# Receipts, a Source of Bisphenol A

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## Introduction

- Bisphenol A (BPA) is a synthetic chemical used to produce resilient plastics. BPA is found in beverage containers, toys, and many other household plastics.
- BPA is a known endocrine disruptor which can affect the reproductive systems of individuals and cause hormonal disturbance. Due to the prevalence in our everyday lives and the plethora of health concerns surrounding BPA, we are interested in other sources.
- BPA has been found in color developers in thermal paper receipts (Semerjian, 2023) in the UAE at detectable quantities. These receipts are found worldwide throughout multiple industries and their presence is understudies.
- It was hypothesized that there will be detectable traces of BPA is the thermal receipts here in the United States. We wanted to compare their quantity in grocery store and restaurant receipts due to employees having variable contact with the paper.

## Results

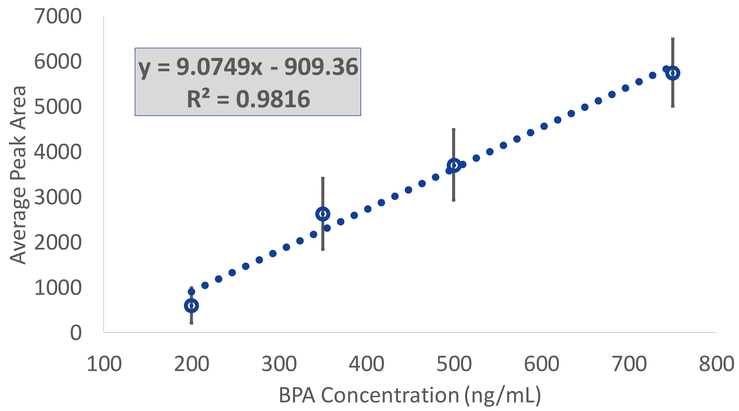


**Fig 2.** Calibration curve

- Standard deviation of peak area from the 200 ng/mL standard and average peak area limit of detection (LOD) and limit of quantitation (LOQ) were calculated: 2 ng/mL LOD; 7 ng/mL LOQ
- Concentrations of BPA for receipt samples were determined using the calibration curve.
- ANOVA comparing all 6 sources; with a p-value of 0.26
- T-test with pooled data from all restaurants compared to all grocery stores with a p-value of 0.09

| | Rest. 1 | Rest. 2 | Rest. 3 | Groc. 1 | Groc. 2 | Groc. 3 |
|---|---|---|---|---|---|---|
| ng/mL | 210 | 120 | 399 | 108 | 163 | 102 |
| ng BPA | 2109 | 1202 | 3997 | 1081 | 163 | 1020 |
| mg BPA per g receipt | 0.084 | 0.048 | 0.160 | 0.043 | 0.065 | 0.040 |

**Table 1.** Concentration of BPA in restaurant 1-3 and grocery store 1-3

## Experimental Design

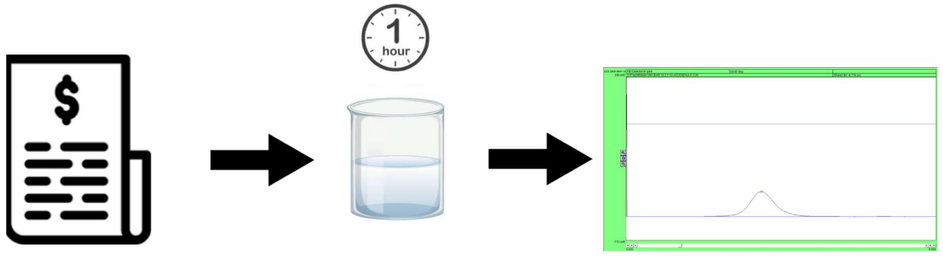


**Fig 1.** Experimental Design

- Receipts from three different grocery stores and restaurants were collected within 7 days.
- Extraction method was optimized, and 25 mg of cut receipts were submerged in 10mL of room temperature water for 60 minutes (Semerjian, 2023).
- 50 µL of each sample injected into HPLC with 254 nm UV detector: mobile phase 55/45% v/v water/acetonitrile; 1 mL/min flow rate
- Concentrations determined against standard calibration curve

## Discussion

- BPA concentrations detected were lower in comparison to other studies (Semerjian, 2023).
- ANOVA showed no significant difference in BPA
- Found an average level of BPA of 60 µg/receipt which is far above the 15 µg/per person recommended exposure level (Hafezi, 2019).
- It has been shown in other studies that exposure to receipts increases BPA concentrations (Semerjian, 2023). This demonstrates that receipts have the potential to contribute to BPA exposures.

## References

Hafezi, S. A., & Abdel-Rahman, W. M. (2019). Current Molecular Pharmacology, *12*(3), 230–238. https://doi.org/10.2174/1874467212666190306164507

Semerjian, L., Alawadhi, N., & Nazer, K. (2023). PLoS ONE, *18*(3):e0283675. https://doi.org/10.1371/journal.pone.0283675