelf life related to the quality of the product can range from a few days (bread and baked goods) to greater than a year (canned goods, dry goods, frozen food). Similarly, the 'best before' date accommodates the wide range of shelf life applied to such products. Accordingly, the Regulations recognise that the format of the coding needs to be flexible for the range of dates covered. For a shelf life under 3 months, an indication of the day and the month is sufficient; between 3 months and 18 months an indication of the month and year is sufficient; for more than 18 months, an indication of the year is the minimum required.

The type of expiry date must therefore be taken into account when reviewing the shelf-life that is assigned to ingredients, work in progress or products that are ready for sale. We discourage the use of 'Use By' dates as a default for unsubstantiated application.

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FACTORS AFFECTING SHELF-LIFE

1. RAW MATERIALS

› If incorporated into another product without being processed or significantly changed (e.g. chilled ham placed on a chilled raw pizza or included in a sandwich), the life of the final product should not exceed the life declared for the raw material.

› If a raw material is changed during processing (e.g. by being cooked) or if the storage requirements change (e.g. chilled raw material but frozen final product) the life given to the final product should be re-assessed.

› The food safety controls used to set the raw material life should be understood to ensure that any impact a change may have is understood. Examples are:

    › if a raw material has a long shelf life due to being very dry (low A_w) and it is then added to a wetter product (higher A_w), the shelf life is likely to reduce.

    › if packed in Modified Atmosphere Packaging (MAP), the shelf life only applies whilst the packaging remains sealed and the shelf life may significantly reduce when the package is opened e.g. a bag of salad is opened and the salad added to a sandwich. Even if MAP has not been employed, fresh produce will naturally modify the atmosphere in the pack and so again opening the pack may have an impact on the remaining life.

2. PRODUCT DESCRIPTION

The type of recipe (e.g. sliced honey roast ham) is not sufficient information on which to base the shelf-life of a product and therefore it is inadvisable to simply copy the life assigned to someone else's product or from a similar in-house recipe. For products where Listeria monocytogenes is a hazard, shelf life must be established according to Annex II of Commission Regulation (EC) 2073/2005 on Microbiological Criteria for Foodstuffs as amended. FSA Guidance on EC Regulation 2073/2005 as amended by EU Regulation 1441/2007 is also available.

› Controls used in a designated ingredient to ensure food safety such as pH, type of acid, preservative, water activity and humectant may be specific to that ingredient and may not be of the same type, added in the same quantity or may not be present at all in similar ingredients. Once combined in a recipe, their effectiveness may also be reduced or increased on interaction with other ingredients.

› The mix and quantity of ingredients used in the recipe may also affect parameters such as leaching of colour in layered product or the rate of fat oxidation, which in turn can influence consumer acceptance and therefore the shelf life of the product.

3. TYPE OF PACKAGING

› Use of MAP for the food being produced may enable a longer shelf-life to be assigned than would otherwise be possible.

› Vacuum packaging can extend product life by removing all air from a package which is then sealed. The removal of the air is the key factor for preservation in these products although it should be noted that for some chilled foods this can increase the risk from some types of food poisoning bacteria, e.g. Clostridium botulinum, that will only grow in the absence of oxygen and in such cases additional controls will be required to be used in combination.

FACTORS AFFECTING SHELF-LIFE contd

> 'Active' packaging materials in the form of sachets or altered packaging materials may be used to extend life either by adding or removing gases (e.g. oxygen) from a pack over life or by controlling the rate at which certain gases can pass through the film.

> Different packaging materials may react differently on contact with food and consideration should be given to potential migration of chemicals from different packaging materials over time.

> 'Secondary' and 'tertiary or transport' packaging must not be ignored for these will often be designed to protect the primary packaging in direct contact with the food e.g. glass jars are designed to protect the food whilst the tertiary and secondary packaging are designed to protect the glass jar during its journey along the rest of the supply chain. Knowledge of the supply chain and handling requirements will be needed to ensure that external packaging carries sufficient information to ensure the primary pack and product is stored and handled correctly.

4. TEMPERATURE

> The temperature to which foods are exposed may greatly affect the length of time that a food remains safe or of a suitable quality for consumption. Selection of the most appropriate temperature regimes and applying them consistently is therefore extremely important not just for finished product but also during preparation.

