

Determinations of UV filters in consumer products by solid phase microextraction with GC-MS/MS



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Overview

- The functions of UV filters: protect human skin from UV radiation and enhance photostability of the products.
- The sources of UV filters are consumer products, while dermal contact is the major exposure pathway.
- There is a need to determine the levels of UV filters in products and assess the associated exposures.

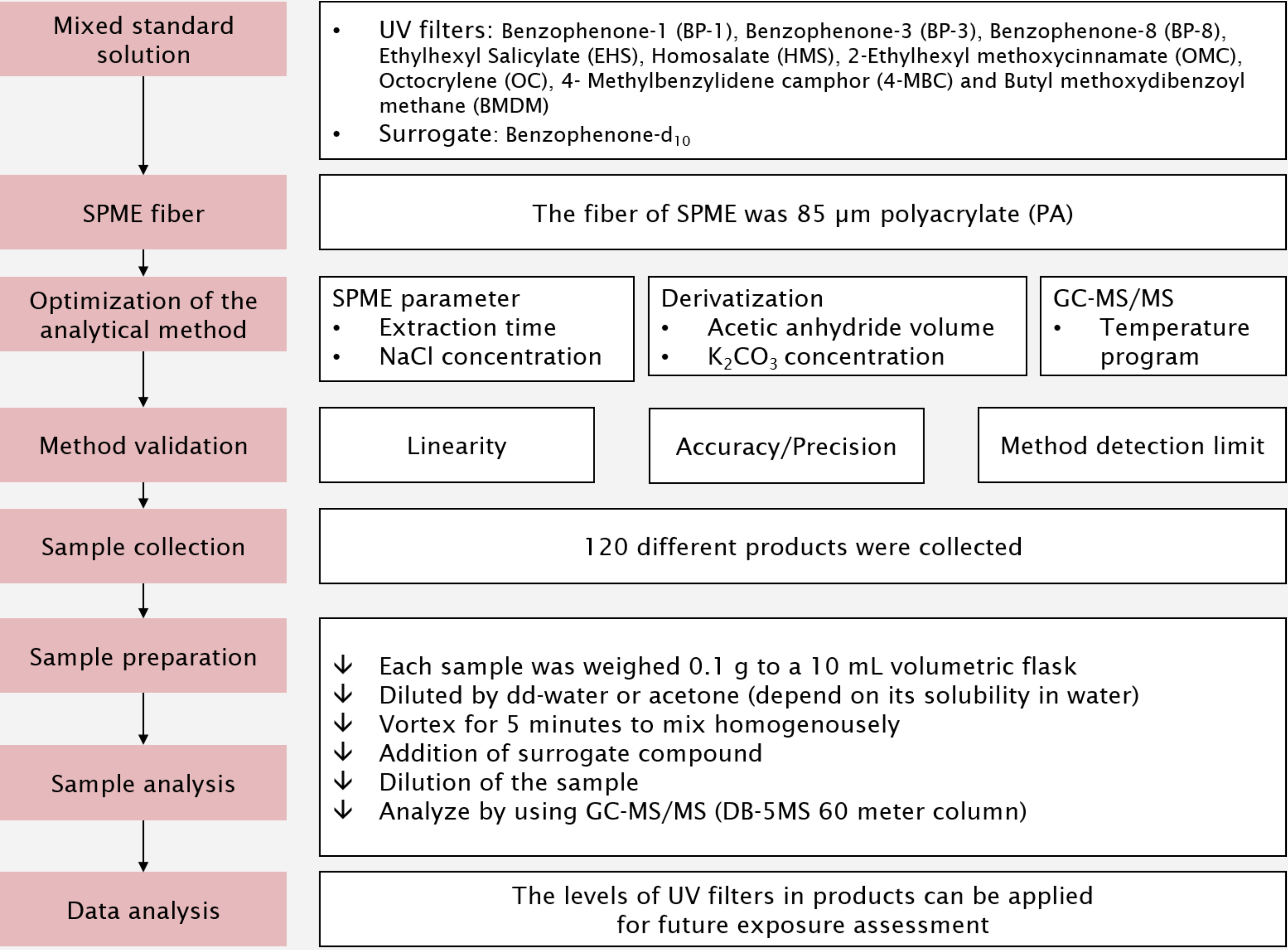
Introduction

In order to protect our skin against UV radiation or to prevent the products from light-induced degradation, organic UV filters are increasingly added into various products. However, UV filters have been identified as possible endocrine disrupting chemicals (EDCs) and have also been detected in multiple environmental matrices and human bodies. Nevertheless, the information regarding the distributions of UV filters in various categories of products is still limited in Taiwan.

