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Food Distribution Research Society

Journal of Food Distribution Research
Volume 43, Issue 1

Microbiological Quality of Packaged Lunchmeat as Related to the Sell-by-date

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Abstract

Consumers are often confused by the product dating systems used by the food manufacturers. However, they have reported that they consider these dates when purchasing lunchmeats and other ready-to-eat foods. A study was conducted to evaluate changes of microbiological quality of packaged lunchmeat during refrigerated storage as related to the sell-by-date (SBD). Thirty packages of lunchmeat with the same lot number were tested over an extended period. The microbiological quality was satisfactory at the time of purchase. It deteriorated steadily during refrigerated storage regardless of whether the packages were opened or not, and was unsatisfactory at SBD. Food manufacturers should strive to meet the microbiological quality standards and consider the usefulness of the information to consumers when setting a product date.

Keywords: Bacteria in lunchmeat, Package labeling, Sell-by-dates

Introduction

Packaged lunchmeats are a popularly consumed product in homes in the United States. In a study by Godwin and Coppings (2005) the majority of consumers (71%) reported having lunchmeat in their refrigerator for varying lengths of time, some for over one month. Product dating information, e.g. sell-by dates (SBD), is often found on food packages. However, consumers are confused by the different open dating systems, such as sell-by, use-by, and best-if-used-by. A survey conducted by Food Marketing Institute found that consumers' perceptions vary regarding interpreting the dating statements used (Food Marketing Institute 2002). Similar findings were found in a consumer survey conducted by RTI International and Tennessee State University (Kosa et al. 2007). They also found that the majority of participants said they read the dates before purchasing a product. Although the SBD is intended for inventory control and traceability, consumers believe that it indicates a date related to the safety of the product, i.e. how long it is safe to use and store the product after purchasing. USDA-FSIS has published guidelines for consumers' understanding and proper use of the dating information (USDA-FSIS 2011). According to this consumer guideline, lunchmeat, assumedly if purchased before SBD, may be kept in a refrigerator for up to 14 days unopened and 3-5 days after opening. Yet upon inspecting the contents of refrigerators in several states, more than almost one-fourth of them had lunchmeat stored in packages with no dates at all (Godwin and Coppings 2005). Wide variations in microbiological quality may be seen in stored lunchmeat since the product may be purchased up to the SBD, and stored for lengthy times thereafter. Scientific data is needed for developing educational materials regarding storage times and handling practices of refrigerated RTE foods. In order to assess various scenarios of the length of storage, this study was conducted to evaluate changes of microbiological quality of packaged lunchmeat during refrigerated storage as related to the SBD.

Materials and Methods

Thirty packages of thin sliced oven roasted turkey breast with the same lot number and SBD were purchased from a local grocery store. Packages were randomly divided into ten batches (three in each batch) and stored in the original resealable bags at 40 °F in a home-style refrigerator. A testing schedule was arranged so that a new batch was opened every two to four days. The exterior of the packages were sampled the day the packages were opened. A slice of the meat from within was analyzed on the first day the bags were opened, and continuously every two-days, for a total of fourteen days. Microbiological quality of the lunchmeats was determined by aerobic plate count (APC) and Enterobacteriaceae count (EC). In brief, a slice of lunchmeat (about 28g) was place in a sterile stomacher bag and 5 volumes (v/w) of Butterfield's phosphate buffer (pH 7.2) were added to the bag. The contents of the sample bags were blended using a Stomacher R 400 Circulator (Seward Limited, UK) at 230 rpm for 2 minutes. The liquid contents were serially diluted in Butterfield's phosphate buffer from 10-1 to 10-7 folds for subsequent plating. Total Plate Count Agar and Violet Red Bile Glucose Agar were inoculated with 1 mL of the serially diluted samples using the pour plate method (Maturin and Peeler 2001; Szabo 1997). The plates were incubated at 35° C for 48 hours and the colonies were enumerated manually and recorded after incubation. APC and EC were converted to log CFU/g of sample. Microbiological data were analyzed using Statistical Package for Social Sciences (SPSS) software, Version 15.0 for Windows. Descriptive statistics including means and standard deviations were calculated for

all microbial data. Significant differences were tested using General Linear Model. Significance thresholds for all tests were set at P = 0.05.

Results and Discussions

According to industry standards (i.e. less than 1,000 CFU/package for APC and EC), the exterior surfaces were found to be clean for all the packages (n=30) except one. Since any unacceptable count is potentially harmful, this result suggests that the exterior of the package may be contaminated during display or handling at stores or after purchasing. Consumers are advised to clean the surface of package before opening it, and to keep the unused portion of the lunchmeat sealed and stored in the original package. Transfer of lunchmeat from the original package to a container is not recommended as this could increase the potential for contamination.

