Large-scale biomonitoring of bisphenols in the Swiss population

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2022 and 2023, the Swiss Federal Food Safety and Veterinary Office (FSVO) conducted a study about salt intake in Switzerland. The study included a representative sample of adults from different regions, age groups, and genders across Switzerland. Beside the determination of some cardiometabolic indicators, 863 Participants completed detailed questionnaires about their dietary habits, knowledge about salt consumption and other lifestyle factors [1]. The participants were also asked to provide 24-hour urine samples. In this elaborate framework, the FSVO mandated METAS to determine in these urine samples the amount of some bisphenols, phthalate metabolites, and iodine.

Bisphenols (BPs) are used as monomer for the production of polycarbonates, epoxy resins and thermal paper. Due to their presence in common consumer products as well as their chemical structure, they can migrate into food, beverages, water, dust and soil, leading to human exposure by a variety of routes. Dietary ingestion is the most significant route of exposure [2]. BPs can leach into food and drinks from containers, especially when they are scratched, heated or washed repeatedly. BPs are suspected to have disrupting effects on the endocrine system of humans and animals. Endocrine-disrupting chemicals may mimic, block or interfere with the body's hormones and are associated with health issues [3]. Glucuronidation of BPs in the intestine and liver is considered the main metabolic pathway for most BPs while other metabolites only result when the glucuronidation pathway is saturated. These metabolites are mainly excreted through urine [4]. Therefore, human biomonitoring in urine is a crucial method to assess the possible presence of these chemicals in various body fluids to determine the overall extent of exposure in both a qualitative and quantitative manner.

Sample preparation was optimized for high-throughput. During the sample preparation, enzymatic hydrolysis is performed to cleave the glucuronides in urine, followed by protein precipitation. Eleven bisphenols were selected and analysed with ultra-high pressure liquid chromatography–mass spectrometry in a 13-minute run. The mass spectrometer was operated in negative ionization mode, using a scheduled multiple reaction method with three transitions per substance (one quantifying and two qualifying transitions) to ensure selectivity. Corresponding isotopically-labelled standards were added in equal amounts to all samples to ensure robustness. The Method Accuracy Profile associated with the β-expectation tolerance intervals was selected to assess and validate the quantitative performance of the newly developed analytical method. Measurement uncertainties were estimated based on the validation measurements.

We will present the results of this extensive biomonitoring study of bisphenols in Switzerland.

[1] https://www.blv.admin.ch/blv/en/home/lebensmittel-und-ernaehrung/forschung/gesundheitliche-risiken/ernaehrungsrisiken/salzstudie.html (29.01.2026).
[2] Vandenberg *et al.*, Reprod Toxicol, **2007**, *24*, 139-177.
[3] Teng *et al.*, Chem-Biol Interact, **2013**, *203*, 556-564.
[4] Trdan Lusin *et al.,* Toxicology, **2012,** *292*, 33–41.