Objectives

- Establish a suitable method to determine the levels of UV filters in various consumer products.
- With the information of their distributions, health risks with the associated exposures of UV filters can be assessed.

Methods



Results

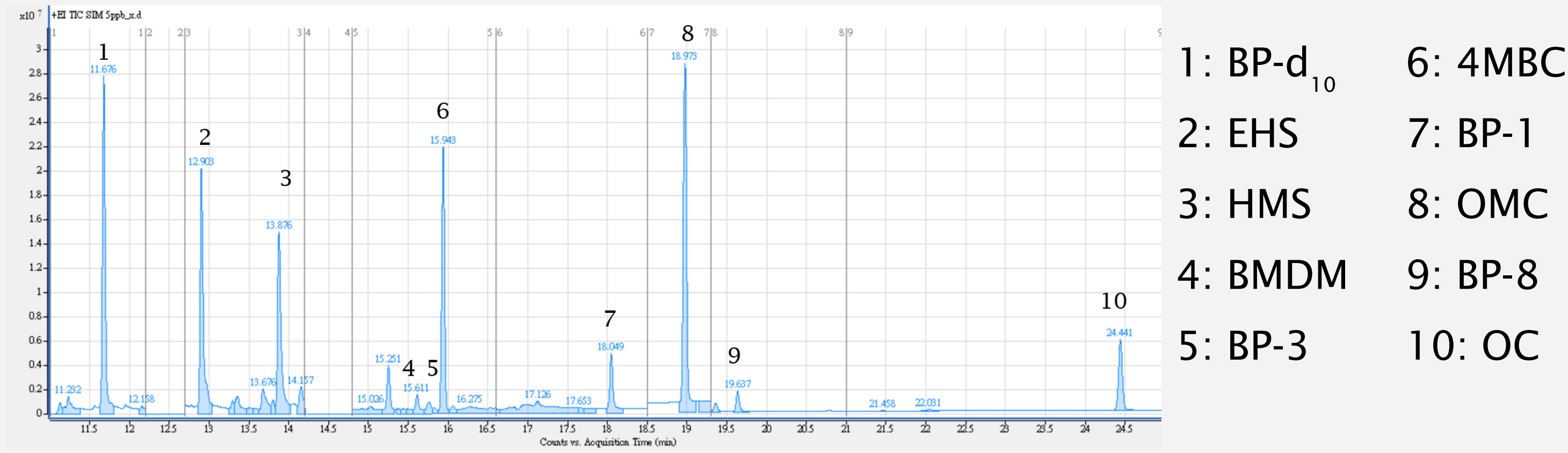


Figure 1. Chromatogram of mixed standards with SPME procedure in SIM mode

