

BACTERIA PRESENCE WITHIN THE DAMAGED CANNED MEAT PACKAGING AND SURFACE SAMPLES OBTAINED FROM BATH, UNITED KINGDOM MARKET

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Abstract

The study was carried to survey a total of 60 samples of canned meat (20 samples of canned pork, 20 samples of canned meat with sauce and 20 canned fish). The samples were obtained from local markets in Bath city and Wiltshire County within the United Kingdom, during three months January – March 2015. The samples were relocated to laboratory and kept at room condition (temperature and humidity). Thus, the scope of the present study was to conduct bacteriological measurements for the quality control of canned meat stored at 20°C for up to 15 days. In this paper, variations of the cans integrity are analysed to reveal the correlation between cans structure and the evolution of the spoilage organisms developing in food cans, semi-finished goods meat product and on fish packed meat. The study was focused on analysing the growth behaviour of the spoilage flora in the processed meat product, and on liquid medium rather than in fresh meat. Based on these analyses it was observed that all cans that are damaged deeply, more than cans that are superficial scratched, had a growth of microbiological spoilage. The bacteriological examinations of external surface showed negative results, so there no pathogenic microorganisms attached to the surface, but some presence of moulds was highlighted in this study.

Key words: bacteriological measurement, spoilage organisms, canned meat, shelf life.

INTRODUCTION

Canned meat and derivate products are considered as an alternative way to keep food away from microbiological and other contaminations, but there are some specific situations when it fails to be a good shelf preserver and the food matrix can be a good media to develop microorganisms.

Not all microorganisms are dangerous for human health, but most of them are developing toxins that are poisonous for ingestion.

The pasteurization and sterilization of cans transform meat, vegetables and fruits into safe food products, hermetically closed by the metallic tins. Though, some external forces can shift them into unsafe products. Even when the tins are perfectly closed, contamination may appear due to poor hygiene of the storage spaces and of the handling tools (Fraser, O. P., Sumar, S., 1998).

The meat acidity of the properly processed products can be altered by the low and very low modification of its metal tin structure and in consequence spoilage can appear if incubated at different temperatures. Such an example is

the occurrence of *Escherichia*, which is one of the main food safety indicators.

For many people, the canned meat represents an important source of nutrients within the daily nourishment. Meat is an important food element, which keeps suffering chemical and biochemical alterations even after its complex processing and transformation into secondary food products (Le Loir, Y. et al., 2003). As it has a high content of water, meat represents a good environment for bacteria development (Krieg, N. R., 1984).

MATERIALS AND METHODS

The study was conducted to evaluate a total of 60 samples of canned meat (20 samples of canned pork, 20 samples of canned meat with sauce and 20 canned fish). The samples were collected from local market in Bath, Somerset, UK.

Diluted canned meat samples in standard saline was practiced onto these micro well substrates and incubated at 35 - 37°C for 18 - 24 hours, except detection of fungi, which were incubated at 25°C for 5 days. *Staphylococcus* segregates were exposed by microscopic,

cultural and habitual biochemical tests. Progressing dilutions up to sixty were prepared for the microbiological analysis.

One of the materials used was Microgen Bacillus-ID (MID-66), a miniaturised biochemical identification system designed to identify those Mesophilic *Bacillus* spp. and related genera associated with food and beverage spoilage and food poisoning. The method uses classical biochemical substrates modified in such a way that they can be employed for the identification of these organisms. The Microgen *Bacillus*-ID identification system consists of 2 microwell test strips (labelled BAC 1 and BAC 2), each containing 12 dehydrated substrates for the performance of either carbohydrate fermentation tests or other biochemical based tests. The last well in the second test strip is a carbohydrate fermentation control well for use as a reference well in the interpretation of these tests. The selection of the substrates included in the test panel has been determined using computer based analysis of all available substrates for the identification or differentiation of this group of organisms.



Figure 1. Microgen Bacillus-ID identification system

The second type of assessment was obtained using Microgen GNA Identification system for Gram Negative Bacilli consists of traditional or conventional biochemical substrates presented in a miniaturised format. When these substrates are inoculated with a suspension of test organism and the organism is able to metabolise the active components, the end products are detected either through a change in colour of a pH indicator or the development of

a coloured end product after the addition of a supplementary reagent. The colours are scored as positive or negative and then translated into a digital Reaction Code which when input into the associated software produces an identification.

The Microgen GNA Identification system offers a number of features which are able to set it apart from other systems. The Microgen GNA-ID system is suitable for use in the identification of isolates from food or medical samples including urinary pathogens, faecal pathogens and common wound isolates. For canned meat applications and better results of current research due the multiple species of Enterobacteriaceae and an extensive range of oxidase-positive Gram Negative Bacilli that might be identified it was used the combination of the Microgen GNA + GNB identification panels i.e. 24 substrates. The microwell test strips are stable in the unopened foil pouches at 2 - 8°C.

It was selected a single colony of the isolate by the time to be identified. The colony was emulsified in 3ml saline without using of PBS and Distilled Water. The optimum density to MacFarland was 0.5. Final suspension reached the visibly turbid or cloudy appearance. The adhesive tape was peeled back without removing completely. The next run was adding 3 - 4 drops (100µL) of the suspension to each well of the strips. The quantity went be approximately 30 - 40% full. The next phase was overlaying appropriate of wells with mineral oil, the wells indicated by black highlight. After that 3 drops of mineral oil were used. Re-sealing of the inoculated strip with the adhesive tape and incubating 18 - 24 hours at 35 - 37°C.

