Shelf Life Testing

'The length of time for which any particular food can be kept will depend on the nature of the food itself, and the preservation treatments to which it has been subjected. The type of packaging used to contain the food will also have an inherent effect. It is up to the manufacturer of the food to determine and assign the shelf life of the food they produce, keeping in mind the requirements of relevant legislation, such as the Food Safety Act 1990 and Regulation (EC) No 178/2002 (the 'General Food Law Regulation'). '

What affects a product's shelf life?

A product's shelf life is determined by a number of things including whether it is fresh or frozen, the packaging that is used and the quality of the ingredients when you manufactured the product. Storage conditions after manufacture can also impact whilst storing the product and the consumers' handling and storage at home. Product formulation and additions (such as acidification, drying, smoking, preservatives such as sugars, salts or chemicals) also affect shelf life.

Determining a method to work out shelf life

Shelf life cannot be determined just by copying a similar product's shelf life. You can start to gather some data in-house about shelf life performance of your products, but this shouldn't replace professional advice or laboratory testing. Your local EHOs may be able to assist in providing general support.

Shelf life validation of products

Determining a 'best before' or 'use by' date can be tricky and may take some testing. The rigour for chilled products will be significantly greater than for frozen products. If a product is hygienically prepared and frozen quickly using a fast-freeze method, then the product is unlikely to be unduly affected by microbiological deterioration during the frozen storage. There are quality changes, such as build-up of ice crystals and oxidative rancidity that can affect products and will need to be considered. For validation of frozen products, microbiological end of life testing can be at a minimal level with samples retained at and beyond the defined shelf life to validate date selection.

For chilled products, don't assume your ready meal can have the same dates as a ready meal sold in a supermarket as mass produced ready meals often have 'Modified Atmospheric Packaging' where the oxygen is removed from inside the packaging and replaced with a mix of gases to extend the shelf life of the product. This is not really an option for small-scale production (although the technology is becoming more affordable), but important to note when determining a best before date. Shelf life for chilled products will be based on a programme of microbiological validation combined with end of life sensory evaluation through organoleptic assessment.

For completing a formal validation, you should contact an accredited laboratory that can support the testing process. Qualified microbiologists working in accredited laboratories are often able to provide advice on testing protocols. The normal methodology is to establish an approximate idea of the shelf life required and this can be informed by review of 'like' products, but be cautious as different manufacturers can have vastly differing controls. A decision will be needed as to whether testing will be needed for the whole product range or representative products (normally based on 'worst case' whereby formulations are most prone to microbiological growth may be selected to reduce the cost of testing the entire range.

Products are made using standard methods and processing criteria and samples are taken hygienically (can be in unopened original packaging for submission). Testing by the laboratory will normally be undertaken on the date of receipt (P+0) and at defined intervals, with a separate sample to be submitted for each test. As an example, if for a chilled product, a date of 7 days' shelf life was being tested, products would be tested on day 6, 7, 8 and 9. Normal testing will go beyond the desired shelf life date as a precautionary principle. Products will normally be kept in accordance with the instructions (notably in regard to temperatures). More detailed studies may also include some temperature abuse to better reflect consumer controls that may not follow best practice temperature control. Testing will normally be reported and laboratories should advise on the acceptability of results against published guidelines or legal requirements.

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REVIEW BY: Mar 2024

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In addition to shelf life microbiological testing, sensory evaluation of products (organolepsis) is advised as a parallel study to the test programme. Ambient and low risk products such as pickles, cakes and biscuits may be assessed purely by sensory evaluation in setting a sensible shelf life and this is related to product quality rather than safety.

Sensory testing in the kitchen - sight, taste, smell and texture

Building an evidence base of in-house shelf life testing can help improve product quality and development and help ensure you are meeting your expected best before / use-by dates that the consumer expects and meeting your original specification and ambition for your food products, or to help you respond to a food safety issue.

1. Put by a number of units from each batch in their consumer facing packaging and ensure they are clearly labelled with which batch they were from. How many depends on whether your product is fresh or frozen and how often you intend to test. For example, you may want to test a frozen product every month for 4 months, or if fresh, every day for 7 days. These will make up your shelf life test samples. You may want to do an extra test beyond the best before date or use by date (if you feel safe to do so) to enable to see if you are able to extend the shelf life.
2. Keep those samples as per your storage instructions for the consumer.
3. When ready to take your shelf life test, prepare one sample as per the consumer cooking instructions, On your shelf life record, note down the date of test and the batch number.
4. Once prepared taste the sample - ensure you have not recently eaten anything with strong tastes, or have a glass of water before you test. You should have at least two people to taste the sample to ensure your results are objective.
5. You will need to assess the following:
    a. Odour / Aroma
    b. Texture
    c. Taste
    d. Colour
    e. Appearance

Document you comments and results and keep with your product records. What this method does not tell you is all of the the microbiological changes that are happening in your product as it ages so it is advisable to determine a lab testing regime to determine if your products are holding up to environmental and microbiological pressures. Use your laboratory tests alongside your own tests to determine your shelf life more accurately,

Please note this guidance in this sheet does not replace the need for technical advice on shelf life. Expertise should be sought if it is not available within your food business.

References, links and further guidance

https://www.leatherheadfood.com/files/2016/11/White-paper-Using-sensory-shelf-life-testing-to-drive-consumer-satisfaction-FINAL.pdf
https://www.sensorysociety.org/knowledge/sspwiki/Pages/Sensory%20Shelf-Life%20Test.aspx
https://www.campdenbri.co.uk/white-papers/determine-product-shelf-life.php
https://www.fdf.org.uk/globalassets/resources/publications/guidance/shelf-life-guidance.pdf
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V1, created by RF & JD 2022
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