MONITORING OF BISPHENOL A AND ITS 15 ANALOGUES IN ENVIRONMENTAL SAMPLES WITH ULTRA-HIGH PERFORMANCE LIQUID CHROMATOGRAPHY HIGH RESOLUTION TIME OF FLIGHT MASS SPECTROMETRY (UHPLC-TOF-MS)

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Bisphenol A (BPA) is a high-production volume chemical and is used as a monomer in the production of polycarbonate polymers and epoxy resins in many industries. Since BPA is recognised as an endocrine disruptor, there are concerns over its potential impact, particularly on the health of children and the environment. In January 2011, the European Commission adopted Directive 2011/8/EU, which prohibits the use of BPA in the manufacture of polycarbonate infant feeding bottles. Health Canada has also banned BPA use in baby bottles and the US FDA has prohibited its use in the coating of infant formula packaging. The European Food Safety Authority (EFSA) completed its first full risk assessment of BPA in 2006 and set a Tolerable Daily Intake (TDI) of 50 µg/kg bw/ day, although in January 2015, they recommended that this should be lowered to 4 µg/kg bw/day. Recently, the restrictions on the use of BPA have forced the polymer industry to replace BPA with bisphenol S (BPS) in thermal paper and other products. Bisphenol F (BPF) and bisphenol B (BPB) are possible replacements in the production of epoxy resin and polycarbonate, and have already been detected in canned foods and soft drinks. In addition to these analogues, Bisphenol AF (BPAF) is used in the manufacturing of phenolic resins or fluoroelastomers. These bisphenols have a structural similarity to BPA and unfortunately, may have the same health effects as BPA. In this study bisphenol A, S, F, B, AF and 12 other new bisphenols were analyzed in water, sediment and biological samples with with ultra-high performance liquid chromatography high resolution time of flight mass spectrometry (UHPLC-TOF-MS).

Keywords: bisphenol A, new bisphenols, emerging contaminants

REFERENCES

1. Commission Directive 2011/8/EU of 28 January 2011 amending Directive 2002/72/EC as regards the restriction of use of Bisphenol A in plastic infant feeding bottles.
2. EFSA Press Release, Bisphenol A: EFSA consults on assessment of risks to human health, 17 January 2014.
3. Screening Program 2013: New bisphenols, organic peroxides, fluorinated siloxanes, organic UV filters and selected PBT substances, Kevin Thomas (NIVA), Martin Schlabach (NILU), Kathrine Langford (NIVA), Eirik Fjeld (NIVA), Sigurd Øxnevad (NIVA), Thomas Rundberget (NIVA), Kine Bæk (NIVA), Pawel Rostkowski (NILU) and Mikael Harju (NILU), Norwegian Environment Agency, Report M-176/2014.
4. Yang, Y. J.; Lu, L. B.; Zhang, J.; Yang, Y.; Wu, Y. N.; Shao, B., Simultaneous determination of seven bisphenols in environmental water and solid samples by liquid chromatography-electrospray tandem mass spectrometry. Journal of Chromatography A **2014,** 1328, 26-34.
5. Grumetto, L.; Montesano, D.; Seccia, S.; Albrizio, S.; Barbato, F., Determination of Bisphenol A and Bisphenol B Residues in Canned Peeled Tomatoes by Reversed-Phase Liquid Chromatography. J Agr Food Chem **2008,** 56 (22), 10633-10637
6. Eladak, S.; Grisin, T.; Moison, D.; Guerquin, M. J.; N'Tumba-Byn, T.; Pozzi-Gaudin, S.; Benachi, A.; Livera, G.; Rouiller-Fabre, V.; Habert, R., A new chapter in the bisphenol A story: bisphenol S and bisphenol F are not safe alternatives to this compound. Fertil Steril **2015,** 103 (1), 11-21.