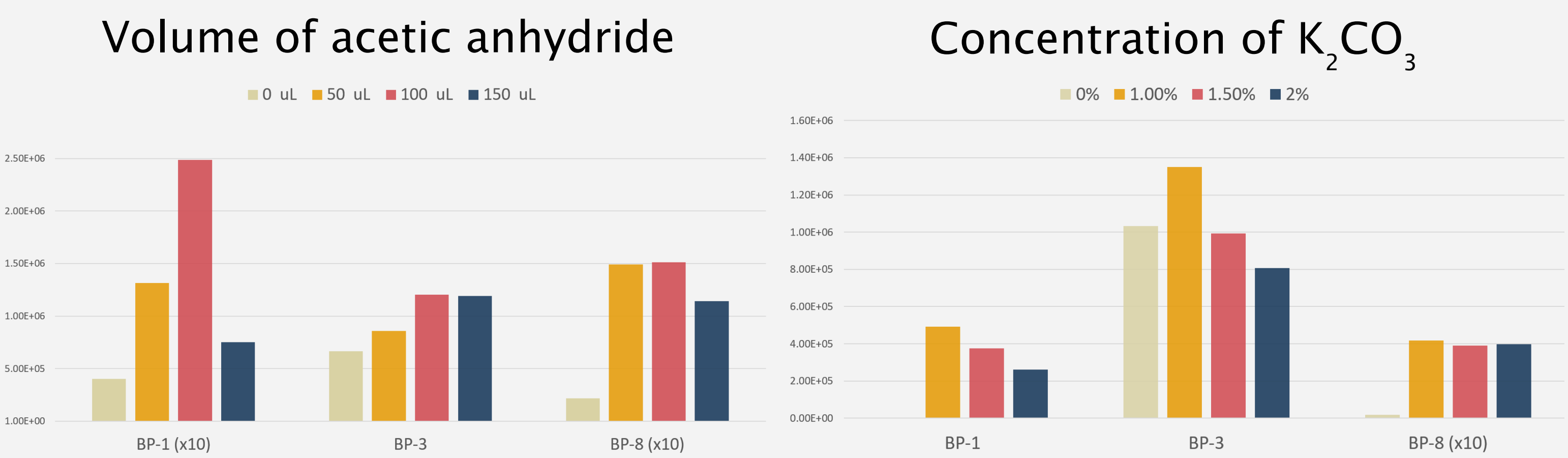


Figure 2. The effect of acetic anhydride (AA) volume with derivatization on the targeted analytes

Figure 3. The effect of K₂CO₃ concentration with derivatization on the targeted analytes

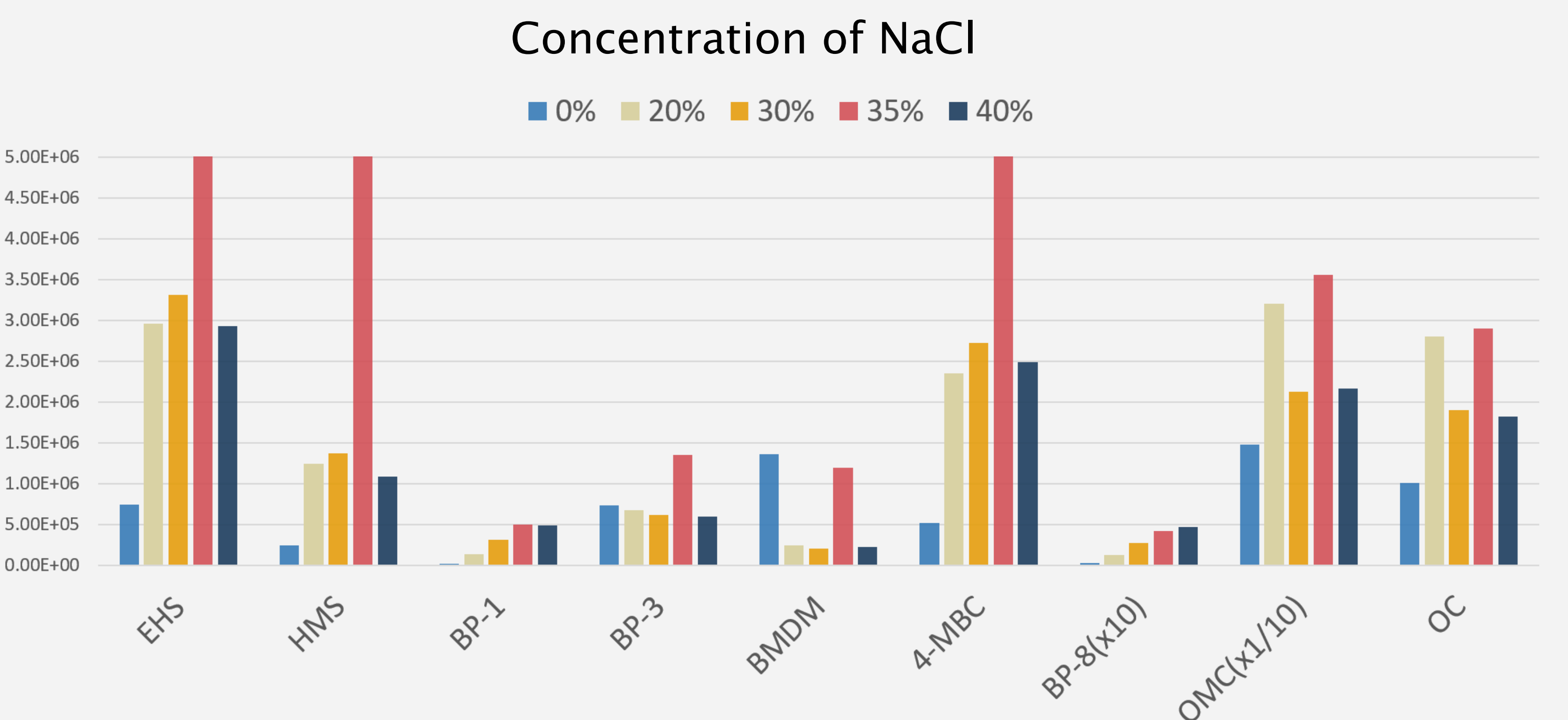


Figure 4. The effect of NaCl concentration with derivatization and salting-out effects

