

Perchlorate Contamination in Foods of Plant Origin

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Introduction

Since July 2012 more than 2,000 samples of plant-based foods have been analyzed for the presence of perchlorate using the QuPPE method developed by the EURL-SRM.

The analyses revealed conspicuously high levels of perchlorate (> 0.1 mg/kg) in 3% of the samples, with the highest amount detected in spinach, with 3.9 mg/kg. Among the organically grown food samples 2% contained levels above 0.1 mg/kg. Organically labelled green tea contained 0.4 mg/kg and an organically grown cucumber had 0.33 mg/kg perchlorate.

Analytical methods

Analysis was performed applying the QuPPE method and LC-MS/MS determination (ESI neg mode) using an $^{18}\text{O}_4$ -Internal Standard (ILIS).

LC-Conditions:

Column:

• Hypercarb 2.1 x 100 mm; 5 μm

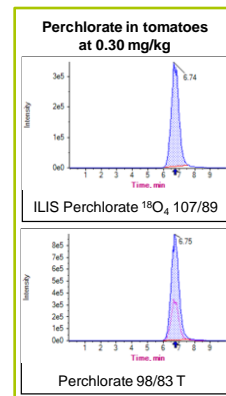
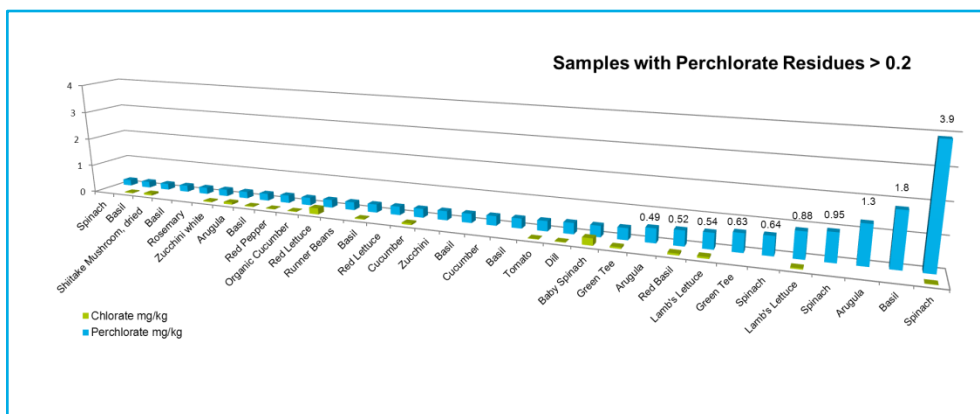
Mobile Phase:

A: 1% acetic acid in water + 5% MeOH

B: 1% acetic acid in MeOH

Gradient: 0-10 min 100% A - 70% A

Injection volume: 5 μL ; samples 5-fold diluted



Legal aspects

In July 2013 the Standing Committee of the Food Chain and Animal Health published a harmonised provisional enforcement approach for intra-Union trade until an EFSA opinion evaluating the risk for public health as a consequence of the presence of perchlorate in food is available.

Levels of Perchlorate:	mg/kg
All food / fruits and vegetables, except:	0.5
Citrus fruits, pome fruit, root and tuber vegetables, table grapes, spinach, melons and watermelons	0.2
Leaf vegetables (exc. spinach), fresh herbs and celery – grown in glasshouses / under cover	1.0

The competent authorities of the Member States agreed not to take action in cases below these levels for the moment.

A high consumption of perchlorate may lead to a (reversible) inhibition of iodine intake by the thyroid. Long-term suppression of iodine absorption can lead to a change in the thyroid's hormone level, which can severely impair one's health, especially for children and pregnant women.

Reference

<http://www.cvuas.de>



Results

The foods most affected were leafy vegetables such as lettuce and herbs, fruiting vegetables such as tomatoes and zucchini, and citrus fruits. By examining the dispersion of perchlorate between the peel and flesh of melons and grapefruit, we could show that perchlorate contamination can occur both in the interior of fruits as well as on the peel. Therefore, it is not possible to get rid of the contamination by simply washing the food. The systemic distribution further indicates uptake via the roots; contamination takes thus place during the growing period in the field. Investigations by other groups have shown that fertilizers are a main source of perchlorate contamination in the fields.

Summary

The results of data collected after the publication of the internet report on Perchlorate Contamination in Foods of Plant Origin between June 2013 and May 2014 imply that the percentage of samples with perchlorate residues is still high. Residues above 0.01 mg/kg were detected in 21% of the samples. However, only 0.5% (7 samples) of the examined samples contained more than 0.5 mg/kg, with the highest amount of perchlorate in spinach at 3.9 mg/kg.