The average microbial load of the lunchmeats was less than 100 CFU/g at the beginning of the experiment (twenty-first day before SBD). According to the guidelines for the microbiological quality established by PHLS Advisory Committee for Food and Dairy Products, sliced meat should have less than 106 CFU/g of APC and less than 104 CFU/g of EC at the point of sale to be considered acceptable (Gilbert et al. 2000). The lunchmeat used in our study met this microbiological quality standard at the time of purchase. There was a steady increase of APC and EC during refrigerated storage regardless of whether the packages were opened or not. The average increase over a one week period was 11.7 times (1.07-log) for APC and 11.2 times (1.05-log) for EC (Figure1). The data suggested both APC and EC increased more than 10 times in a period of about 7 days under proper refrigerated storage. It is advisable to consumers that the packaged lunchmeat be consumed as soon as possible after purchase since the freshness of the product deteriorated even if they are unopened. The microbiological quality of the product may deteriorate at much faster rate if handled inappropriately, such as being left at room temperature for extended times, stored at incorrect refrigeration temperatures, or unsanitary handling. The average APC was 4.2 x 104 CFU/g and average EC was 2.8 x 104 CFU/g at SBD; the microbiological quality would be considered satisfactory for APC but unsatisfactory for EC if purchased on the SBD. Our data suggested that the packages of lunchmeat in our study would reach the unsatisfactory level of EC at least 1-2 days before SBD. Food manufacturers need to consider reevaluating the SBD labeling based on these guidelines. There were no significant differences among the packages that were been opened at different days before the SBD (Figure 2). The opening of the package is not considered a major factor in the deterioration of the microbiological quality if handled and stored properly. Therefore, educational efforts should be focused on the importance of refrigeration temperature control. Both APC and EC reached more than 107 CFU/g at the fourteenth day after SBD. These exceed the satisfactory level for APC and EC. Thus it is a concern, in the worst scenario, if consumers purchase a product just before SBD and store it unopened in the refrigerator for 14 days before eating. It is advisable that consumers eat lunchmeats purchased close to the SBD immediately.

Conclusion

The results suggest that SBD, in addition to being used for inventory purposes, can be useful information for consumers as a criterion in judging microbiological quality of the packaged

lunchmeats. Food manufacturers should reevaluate the SBD considering the usefulness of the information to consumers and meeting the microbiological quality standards. Education programs are needed in order for consumers to use the product dating information effectively.

Acknowledgements

This research was financially supported by a grant from USDA-NIFA. The authors would like to thank Ms. Bhargavi Sheshachala for the assistance in laboratory work.

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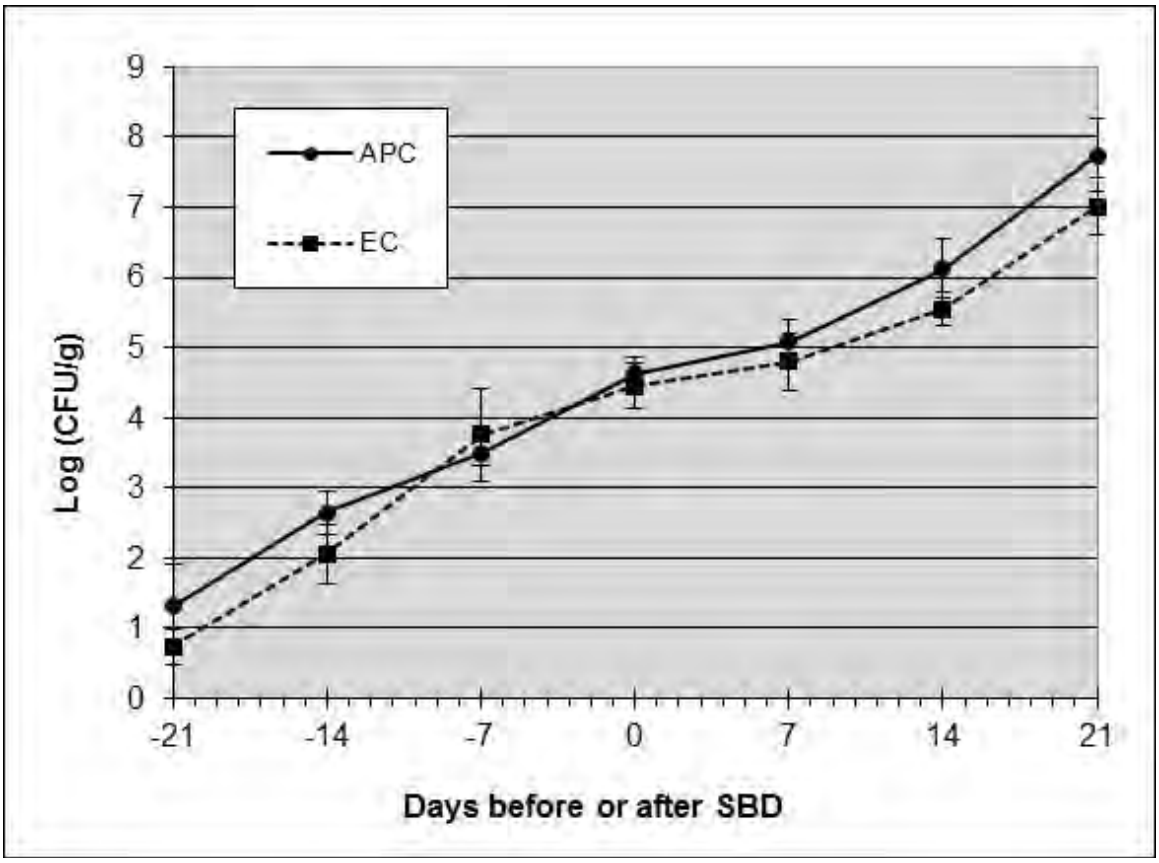