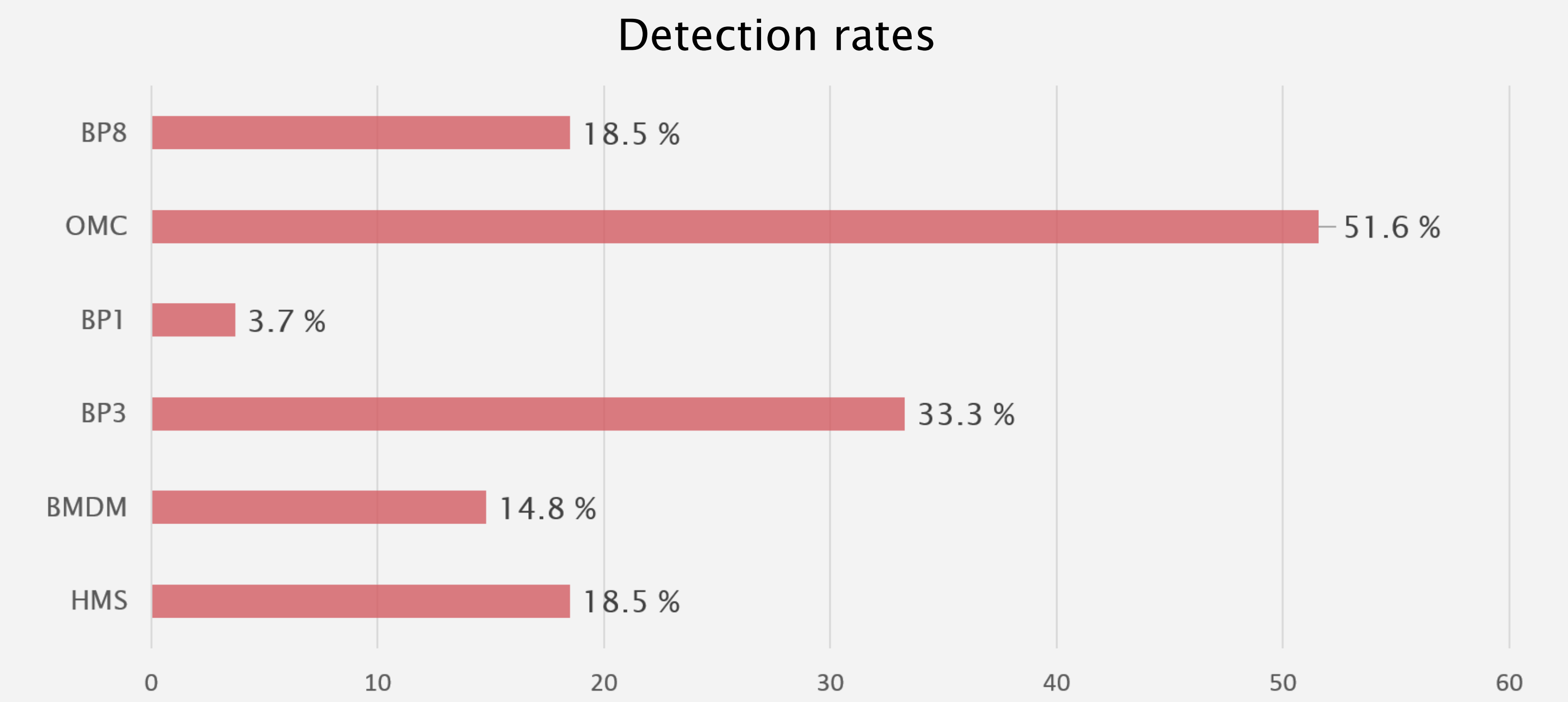


Figure 5. Detection rates in 27 consumer products, including shampoo, face lotion, body wash, face cleansing, and face toner

Conclusions

- The headspace SPME procedure coupled with GC-MS/MS analysis for the determinations of UV filters in consumer products was established in this study. Acylation with acetic anhydride and K₂CO₃ is a workable method to derivatize benzophenone type of UV filters. The linear ranges of these substances ranged from 0.02 to 200 ng/mL, depending on their properties. Good linearity and precision were presented.
- UV filters are detected in different types of products. In fact, some of these products did not show these ingredients on their labels. The concentration of OMC (with highest detection rate) is between 0.00012 and 0.00087 (% g/g) in samples. Moreover, in sunscreen and perfume products, OMC not only can be detected, but also has higher level than other products (around 6 % g/g).
- With the level of UV filters in different products, dermal exposure could be assessed in the future.

References

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