> Consideration must be given to what can reasonably be expected to happen once the food has left your control and it should be noted that allowing for 'abuse' or mishandling is a legal requirement under the Consumer Rights Act 2015, the commentary for which states:

'the test of whether or not the quality of the goods is satisfactory is determined by what a reasonable person would consider satisfactory for the goods in question, taking into consideration all relevant circumstances…'

Therefore, while instruction may be given for a food to be stored at +5°C or below, as it is reasonable to expect higher temperatures to occur in a consumer's car and that the food will actually be held at below +8°C due to the normal operating temperature of a domestic fridge, these temperatures must be allowed for when setting the shelf-life. In some cases, the difference between the safe shelf life that can be obtained under ideal conditions and the shorter shelf life that occurs when allowing for such abuse is referred to as a 'buffer'. However, it is advisable instead to think of this as a safety zone designed to protect both the consumer and the manufacturer or seller of the food.

> If food is exported, do not assume that your product will be handled or stored under the same conditions as in your own country. The business to consumer supply chain should be considered in setting the appropriate shelf life. This will require investigation.

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FACTORS AFFECTING SHELF-LIFE contd

5. HYGIENE

Product design and assessment in isolation does not provide enough information to enable the setting of shelf-life in relation to food safety. It is therefore important to consider:

> **Building Design**
> The environment used for storing and handling both foods and food contact packaging will commonly range from a high risk environment where the aim is to prevent contamination from micro-organisms to a low risk area where the aim is to minimise the growth and contamination of micro-organisms. In some cases, there may even be 'zero care' environments such as outside catering. Clearly the lower the level of control achieved, the greater the risk of contamination that could immediately, or after a period of time, create a food safety problem.

> **Process Design**
> Bacteria are highly unlikely to be completely absent from anything other than highly specialised food production areas or types of foods (e.g. NASA's meals for astronauts) and so it is important to build up a clear picture of where bacteria may exist, how quickly numbers increase and how they might contaminate the food. The effectiveness of cleaning, the length of time equipment is used before being cleaned and the sources of bacteria should therefore be carefully assessed. It is advisable to make use of laboratory testing to analyse findings and validate hygiene programs.

> **Equipment design and storage**

>> The harder equipment is to clean and the longer it takes to clean, the less likely it is to be cleaned and disinfected effectively.

>> It is unlikely that equipment will remain in a hygienic condition indefinitely without specific controls being applied. The frequency of use and the controls in place to prevent re-contamination of clean equipment should therefore be understood before deciding upon the shelf-life to apply.

6. EXPECTED USAGE AFTER OPENING

Different foods can be expected to be used in different ways from a packet of cereal being opened and lasting a number of weeks to an ice cream lolly that is likely to be consumed immediately on opening.

> Where there is any likelihood of a foodstuff not being consumed immediately on opening, this secondary or open life must also be allowed for taking into account all of the factors described above in relation to the food and the consumer's environment such as a domestic kitchen.

> It is a legal requirement to provide the consumer with any special instructions 'if they will need them to use the food appropriately'[1]. This includes instructions on preparation such as defrosting or cooking, how to store the food once the package is opened, or to consume immediately.

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[1] Defra Guidance on Food labelling: giving food information to consumers (June 2015)

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VALIDATING THE SHELF-LIFE PROPOSED FOR A FOOD

Once the above factors have been understood and a shelf-life proposed, testing will need to be undertaken to identify the actual life of the product. This must take into account both the shelf-life assigned to the unopened pack and any secondary use-by instructions that apply after the primary package has been opened.

Shelf-life prediction software is a useful tool for identifying the possible life that may be achieved based on data entered for a number of parameters. However, such software should not be used in isolation to set the shelf-life of a food due to the high number of variables that will affect the actual life achieved.

The food to be tested must be made in exactly the same manner and on the same equipment as will be used during a normal day's production. Where a long production run is applied, consideration must be given to all factors that may impact the shelf life. It is therefore advisable to take samples throughout the production run.

Both the organoleptic quality and the food safety standards achieved will need to be tested which in general will require the use of taste panels and microbiological analysis as a minimum. As the organoleptic qualities of the food will generally require the food to be eaten, it is highly advisable to first undertake microbiological testing of the food to provide assurance that it is safe to eat on the day of testing. If any legal claims are made (e.g. in respect of nutritional content) then this will also need to be factored into testing for any nutrients that may degrade over time.

