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Application Note

Rapid Screening for DEHP in Food and Beverage Products

Waters Corporation

This is an Application Brief and does not contain a detailed Experimental section.

Abstract

This work describes successful screening for the presence of di(2-ethylhexyl) phthalate (DEHP) in food and beverage products using a simple, rapid technique with minimal sample preparation and no chromatographic separation.

Benefits

Screen for DEHP in less than 2 minutes with minimal sample preparation and no chromatographic separation.

Introduction

Di(2-ethylhexyl) phthalate (DEHP) is a costeffective general purpose plasticizer used mainly for making plastics soft and pliable in building materials such as flooring, cables, as well as medical devices.

In May 2011, the Taiwan Food and Drug Administration (TFDA) found DEHP in powdered probiotics, which was then traced back to the clouding agent supplier. The so-called “clouding agent” is a legal food additive that is commonly used in beverage, food, and dietary supplements. However, the supplier intentionally replaced the additives with DEHP in order to cut costs. DEHP is 20 times more toxic than melamine, and is classified as a class B2, probable human carcinogen, under the U.S. Environmental Protection Agency. Consumption of plasticizer-tainted food or beverage products increases the risk of reproductive abnormalities.

The regulations of Food Containers and Appliances (Taiwan) mandate that the maximum level of DEHP dissolved from plastic items must not exceed 1.5 ppm, and that no DEHP can be added to food products. The international acceptance criteria of daily maximum consumption ranges from 1.2 to 8.4 mg for a 60 kg adult.

Food safety regulators require that all products found to be contaminated with DEHP be recalled and removed from the shelves immediately. Rigorous tests must be carried out on six categories of food and beverages including sports drinks, fruit juices, tea drinks, fruit jam and jellies, food powders, and health supplement tablets. This poses a major analytical challenge, as the complexity of food matrices requires the use of different extraction techniques. Thus the ability to rapidly screen for the presence of DEHP using a simple technique with minimal sample preparation and no chromatographic separation would be advantageous.

Results and Discussion

The Waters Atmospheric Solids Analysis Probe (ASAP), together with the Xevo TQ MS System, is able to rapidly screen for the presence of DEHP in less than two minutes. Minimal sample preparation and no chromatographic separation are required for this analysis. This method is able to detect for DEHP confidently in a range of food matrices.

The glass capillary was dipped into the food sample and any excess sample was wiped off. The capillary was then attached onto the ASAP probe and loaded directly into the source enclosure of the Xevo TQ MS System. The desolvation gas was rapidly heated to 450 °C within 20 seconds and acquired using multiple reaction monitoring (MRM) with three transitions listed in Table 1.

The Atmospheric Solids Analysis Probe (ASAP).

Precursor ion	Product ion	Cone voltage (V)	Collision energy (eV)
391.3	149	19	20
	167		14
	279		9

Table 1. MRM transitions for DEHP analysis.

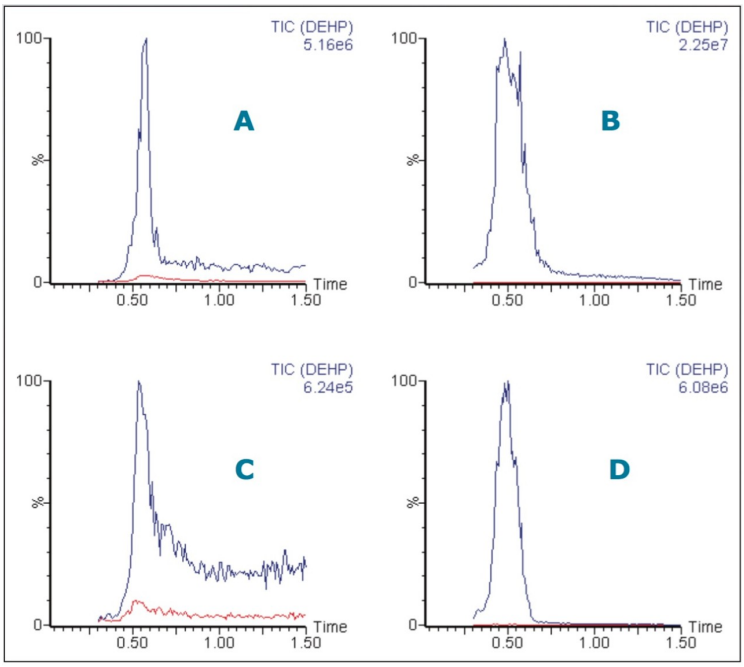

Figure 1. TIC traces of DEHP spiked at 1 mg/kg (blue) versus blank (red) in flavored syrup (A), fruit juice (B), fruit jam (C), and health supplement tablet (D).

Conclusion

DEHP was successfully detected at 1 ppm in a range of food matrices. Requiring minimal sample preparation and with no chromatographic separation, this was achieved in less than 2 minutes per sample using ASAP and Xevo TQ MS.

This solution provides an increase in lab productivity and efficiency due to the ease of sample preparation (direct sampling from the matrix) and shorter analysis times. At the same time, with the minimal use of solvent in this analysis, the cost of lab consumables is also minimized.

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Atmospheric Solids Analysis Probe

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