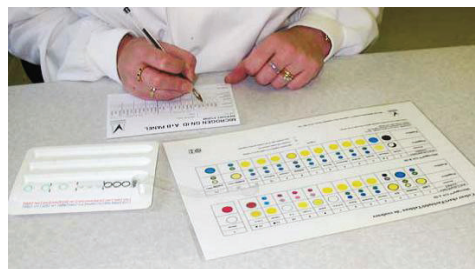


Figure 2. Microgen Bacillus-ID identification system – results monitoring sheets

The next phase was adding reagents Indole, read within a few seconds and VP1, VP 11 reagents were added in order to colour development of positive reactions that started within five minutes and the intensity increased over the next 15 – 20 minutes.

RESULTS AND DISCUSSIONS

Considerable types of microorganisms, whose action may have a relevant influence on the quality of canned meat, were monitored in samples of meat with sauce and fish tins during microbiological analysis. The surface of cans becomes contaminated during storing, in relation with the hygiene conditions.

A diminished presence of microorganism was found in pork canned meat and partially damaged tins for which their inner integrity was not affected. Storing tins in a temperature controlled environment influences the numbers of microorganisms.

The numbers of coliform bacteria were not present for the tins that were not damaged. The numbers of coliform bacteria in damaged cans, especially fish and meat with sauce, duplicated much more than safe undamaged tins.

The first values were low in both cases and their numbers increased only intensely slowly, particularly during long periods of storage.

No visible growth of mould was discovered on the samples of meat stored. Any spores present were in an inactive state.

Low culture amounts of moulds were discovered following cultivation during the storage period. The amplification of moulds was inhibited by competing microflora and for the hermetically cans an insufficiency of oxygen.

The existence of yeasts were also low at the beginning of storage, though their appearance moderately increased by storage time and conditions.

Coliform results

Coliform presence was confirmed in canned sauce meat and fish samples for 20 samples that were damaged (cracks and pin holes). It was found that fish tin contained significantly higher numbers of coliform compared to other tins samples.

However, no significant difference was found between the hermetically closed cans and the

canned meat tins with insufficient damage. These results are also due to the aseptic techniques implied by the correct food processing.

Staphylococcus aureus

A total of 18 out of 60 canned meat samples were found positive in total *Staphylococcus aureus*. The mean staphylococcal counts of sauce meat sample and fish tins were significantly high ($P<0.05$) than other samples. The results of present research showed that *Staphylococcus aureus* were isolated from sauce meat and fish tins samples.

Salmonella and Shigella

The lack of *Salmonella* in the meat product samples indicate the quality of raw meat and that the process conditions and food hygiene include the quality of the raw materials, water and tools used in process.

Fungal

No fungus was detected in the sample of undamaged meat except sample 2 samples with leakage presence on the outside surface. Within this study, it was observed that in the initial condition of normal and undamaged cans, the fungal flora was not present in a high percentage which could harm human health after consumption. Moreover, for the damaged cans, other contaminants were detected in a small percentage.

Table 1. Test results for the main categories – Undamaged Cans

Undamaged Food Cans	Pork cans	Sauce meat cans	Fish cans
Coliform presence	-	-	-
<i>Staphylococcus aureus</i>	-	-	-
<i>Salmonella Shigella</i>	-	-	-
Fungal presence	-	+	-

The study revealed that the count of detailed bacteria in canned sauce meat was higher than acceptable values, making the product a potential public health hazard.

Table 2. Test results for the main categories – Damaged Cans

Damaged Food Cans	Pork cans	Sauce meat cans	Fish cans
Coliform presence	+	+	+
<i>Staphylococcus aureus</i>	+	+	+
<i>Salmonella Shigella</i>	+	+	+
Fungal presence	+	+	+

Commercially canned food is considered safe as it is processed under carefully controlled conditions (Waliullah, S., Ahsan C.R., 2011). If canned food shows signs of spoilage, like bulging can ends, leakage of spurting liquid, odd odour or mould, it should not be consumed by any way. Canned meat may contain toxin if it is not properly processed.

This study's purpose was to indicated the mean count of mould and yeast of canned beef and fish. It revealed that canned meat contains a lower presence of mould than un-canned meat. However, the processing environment and product handling and packaging may introduce microorganism, including pathogens, into packaged product (Smoot, L. M., Pierson, M. D., 1997).

CONCLUSIONS

Particularly more rapid development of contaminating microflora was found in canned meat with sauce and fish rather than pork stored under aerobic conditions. In the final phase of monitoring the numbers of microorganisms, i.e. on day 8 for canned fish meat, meat with sauce and on day 16 for pork tins, extremely similar numbers of all groups of microorganisms were found in all tins.

Restricting the supply of air and the protective action of the packaging material led to numbers of microorganisms growing considerably more slowly in hermetically closed meat tins – the

meat continued to be of acceptable sensory quality even after 14 days of storage.

To meet the food safety requirements of canned meat is important to ensure contamination suppression within the manufacturing process and supply chain, rather than end-product testing. As canned meat was not massively contaminated with microorganisms, just the damages and alteration of hermetically issues are possible drives of food borne illnesses, hence conditions of hygiene on the market shelves and employees respect all conditions and regulation for food market.

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