Advice on which bacteria should be included in the testing should be gained from an expert such as an industry association, accredited laboratory or independent consultant unless suitable expertise exists within the FBO.

When deciding upon the test regime, reference should be made to customer and legal requirements, both of which may require pathogen testing to be undertaken e.g. legislation and guidance in relation to the presence of Listeria monocytogenes[2] or Clostridium botulinum (see section on Additional Information, below). It is also advisable to ensure that accredited test methods are being used.

Where a specific pathogen and/or spoilage microorganism is identified as likely to be present in a food then challenge testing may be appropriate. However, expert advice should be sought to ensure that all the limitations of such testing are fully understood.

Once a shelf-life has been validated and the product is placed on sale, repeat testing should then be scheduled even if no obvious changes have been made to the recipe or instructions given. This will ensure that any variation that may occur within the supply chain, affecting ingredient quality without your knowledge, is taken into account.

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[2] For products where Listeria monocytogenes is a hazard, shelf-life must be established according to Annex II of Commission Regulation (EC) 2073/2005 on Microbiological Criteria for Foodstuffs as amended. FSA Guidance on EC Regulation 2073/2005 as amended by EU Regulation 1441/2007 is also available.

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Summary Flowchart for setting the shelf-life of a food

Agree the Recipe and storage conditions

Identify what will cause the food to become unpalatable or unsafe

Predict the life of the product

Design the test regime

Test the safety of the food to the end of the predicted life

Test the Organoleptic Quality at the end of food safe life

Set the shelf-life

Reassess routinely or after an ingredient or process change

DO'S AND DON'TS

Do

> Make use of technical expertise

> Allow for abuse that may occur when the product is out of your control

> Routinely schedule end of shelf life safety and quality testing

> Ensure that shelf-life trials are carried out using the same ingredients as are to be used in the production plant, and using the same factory equipment and procedures in the manufacturing environment as will be used during standard production

Don't

> Assume you can copy the shelf-life assigned to a similar product

> Extend the life of the original ingredient(s) unless you have altered them in some way that enables the extension e.g. cooking and have validated that it has been effective

> Change an ingredient without reviewing its effect on the finished product's shelf life

> Assume the food will be kept in perfect conditions after it has left your control

> Rely solely on shelf-life prediction software

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GLOSSARY OF TERMS

Active Packaging: 'packaging in which subsidiary constituents have been deliberately included in or on either the packaging material or the package headspace to enhance the performance of the package system' (Robertson, 2006).

Challenge testing: deliberate inoculation of product with relevant microorganisms that have the potential to survive or grow within the product during normal storage conditions (challenge tests can allow the risk of food poisoning to be evaluated if contamination occurred).

Humectant: a substance such as a food additive, used to reduce the loss of moisture.

MAP - Modified Atmosphere Packaging: Altering the natural percentages of nitrogen, oxygen and carbon dioxide within a food package with the aim of extending the life of a food.

Organoleptic: the taste, smell, appearance and texture of the food.

Secondary or Open life: the period of time during which a food will remain safe and of a suitable quality for consumption after the primary product packaging has been opened.

Shelf life: the period of time during which a food will remain safe and of a suitable quality for consumption while stored as instructed and in any unopened packaging within which it was supplied[3].

Shelf-life studies: assessment of the growth of microorganisms likely to be present in, or able to cross contaminate, a batch of product.

Vacuum packaging: product is placed into a strong pouch from which all the air is removed under vacuum before it is sealed. The removal of the oxygen present in the air prevents many food poisoning bacteria and spoilage organisms from growing and stops 'aerobic' reactions that could lead to off taints or colours. However, the lack of oxygen may stimulate the growth of the potent pathogen, Clostridium botulinum, and this needs to be considered in any anaerobic pack.

[3] This is defined in Article 2(f) of Commission Regulation (EC) 2073/2005 on Microbiological Criteria for Foodstuffs as amended

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ADDITIONAL SOURCES OF INFORMATION

FSA Guidance on Food Information Regulations (FIR) (December 2014): Summary guidance for food business operators and enforcement officers in Scotland, Wales and Northern Ireland contains a section on date labelling.

