

## RESEARCH REPORT - No. 1603 FY 2016-2017

Title of research project	Study on estimation of intake of chemical substances migrated from PET bottles
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Research period	FY 2016–2017
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### **【Abstract】**

Polyethylene terephthalate (PET) is a clear and tough plastic with high impermeability to gas and moisture. This material is widely used for food contact materials such as PET bottles. Generally, potential migrants from PET bottles consist of initial reactants including monomers, metallic catalysts, reaction byproducts and degradation products. However, migration data of these substances are not enough to estimate their daily intake. The aim of our research is to identify and quantify the migrants of PET bottles for estimation of daily intake of such chemical substances.

PET bottles for soft drinks that are frequently consumed in Japan were used as samples. Firstly, potential migrants were identified with various devices suitable for each compound. As a result, antimony, germanium, titanium, cobalt, phosphorus, 2-methyl-1,3-dioxolane, nonanal, decanal, cyclopentanone and benzaldehyde were identified using ICP-MS and HS-GC-MS. Moreover, oligomers having a carboxyl group at its terminal were newly identified by LC-MS non-target analysis. Migration study was conducted with total of 25 substances including above identified substances and known substances such as PET monomers, cyclic oligomers, acetaldehyde and formaldehyde.

In order to determine the migration amount into food simulants (water, 4% acetic acid and 50% ethanol) with high sensitivity and accuracy, rapid and simple methods using ICP-MS, PT-GC-MS and LC-MS were developed. Validation test were carried out for the test methods, and performance parameters such as trueness and precision met our target values. In order to confirm the influence of the storage temperature, a short-term migration test were conducted at 25°C, 40°C and 60°C for 10 days, and a long-term test were conducted at 25°C for 10 days, 3, 6, 9, 12 months based on the shelf life of the soft drinks in the PET bottle. As a result, antimony, germanium, 2-methyl-1,3-dioxolane, newly identified oligomers of carboxyl group at its terminal, bis (2-hydroxyethyl) terephthalate, cyclic trimer, acetaldehyde and formaldehyde were found to migrate. Moreover, migration amount increased as the storing temperature and time increased.

The daily intake for the 25 substances subjected to the migration test, was estimated from the migration results of 25°C for 12 months and the consumption of soft drink contained in the PET bottle. As a result, the estimated daily intake of 6 substances was 0.28 to 30.8 µg/day. The other

19 substances were below the limit of quantitation. Conservative daily intake was estimated using their limit of quantification, and was < 0.0062 µg/day to < 16 µg / day.

This research is the first report that conducted a long-term migration test over a year covering domestically used PET bottles. Many results were obtained that have not been reported before. These results would provide useful information for the assessment by The Food Safety Commission.