

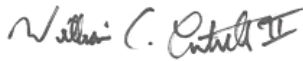
Re: Plascon's Saftea® Zip Top Liner shelf life study

To whom it may concern:

Eurofins Microbiology Laboratories has investigated the ability of Plascon's Saftea® Zip Top Liner to inhibit growth of bacteria, yeast, and mold in a brewed tea product in commercial urns held under typical room-temperature commercial storage conditions. As compared to an urn containing either a similar competitor liner product, or an urn using no liner at all, the tea contained in the urn using the Plascon Saftea® Zip Top Liner was better able to resist the outgrowth of bacteria, yeasts, and molds, especially over extended storage periods. The effect against fungal organisms (yeasts and molds) was most significant, with levels of these organisms recovered at 10-100 times less over the course of the study in the Saftea® Zip Top-lined urn than the competitor-lined urn or the urn with no liner. This means that the use of a Plascon Saftea® Zip Top Liner, as opposed to either the lack of a liner or the use of a competitor liner, may increase both the shelf life and the overall safety of brewed tea held in these urns over extended storage times.

Full information from this study ("Comparative Shelf Life of Tea Products Stored using Saftea® Liners and Other Liner Systems") is available upon request.

Sincerely,



William Centrella  
Special Projects Manager  
Eurofins Microbiology Laboratories, Inc.

# Comparative Shelf Life of Tea Products Stored Using Saftea Liners and Other Liner Systems

---

Eurofins Microbiology Laboratories, Inc.  
2430 New Holland Pike  
Lancaster, PA 17601

717-556-3725  
[www.eurofinsus.com](http://www.eurofinsus.com)

**CONFIDENTIAL INFORMATION**

---

**TABLE OF CONTENTS**

---

1.0	OBJECTIVE .....	3
2.0	PROTOCOL OVERVIEW .....	3
3.0	MATERIALS AND METHODS.....	3
3.1	Product samples and storage materials .....	3
3.2	Sampling intervals.....	3
3.3	Sample testing protocol.....	3
3.4	Data analysis and reporting.....	4
4.0	RESULTS .....	4
5.0	CONCLUSIONS .....	6
6.0	REFERENCES.....	6
7.0	FINAL REPORT APPROVAL .....	7

## 1.0 OBJECTIVE

---

The overall purpose of this study is to define the relative shelf life of tea products held at room temperature when stored inside brewed beverage urns using Saftea Liners as compared to other urn lining products.

## 2.0 PROTOCOL OVERVIEW

---

Samples of tea were held in brewed beverage containers at room temperature for up to 48 hours. The containers contained a Saftea Liner, produced by Plascon, a liner from a leading competitor, or no liner at all. At predefined intervals, samples of the product were analyzed for typical spoilage organisms. The products was also assessed for any changes in the organoleptic properties. The relative shelf life of the product when stored using each liner system was compared.

## 3.0 MATERIALS AND METHODS

---

### 3.1 *Product samples and storage materials*

Tea samples and brewed beverage containers to be used were provided by Plascon. Containers included a liner system, either the Saftea Liner produced by Plascon, or a leading competitor. Tea was brewed and placed in the containers with the appropriate liners. Containers were filled with the tea product and left at room temperature. An additional container was also prepared using no liner.

### 3.2 *Sampling intervals*

Samples from each container were evaluated at the beginning of storage (Time 0, or the completion of brewing), and were aseptically drawn from each system at the container spigot after 12, 24, 36, and 48 hours of storage.

### 3.3 *Sample testing protocol*

At each sampling point, samples of the product were tested in triplicate for the following parameters:

- Aerobic Plate Count (as per AOAC 966.23)
- Yeast and Mold (as per FDA-BAM Chapter 18)

Samples were plated and incubated at appropriate dilutions and at times and temperatures according to the methods detailed above. After incubation, all plates were enumerated by hand using a Quebec colony counter (Model 3325, Reichert, Inc., Depew, NY). Any organoleptic changes (appearance, odor, etc.) detected during sampling were noted.

### ***3.4 Data analysis and reporting***

Results of the enumerations for the samples after each time point were compared to the results from the initial set of samples to determine the ability of each liner product to inhibit or resist the outgrowth of any naturally occurring spoilage organisms. Product shelf life was determined by noting the latest date observed without significant outgrowth of possible spoilage organisms, along with no adverse organoleptic assessment.

## **4.0 RESULTS**

---

Results from the comparative shelf life evaluations are shown in Tables 1 to 3 below, including time of storage, observed count for each replicate, average count of all replicates for each parameter, and the  $\log_{10}$  of each average for each parameter.

**Table 1. Aerobic plate count results by liner**

<b>Competitor Liner</b>	<b>APC 1</b>	<b>APC 2</b>	<b>APC 3</b>	<b>APC Average</b>	<b>APC Log<sub>10</sub></b>
Time 0	<10	<10	<10	<10	<1.00
12 Hours	<10	<10	<10	<10	<1.00
24 Hours	<10	<10	<10	<10	<1.00
36 Hours	<10	<10	<10	<10	<1.00
48 Hours	<10	<10	20	13	1.10
<b>Plascon Liner</b>	<b>APC 1</b>	<b>APC 2</b>	<b>APC 3</b>	<b>APC Average</b>	<b>APC Log<sub>10</sub></b>
Time 0	<10	<10	<10	<10	<1.00
12 Hours	<10	<10	<10	<10	<1.00
24 Hours	<10	<10	<10	<10	<1.00
36 Hours	<10	<10	<10	<10	<1.00
48 Hours	<10	<10	<10	<10	<1.00
<b>No Liner</b>	<b>APC 1</b>	<b>APC 2</b>	<b>APC 3</b>	<b>APC Average</b>	<b>APC Log<sub>10</sub></b>
Time 0	<10	<10	<10	<10	<1.00
12 Hours	<10	<10	<10	<10	<1.00
24 Hours	10	20	10	13	1.12
36 Hours	20	20	20	20	1.30
48 Hours	70	30	120	73	1.87