Figure 1. Average APC and EC of lunchmeat related to SBD.

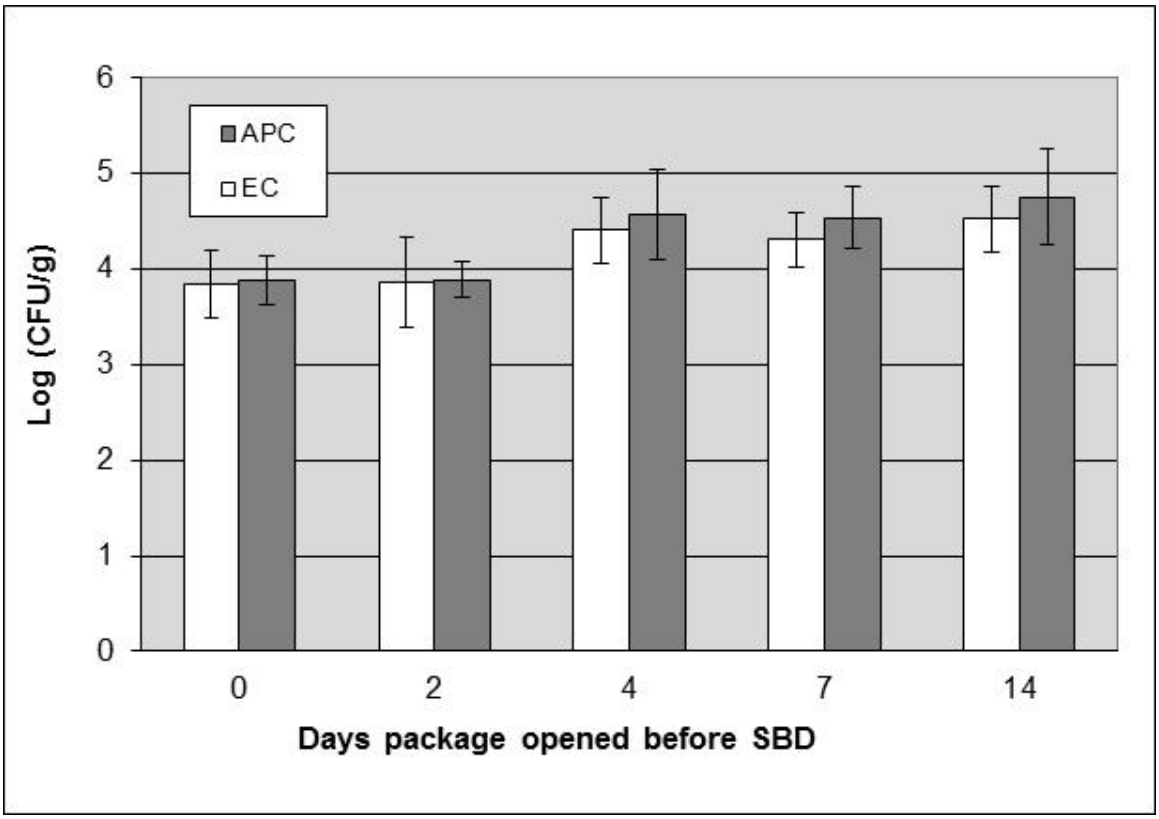

Figure 2. Average APC and EC of lunchmeat at SBD.