The **DEFRA / FSA guidance on the application of date labels to food** issued in September 2011 references to the Food Labelling Regulations 1996, it should instead be considered as references to FIR. This guidance was designed to help businesses to decide whether to label their food products with either a 'Best Before End' or a 'use by' date.

Defra Guidance on Food Labelling: Giving Food Information to Consumers (October 2016) contains a section on date labelling

The Waste and Resources Action Programme (WRAP) **Information Sheet Updating Guidance to Food Businesses on the Application of Date Marks and Related Advice** (April 2017)

WRAP **Product Life Feasibility Study** (September 2012) – a study that examined how manufacturers and retailers set product life and how much of this time is taken within the supply chain.

WRAP **Working with Businesses to Reduce Food Waste by Extending Product Life** (March 2015) – an overview.

WRAP **Food Waste Prevention** – a guide to help you and your business challenge existing product life and 'open' life.

WRAP **Food Waste Prevention - A Worked Example.** To be read in conjunction with 'a guide to help you & your business challenge existing product life & 'open' life' (above).

FSA/FSS Guidance on the safety and shelf-life of vacuum and modified atmosphere packed chilled foods with respect to non-proteolytic Clostridium botulinum published by the FSA in June 2017 intended to assist food businesses, including manufacturers and retailers of chilled vacuum packed and modified atmosphere packed (VP/MAP) foods in the practical development and implementation of a HACCP (Hazard Analysis Critical Control Point) based approach for these foods to minimise the risk of Clostridium botulinum. It explains the 10-day shelf-life rule and the requirement for additional controlling factors, where the shelf-life is greater than 10 days.

Shelf Life of Ready to Eat Food in Relation to L. monocytogenes – Guidance for Food Business Operators (the Shelf Life Guidance) was published in March 2010 by the Chilled Foods Association and British Retail Consortium. It is designed to help businesses from small food outlets to major food manufacturers calculate an accurate time period for people to eat food and minimise the risk of illness. The Guidance is also designed to help firms meet European Union microbiology rules – in particular Regulation (EC) No. 2073/2005. This sets limits on micro-organisms, such as listeria, in food.

Food Safety Authority of Ireland Guidance Note 18 on Validation of Product Shelf Life (version 2) from 2014

International Commission on Microbiological Specifications for Foods: Microorganisms in Food 8, Use of Data for Assessing Process Control & Product Acceptance (2011). In Chapter 2 - Validation of Control Measures - there is a section (2.6) on Shelf Life Determination. This covers time-temperature indicators and time-temperature abuse.

Publication by Campden BRI: Food and beverage stability and shelf life 2011. Part 1 describes important food and beverage quality deterioration processes, including microbiological spoilage and physical instability. Chapters in this section also investigate the effects of ingredients, processing and packaging on stability, among other factors. Part 2 describes methods for stability and shelf life assessment including food storage trials, accelerated testing and shelf life modelling. Part 3 reviews the stability and shelf life of a wide range of products, including beer, soft drinks, fruit, bread, oils, confectionery products, milk and seafood.

Publication by Campden BRI: Evaluation of product shelf-life for chilled foods 2004 (Guideline No. 46) The core of the guide is organised around a series of shelf-life 'evaluation sequence' flowcharts - from pilot scale through pre-production run to full scale production. Supplementary information - such as tables of information on factors limiting microbial growth, microbiological tests that can be used in shelf-life trials, and factors that can affect shelf-life - provides a basis for further consideration of the practical aspects of shelf-life determination.

About FDF

The Food and Drink Federation (FDF) is the voice of the UK food and drink industry, the largest manufacturing sector in the country. We communicate our industry's values and concerns to Government, regulators, consumers and the media. We also work in partnership with key players in the food chain to ensure our food is safe and that consumers can have trust in it.

Disclaimer of liability

Every effort has been made to provide accurate and complete information. However, FDF expressly disclaims liability for errors and omissions in the content.

Contact the FDF team to learn more.

Food & Drink Federation
6th Floor, 10 Bloomsbury Way
London WC1A 2SL

020 7836 2460
generalenquiries@fdf.org.uk
www.fdf.org.uk

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