**Table 2. Yeast results by liner**

<b>Competitor Liner</b>	<b>Yeast 1</b>	<b>Yeast 2</b>	<b>Yeast 3</b>	<b>Yeast Average</b>	<b>Yeast Log<sub>10</sub></b>
Time 0	<10	<10	<10	<10	<1.00
12 Hours	<10	<10	<10	<10	<1.00
24 Hours	<10	<10	<10	<10	<1.00
36 Hours	<10	20	<10	13	1.10
48 Hours	30	660	<10	233	2.37
<b>Plascon Liner</b>	<b>Yeast 1</b>	<b>Yeast 2</b>	<b>Yeast 3</b>	<b>Yeast Average</b>	<b>Yeast Log<sub>10</sub></b>
Time 0	<10	<10	<10	<10	<1.00
12 Hours	<10	<10	<10	<10	<1.00
24 Hours	<10	<10	<10	<10	<1.00
36 Hours	<10	<10	<10	<10	<1.00
48 Hours	<10	<10	<10	<10	<1.00
<b>No Liner</b>	<b>Yeast 1</b>	<b>Yeast 2</b>	<b>Yeast 3</b>	<b>Yeast Average</b>	<b>Yeast Log<sub>10</sub></b>
Time 0	<10	<10	<10	<10	<1.00
12 Hours	<10	<10	<10	<10	<1.00
24 Hours	<10	10	10	10	1.00
36 Hours	10	20	<10	13	1.11
48 Hours	110	120	230	153	2.19

**Table 3. Mold results by liner**

<b>Competitor Liner</b>	<b>Mold 1</b>	<b>Mold 2</b>	<b>Mold 3</b>	<b>Mold Average</b>	<b>Mold Log<sub>10</sub></b>
Time 0	<10	<10	<10	<10	<1.00
12 Hours	<10	<10	<10	<10	<1.00
24 Hours	10	<10	<10	<10	<1.00
36 Hours	<10	190	<10	69	1.84
48 Hours	540	<10	770	440	2.64
<b>Plascon Liner</b>	<b>Mold 1</b>	<b>Mold 2</b>	<b>Mold 3</b>	<b>Mold Average</b>	<b>Mold Log<sub>10</sub></b>
Time 0	<10	<10	<10	<10	<1.00
12 Hours	<10	<10	<10	<10	<1.00
24 Hours	<10	<10	<10	<10	<1.00
36 Hours	<10	<10	<10	<10	<1.00
48 Hours	20	20	80	40	1.60
<b>No Liner</b>	<b>Mold 1</b>	<b>Mold 2</b>	<b>Mold 3</b>	<b>Mold Average</b>	<b>Mold Log<sub>10</sub></b>
Time 0	<10	10	10	10	1.00
12 Hours	20	<10	<10	13	1.10
24 Hours	10	20	10	13	1.12
36 Hours	10	50	50	37	1.56
48 Hours	220	150	230	200	2.30

Results for each set of samples were similar with the exception of the appearance of minor general aerobic growth in the competitor liner at 48 hours, and appearance of fungal outgrowth (both yeast and mold) in the competitor liner at 36 hours. In the Plascon liner, the only appearance of any spoilage organisms was after 48 hours of storage, with a level of mold 1.04 logs lower than that in the competitor liner. With no liner in the container, aerobic growth was observed after 24 hours, while mold growth was observed throughout storage. No significant difference in product organoleptics was observed.



## 5.0 CONCLUSIONS

---

The data in this study shows that tea stored in a container lined with the Plascon product is better able to reduce the appearance of potential spoilage organisms, especially after extended storage periods. Fungal organisms (both yeasts and molds) especially were better able to grow out in containers lined with the competitor products, appearing after 36 hours of room temperature storage. Plascon-lined containers showed only mold growth after another 12 hours of storage, at a level 1.04 logs lower than the competitor. Storage without a liner resulted in even greater recovery of each category of organisms, with 1.87 logs of aerobic organisms, 2.19 logs of yeasts, and 2.30 logs of molds recovered during storage without a liner.

## 6.0 REFERENCES

---

AOAC International. 2015. Official Methods of Analysis, Online Edition.

American Public Health Association. 2001. Compendium of Methods for the Microbiological Examination of Foods, 4<sup>th</sup> Edition.

International Conference on Harmonization of Technical Requirements for Registration of Pharmaceuticals for Human Use. 2003. Evaluation for Stability Data.

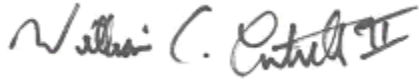
NSF International. 2000. NSF/ANSI Standard for Non-Potentially Hazardous Foods.

U.S. Department of Agriculture. 2015. Microbiology Laboratory Guidebook, Online Edition.

U.S. Food and Drug Administration. 2015. Bacteriological Analytical Manual, Online Edition.

**7.0 FINAL REPOR APPROVAL**

---

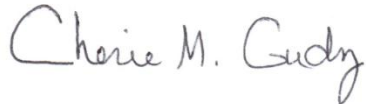
**Prepared By:**

11/02/2015

---

Bill Centrella  
Technical Writer/Special Projects Manager  
Eurofins Microbiology Laboratories, Inc.

---

Date**Approved By:**

11/02/2015

---

Cherie Gudzy  
Manager, EML-Lancaster  
Eurofins Microbiology Laboratories, Inc.

---

Date**Study Sponsor:**

---

David Peterson  
CEO  
Plascon Group

---

Date

---

**CONFIDENTIAL INFORMATION**